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	PAGE
DENMARK	60
EUROPE	421
FRANCE	438

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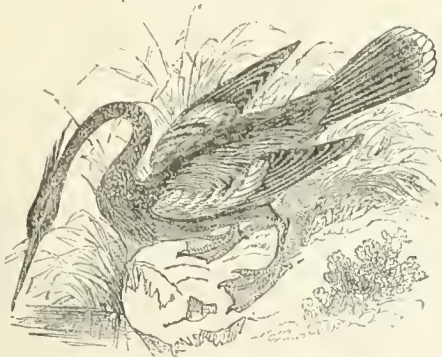
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DA'RNLEY, HENRY STEWART, LORD husband of Mary Queen of Scots, the eldest son of the Earl of Lennox by Lady Margaret Douglas, was born in 1546, in England, where also he was educated. He was handsome in appearance, accomplished in manners, but fatally destitute of all moral and intellectual power. D. is interesting chiefly on account of the position which he occupied with respect to his wife. See **MARY STEWART**.

DARTER (*Plotus*), a genus of birds very nearly allied to Cormorants (q. v.), but having a bill longer than the head, perfectly straight, slender, and sharp-pointed; and also remarkable for the



Darter (*Plotus Anhinga*).

great length of the neck, which has obtained for them the name of *Snake-birds*. They derive the name D. from darting forward their bill at their prey by means of their long flexible neck. They are very voracious, and eat great quantities of fish, which they swallow entire. They are found in warm climates.

DA'RTFORD (Saxon, *Darentford*), a town in the north-west of Kent, 17 miles east-south-east of London by rail, on the left bank of the Darent, which is navigable for barges. It lies in a narrow valley between two steep hills. Pop. (1881) 10,567. It has large corn-mills, cotton and silk printing-works, large powder and paper mills; also manufactures of oil, iron, and machinery. Near D. stood the first rolling, slitting, and wire-drawing mill in England, as well as the first paper-mill, built by Spielman, who died 1607. Here stand the ruins of a nunnery, founded 1355, by Edward III., with 12 acres of walled orchards and gardens. This king held a tournament here in 1331. Wat Tyler's insurrection, in the reign of Richard III., broke out at D. in 1381. Watling Street, an ancient Roman road, crossed the river here. Near D. Heath are many ancient chalk hollows and pits, with deep shafts leading to numerous chambers and galleries excavated probably for sepulture, for retreat, or to make use of the chalk.

DA'RTMOOR, a granitic table-land in the south-western part of the county Devon, remarkable for its wild and rugged scenery, its towering rock-capped hills, the numerous streams that have their source in its boggy soil, and the many cyclopean relics of the aboriginal inhabitants that are scattered over its solitary wastes, where the deep silence is broken only by the sudden flight of the ring-ouzel, the screams of the curlew, or the shrill whistle of the lapwing, dotterel, or stone-plover. D. Proper (or the ancient and royal forest of that name) and its adjuncts, including the outlying common lands that present the same physical features, extend about 20 miles from east to west, and 22 miles from north to south, occupying one-fifth of the entire area of the county of Devon, or more than 130,000 acres. This moorland region, encircled by a natural rampart, moated by deep valleys, has a very considerable elevation above the surrounding country, and culminates in Yes Tor, 2050 feet above the sea-level. Its broken uneven surface has been compared, not inaptly, to 'the long rolling waves of a tempestuous ocean, fixed into solidity by some instantaneous and powerful impulse.'

The most important rivers that rise in Northern D. are the Dart, the Teign, the Taw, the West Ockment or Okement, the Lyd, the Tavy, and the Walkham; while from the swamps of Southern D. spring the Plym, the Yealm, the Erme or Aime, and the Avon. Aven, or Aune.

Geologically, D. is formed, for the most part, of granite rock, which has been protruded through the shales, slates, and sandstones of the Devonian system. Large masses of trap occur at White Tor, Cock's Tor, and other localities. Tin, copper, and manganese are found amongst the granite, of which four varieties—common, finer, red, and compact—are distinguished. These, as well as the several kinds of trap-rock, are much used for economical purposes. At Wheal, Duchy, and Birch Tor are productive tin mines. The soil of D. is composed chiefly of peat, which in the bottoms has accumulated in some places to the depth of 25 feet; it rests on a sub-soil of fine sand. Many of the well-watered

dells and ravines are fertile, while the whole moor affords pasturage for cattle, sheep, and horses. Amongst the mosses and lichens, with which the region abounds, are the *Lecanora perella* and the *L. tartarea*, or Cudbear Lichen. See **CUDBEAR**. Some years ago, both these lichens were largely exported; and it is said that, from 1762 to 1767 inclusive, nearly 100 tons of the *L. tartarea* were collected from the tors of the moor. Wistman's Wood, a grove of stunted oak-trees, averaging about ten feet in height, is of venerable antiquity. It stands on a rocky declivity about 400 yards in length, and measures less than 100 yards across the widest part. The *ornithology* of D. is more limited than formerly; the progress of cultivation and the preservation of game are driving away the eagle, the bustard, the crane, and the kite, which are now rarely seen. The black-cock is likewise becoming extinct. Dr. Moore says: 'The frequenters of the uncultivated parts are now chiefly the sparrow-hawk, the hobby, the goshawk, the hen-harrier, the brown or marsh harrier, and the buzzard.' The *antiquities* of D., as illustrating ancient periods of British history, are worth an attentive study; of these, the Grey Wethers, below Sittaford Tor—a fine specimen of what is usually styled a Druidical circular temple—the vestiges of a large aboriginal village at Grimspond, the cromlech at Drewsteigton, the logan-stones and stone-avenues, the kistvaens, barrows, cairns, rock-pillars, and ancient trackways, whose story the old tors alone could tell, are examples. Many legends and stories of moorland adventure are related; but the most famous is that of the bold hunter, Childe of Plymstock, whose fate Carrington has celebrated in a spirited ballad. See Carrington's *Poems*, Mrs. Bray's *Tamar and Tavy*, and article 'Lost on Dartmoor,' *Chambers's Journal*, vol. i. p. 350.

During the long war with France, consequent on the great Revolution and the career of Napoleon, a prison was erected in the center of the western quarter of D., at about 1400 feet above the sea-level, for the accommodation of prisoners of war.

The first stone was laid on the 20th March 1806, and the building was finished at a cost of £127,000. Prince Town sprang up close by, and soon became a thriving place. The prison is now used as a dépôt for convicts, who are employed in cultivating the adjacent moor.

The castle, manor, and forest of D. were granted by Henry III. to his brother Richard, Earl of Cornwall; and since 1337 A.D., D. has been permanently annexed to the Duchy of Cornwall.

See De la Reche's *Report on the Geology of Cornwall, Devon, and West Somerset* (Lond. 1839); and for a full account of D., *A Perambulation of the Ancient and Royal Forest of Dartmoor*, &c., by Rev. S. Rowe (Plymouth and Lond. 1856); also *Papers on the Geology, Soil, Botany, and Ornithology of Dartmoor*, by Ed. Moore, M.D., &c., in appendix of the above work.

DA'RTMOUTH, a parliamentary and municipal burgh and seaport, in the south of Devonshire, built in terraces on a steep slope 300 to 400 feet high, on the right bank of the romantic estuary of the river Dart, at a short distance from the sea. D. is 32 miles south-by-west of Exeter. The streets are narrow, and many of the houses very old, with overhanging stories, projecting gables, and wood-carving. St. Saviour's Church, of the 14th c., has a richly sculptured, painted, and gilt stone pulpit, a highly ornamented interior, and a beautifully carved rood-loft. A battery, and the remains of a castle built during the reign of Henry VII., stand at the entrance to the harbor. Pop. (1881) 5580. Many of the inhabitants are engaged in the pilchard and Labrador fisheries. The chief exports are woollens, cider, and barley. D. is a quarantine port of the English Channel, and has a considerable trade with the Mediterranean. In 1880, 945 vessels, of 81,355 tons, entered, and 887, of 71,499 tons, cleared the port.—At D., in 1190, the Crusaders, under Richard Cœur-de-Lion, embarked for the Holy Land. The French burned the town in the time of Richard I., but were repulsed in a third attack on it in 1404. In the reign of Edward III., D. furnished 31 ships for the siege of Calais. In 1643, Prince Maurice besieged and garrisoned D. for Charles I.; but in 1646, Fairfax stormed and took it. Sir Humphrey Gilbert, who took possession of Newfoundland for Queen Elizabeth, was born here. Newcomen, the inventor of the steam-engine, was an ironmonger here.

DARU, PIERRE ANTOINE NOEL BRUNO, COMTE, author, and also one of the ablest of the first Napoleon's ministers, was born at Montpellier, 12th January 1767, and in his sixteenth year entered the army. In 1791, he was appointed intendant of the army of Brittany; but having the misfortune to speak ironically of the English as 'our friends,' the suspicious revolutionists threw him into prison as a royalist, where he remained till the fall of Robespierre.

He spent his time in translating the Odes and Epistles of Horace (*Traduction en Vers des Poésies d'Horace*, 1800). Subsequently, he translated the *Satires*. In the same year in which his version of Horace appeared (1800), he published *Cleopédie, ou la Théorie des Réputations en Littérature*, a work full of spirit and felicitous turns of thought. His firmness, fidelity, and industry recommended

him to Napoleon, who, in 1805, made him a councillor of state, and at a later period, intrusted him with the portfolio of the war-department. After the restoration of the Bourbons, he was made a peer. Thenceforth, he devoted himself exclusively to letters. He died 5th September 1829.—D. was a member of the Institute and of the Academy of Sciences. His writings are numerous. Besides those already mentioned, the chief are *Histoire de la République de Venise* (7 vols. 1819—1821); *Histoire de Bretagne* (3 vols. 1826); his *Eloges*; his examination of the *Génie du Christianisme*; his *Discours sur les Facultés de l'Homme* (in verse); and his *Discours sur la Liberté de la Presse*.—His son, NAPOLEON COUNT DARU, opposed the *coup d'état* of Napoleon III., and was proscribed; but became a senator in 1876.

DARWIN, ERASMUS, M.D., an English physician, natural philosopher, and didactic poet, was born 12th December 1731, at Elton, near Newark, in Nottinghamshire; studied first at Cambridge, and afterwards at Edinburgh, where he took his degree; and finally settled in Derby, where he died 18th April 1802. D. had once a great reputation as a physiologist, but his system is, for the most part, inconsequential, baseless, and untenable. At the same time, many of his ideas are original, suggestive, and contain within them the germs of important truths. His strength and his weakness lay in his faculty for seeing analogies in nature. Sometimes he is exceedingly happy in his discoveries; at other times, he is quite fantastical. The same remarks hold good as regards his verse, where, amid the frequent extravagance and incomprehensibility of his notions, there burst forth strains of genuine poetry. Interest in his speculations has been revived by the recognition of his partial anticipation of Lamarck's views on evolution, and so of his own famous grandson's. D.'s chief works are his *Botanic Garden*, in verse (1781); his *Zoonomia*, or the *Laws of Organic Life* (1793); and his *Phytologia*, or *Philosophy of Agriculture* (1800). See Krause's *Life of Erasmus Darwin*, trans. by Dallas (1879).

DARWIN, CHARLES, F.R.S., an English naturalist of the highest eminence, was born at Shrewsbury, February 12, 1809. He was the son of Dr. Robert W. Darwin, F.R.S., and grandson of Erasmus Darwin (q. v.). His mother was a daughter of Josiah Wedgwood, the famous manufacturer of pottery. After attending a public school at Shrewsbury, he studied at Edinburgh University for two sessions, and thence proceeded to Christ's College, Cambridge, where he took his degree of B.A. in 1831.

He now volunteered to go as naturalist in H.M.S. *Beagle*, commanded by Captain Fitzroy, R. N., and started for a survey of South America, and a circumnavigation of the globe, Dec. 27, 1831, returning to England Oct. 2, 1836. His entire life, so far as his health permitted, was afterwards devoted to scientific researches. D., who was a fellow of the principal scientific societies, obtained the Royal Society's medal, and the Wollaston medal of the Geological Society.—His earliest well-known work, *The Voyage of a Naturalist* (2d ed. 1845), is a most interesting and beautifully written work. In 1839 was published his *Journal of Researches into the Geology and Natural History of the various Countries visited by H.M.S. Beagle*; in 1840—1843, the *Zoology of the Voyage of H.M.S. Beagle*, published by government, to which D. contributed the introduction and many of the notes; in 1842, *The Structure and Distribution of Coral Reefs*; in 1844, *Geological Observations on Volcanic Islands*; and in 1846, his *Geological Observations on South America*. He also wrote many papers in the *Transactions of the Geological Society*. In 1851—1853, appeared his valuable *Monograph of the Cirripedia*; and in 1859, D.'s name became 'familiar as a household word' to the mass of educated and semi-educated Englishmen, through the publication of his work, *The Origin of Species by means of Natural Selection, or the Preservation of Favored Races in the Struggle of Life*. In the *Origin of Species*, D. contends that the various species of plants and animals, instead of being each specially created and immutable, are continually suffering change through a process of adaptation, by which those varieties of a species that are in any way better fitted for the conditions of their life survive and multiply at the expense of others. So potent and universal does this process of natural selection seem to be, that D. considers it capable, with other less important causes, of explaining how all existing species may have descended from one or a very few low forms of life. This theory excited fierce controversies, but it has been embraced by many of the ablest naturalists, and has induced great changes in the method of biology and kindred sciences. See DARWINIAN THEORY; also SPECIES. Other works are: *Fertilization of Orchids* (1862); *Variation of Plants and Animals under Domestication* (1867); *The Descent of Man and Selection in relation to Sex* (1871); *Expression of the Emotions in Man and Animals* (1873); *Insectivorous Plants* (1875); *Climbing Plants* (1875); *The Effects of Cross and Self-fertilization in the Vegetable Kingdom* (1876); *Different Forms of Flowers in Plants of the same Species* (1877); *The Power of Movement in Plants* (1880), a work in which it was proved that every growing part of every plant is always moving round or

'circumnutating,' as D. calls it: *The Formation of Vegetable Mould through the Action of Worms* (1881). The latter work, which excited great popular interest, showed that part of the mould which covers the globe is the work of earth-worms, having been voided by them as worm castings. D.'s knowledge was not less remarkable than his caution in statement. He received many high distinctions, such as the Prussian order *Pour le Mérite* (1871), degrees from Leyden and Cambridge, and the membership of the French Academy (1878). He died April 19, 1882, and was buried in Westminster Abbey.

DARWIN MOUNT AND SOUND are on the S.W. side of King Charles's South Land, Tierra del Fuego. The mountain is nearly 7000 feet in height.

DARWINIAN THEORY. Before attempting to discuss the theory of Evolution of Plants and Animals by Natural Selection, as promulgated by Darwin (q. v.), it is necessary briefly to consider first, the scope and aim of biological science; and secondly, the influence exerted upon biology by the progress of other departments of knowledge.

1. *Nature of Biology*.—The primary labors of the botanist and zoologist are, of course, to collect and preserve, to describe and figure the innumerable and varied forms occurring in nature; and in this task, therefore, naturalists have been occupied since the earliest times. The increase of such knowledge necessitated the attempt at orderly arrangement and intelligible cataloguing, problems solved by Linnaeus, whose *Systema Naturæ* first satisfactorily organized the natural history sciences.

The detailed study of internal structure, as well as of external form, commenced by Hunter and Haller, was enormously extended by Cuvier (q. v.), whose labors resulted in the conception that the multitudinous forms of animal life were all organized upon a few distinct plans, of which he defined the vertebrate, molluscan, articulate, and radiate; while Geoffroy St. Hilaire and Goethe were principally instrumental in introducing the idea of homology (see METAMORPHOSIS). But it is not sufficient to analyze the organism into its constituent organs, and to describe and compare these; we must inquire into their minute structure. These organs were analyzed into *tissues* by the Bichat, and these again into their component protoplasmic units—*cells*—by Schleiden and Schwann, and thus anatomy acquired the subordinate province of *Histology*. Finally, the mode of origin of the adult organism from the germ or egg comes to be investigated, and after thus adding to our previous knowledge that of *Embryology*, we are in a position to complete our summary of the structural aspects of an organism by defining its relation to its fellows—in other words, by fixing its position in the natural system of classification. These subjects of anatomy, histology, embryology, and *Taxonomy* or classification constitute the science of *Morphology*.

But an organism has yet other aspects, functional as well as structural, dynamical as well as static; its organs have activities, and for the study of these, a new department of biology must be constituted—*Physiology*, which (although, by reason of the urgent needs of the practitioner and the student of medicine, as yet mainly concentrated upon the study of the functions of the human body) has a field co-extensive with that of morphology.

To the consideration of the forms and the activities of organisms, a new line of inquiry has been much more recently added, that referring to the position in time and space in which the organism occurs and the answer to this comes under a new head, that of *Distribution*, chronological (geological) or geographical, as the case may be.

These three great divisions of biological knowledge, morphological, physiological, and distributional, being constituted, the questions *what*, *how*, and *where* being approximately answered (and since the search for final causes—for the *why*—is outside the field of science), only one more possible inquiry remains—namely, *whence* these organisms, with their particular structures, functions, and positions in space and time? In other words, how did all these phenomena arise—what is their *origin* or *Ætiology*?

The necessity for a theory of the origin of plants and animals thus coming to be felt, only two hypotheses present themselves, since the suggestion that they may have existed in their present state from infinite time, is not only incapable of support by positive evidence, but absolutely negated by geology. The first and historically earlier hypothesis is that of Special Creation, which assumes the sudden origin of the existing species, without reference to previously existing species, by the intervention of supernatural causes; the second is that of Evolution, and assumes the gradual origin of the existing species from pre-existing species by ordinary descent, with modification by the action of natural causes. A little reflection will show (1) that the idea of cause, although presented in different forms by the two rival hypotheses, and at different degrees of remoteness, is not excluded by one more than the other; and (2) that just as the hypothesis of the origin of solar and stellar systems from nebulae is considered on its own merits, without confusion with any hypotheses which

may subsequently arise as to the origin of the nebulae themselves, so we must separate the inquiry as to the origin of *species*, with which the Darwinian theory is alone concerned, from all subsequent hypotheses as to the origin or the nature of *life* (see LIFE; GENERATION, SPONTANEOUS), thus keeping clear of the misunderstandings and misrepresentations with which the subject has too frequently been encumbered.

First in order, therefore, the arguments for and against the theory of the origin of species by special creation demands our examination, of course on scientific grounds alone. From the nature of the case no positive arguments are, or can be presented; and consequently, from the naturalist's point of view, it is urged that not only is no evidence forthcoming, but that the hypothesis fails to explain the existing facts, much less to act as an instrument of research; while on philosophical grounds, it is objected that besides being in no respect a scientific hypothesis, but one which necessarily excludes all scientific hypotheses, it stands discredited *a priori* as the last survivor of a series of once universally diffused pre-scientific beliefs in the irregular and arbitrary occurrence of phenomena, and so is destitute of support from analogy; that it neither satisfies the intellectual wants, nor meets the moral difficulties of the explanation of nature; and worst of all, that it is a purely verbal hypothesis, incapable of any definite representation in thought—in short, inconceivable.

Passing to the second theory, we find it strongly urged in the first place, that not only is much evidence forthcoming, but that it does plausibly explain the known facts, and is even serviceable in the search for new ones; that it belongs to that class of explanations in terms of the natural order of things which have now superseded the system of catastrophie and supernatural hypotheses in every other field of knowledge; that it is capable of clear representation in thought; and that it satisfies not merely the intellectual wants, but meets the moral difficulties. For a full development of this most general form of the discussion, the reader may consult Spencer's *Principles of Biology*, vol. i.

1. *Influence on Biology of Progress in other Sciences.*—The enormous progress of every department of knowledge during the past few generations has not lain merely, as is too commonly supposed, in ever-increasing minuteness of specialization upon ever-multiplying details, but has rather consisted in the concentration of innumerable previously unrelated phenomena into few groups, and of these again into fewer; through the construction of far-reaching hypotheses, which, if surviving and satisfying scrutiny and criticism, observation and experiment, have passed through stages of possibility and likelihood, to that of overwhelming or practically infinite (more rarely absolute) probability, and are then termed generalizations, or more figuratively, laws. A rich harvest of such general conceptions has been garnered by astronomy, and such successive labors as those of Copernicus, Kepler, and Newton, in widening our knowledge of the universe, have widened not a little the theoretic range and grasp of the scientific intellect. And it is important to bear in mind, first, that each of these advances consisted, as every such advance must do, in the substitution of a verified scientific hypothesis for a provisional, though time-honored explanation, in terms of the mysterious and supernatural; and, secondly, that a theory of the evolution of solar and stellar systems (see NEBULAR HYPOTHESIS) is largely maintained by modern astronomers.

In chemistry, such conceptions as those of molecular constitution, and of the indestructibility of matter, of the similarity in composition of our planet with sun and stars, and of the intimate relation between inorganic and organic compounds, are highly instructive; while the actually observed genesis of many species of minerals by the action of natural causes, and the frequent transmutation of one species into another, when some definite change takes place in the surrounding conditions, are not without interest. Moreover, to the theory of the conservation of energy (see FORCE) unifying as it has done, not only all the physical sciences, but these with physiology, a far vaster influence upon biology is due.

But the most important of all influences whatever on the organic sciences has come from geology. The discovery that our earth dates from an almost incalculably remote antiquity, together with the establishment as the fundamental axiom of the science that the present is the key to the past, and consequently that the present phenomena of the earth's crust do not result from catastrophie and deluge, still less from special creation, but are the product of a slow and progressive evolution (by natural causes still in operation) from a widely different previously existing state of things, furnish the evolutionist with the most primary of his data. To the establishment of this new theory of geologic evolution, revolutionary yet uniformitarian, of which the theory of organic evolution is but the complement and corollary, it is interesting to note that after Hutton and Lyell, perhaps no more important service has been rendered by any geological works than by the series (*Geological Observations*, 1844; *Coral Reefs*, 1842; *Earthworms*, 1881; and the essay on the *Imperfection of the Geological Record*, summarized below), which we owe to Darwin.

Nor is it only the preliminary sciences which have influenced biologists, and have aided them in their inquiries as to the origin of their set of phenomena. The human and social sciences—psychology and philology, anthropology and history, have all contributed their ætiological example and results, so that it might almost be debated whether the biological evolutionist has not been more indebted to all the other sciences for his theory, than they to him for theirs.

Origin of the Idea of Evolution in Biology.—No doubt largely influenced by such as existed of the scientific conceptions outlined above, as well as by the Cartesian doctrine, that the universe is a mechanism, and is therefore to be explained on mechanical principles, the evolutionary hypothesis made its first distinct appearance in the work of De Maillet (*Telliamed*, written 1735, published 1758), and was expounded in more or less varying form by more than thirty writers before Darwin, among whom the most notable were Erasmus Darwin, Goethe, Lamarck, and Geoffroy St. Hilaire.

Their hypotheses, although based on masses of biological evidence drawn from homologies and rudimentary organs, from classification and development, from geological and geographical distribution, and so on, never succeeded in gaining general acceptance among naturalists—a failure largely attributable to established prejudice, aided as it was by the authority of Cuvier. Yet, while rendering it extremely probable that modification had occurred, they all came short, as Darwin has pointed out, in one most important particular, that of showing *how* the modification of one species from another could take place, 'so as to acquire that perfection of structure and co-adaptation which justly excites our admiration;' since the hypotheses of the potency of external conditions, of habit, or of the volition of the organism itself, alike successively broke down.

Darwin, in his turn, struck especially by the distributional phenomena he witnessed during his 'Naturalists' Voyage,' devoted himself to the solution of the problem of the origin of species, specially concentrating himself upon this weakest point of the preceding theories. After twenty-one years' continuous work, he was compelled, on receiving a paper by Mr. A. R. Wallace (then exploring the Malay Archipelago), in which views identical with his own were expressed, to proceed to the publication of his results, first in brief outline (*Journ. Linn. Soc.*, 1858), and the following year in that fuller abstract, 'The Origin of Species by means of Natural Selection,' which may now be briefly summarised, in so far as further compression of such 'intellectual pennman' is possible. For details and explanations, the reader must consult the original work (sixth edition, 1875).

Outline of the 'Origin of Species.'—In order to gain insight, then, into the means of modification, Darwin commences with a study of the variation of plants and animals under domestication (later expanded into a separate work; second edition, 1876).

Variation and Heredity.—While all plants and animals exhibit some degree of variation, this is greatest among domesticated species, owing to their new and less uniform conditions of life. These may act directly on the whole organization, or on separate parts, and the variation, though rarely, is sometimes definite, as when size increases with quantity of food, or color changes with its quality; or the conditions may act indirectly by influencing the reproductive system, which is peculiarly sensitive. Changed habits produce an inherited effect, e. g., the leg-bones of the common duck weigh proportionally more, and its wing-bones less, than in the wild variety, because it flies less and walks more. So, too, tame mammals acquire drooping ears, since these are rarely pricked in alarm. One variation is usually correlated with others, thus long-beaked pigeons have small feet, and conversely. All variations tend to be inherited. The popular belief that domestic races revert to the aboriginal stock is unsupported by facts.

Save that domestic varieties are less uniform than wild species, often differ more widely in some single part, and are fertile when crossed, there is no well-marked distinction between these and so-called true species. If, therefore, such varieties as of the dog can be shown to be descended from a single wild species, there necessarily arises great doubt as to immutability of closely allied natural species, such as the foxes. While the many breeds of dog appear to have arisen from several wild species, and those of cattle also from two or three, fowls, ducks, rabbits, &c., all certainly arise from a single ancestral species. The case of pigeons is of peculiar importance, since pouter, carrier, fantail, and tumbler differ so thoroughly, externally and internally, that any ornithologist would be compelled to assign to them, not merely specific but generic distinctness, if he had discovered them in the wild state. There is at least as much difficulty in believing that such breeds can have proceeded from a common ancestor, as in the case of any group of birds in nature; and every breeder of these and other domestic animals has been firmly convinced of their descent from distinct species.

Yet these are proven to arise from the common rock-dove (*Columba livia*) (see COLUMBIDÆ), and thus those who admit

the unity of domestic races should be cautious in deriding the unity of wild ones.

Domestic races all exhibit adaptations to man's use or fancy, rather than their own good. The key to this is man's power of selection; nature gives successive variations, man accumulates them, so making for himself useful breeds, and often (e.g., sheep, cattle, roses, dahlias) profoundly modifying their character even in a single lifetime; so that in all characters to which he attends, they may differ more than the distinct species of the same genera. Again more even than conscious, that unconscious selection which results from every one trying to possess and breed the best animals, is important. Two flocks of Leicester sheep, equally kept pure, appeared of quite different varieties after fifty years. Such slowly accumulated change explains why we know so little of the origin of domestic races; and its absence in regions inhabited by uncivilized man, explains why these yield no plants worth immediate culture. Human selection is facilitated by the keeping of large numbers, since variations will be more frequent, and by preventing crosses; some species vary, however, more than others.

Variation under Nature.—All like organisms in nature present individual differences, more considerable than is usually supposed; no two blades of grass are alike, and far more marked differences often occur, several castes or varieties sometimes existing in the same sex. Between these castes, and much more frequently between forms which systematic botanists and zoologists rank as true species, perfectly intermediate forms may occur. No agreement about the definition of species (the amount of difference necessary to give any two forms specific rank), has ever been come to; thus, in the British flora alone, there are nearly two hundred disputed forms, and individual opinion is in these cases the only criterion. As long as a genus is imperfectly known, and its species founded upon few specimens, they appear clearly limited. But with better knowledge, intermediate forms flow in, and doubts as to specific limits augment. The terms species and variety are thus arbitrarily given to sets of individuals more or less closely resembling each other. See VARIETY, SPECIES, GENUS.

Individual differences are thus of the highest importance, as the first steps towards the slightest varieties worth recording, these towards more distinct and permanent varieties, and these again towards sub-species, and these to species; though extinction may often stop the progress.

The species which present most varieties are those which have the greatest geographical range, or the widest diffusion in their own territory, or possess the greater number of individuals; and in the larger genera of each country the species vary more frequently than in the smaller genera; and in many respects the species of large genera present a strong analogy with varieties, which analogy is alone intelligible on the view that they once existed as such.

Struggle for Existence.—All organic beings tend to increase with extreme rapidity, so that if not destroyed, the earth would soon be covered by the progeny of a single pair. This is evidenced not merely by calculation, but by actual observation of the extraordinary rapidity with which plants and animals have spread, when introduced into new and favorable circumstances.

Since organisms then are reproducing themselves so rapidly, and since all their offspring cannot escape their enemies, get food and live, much less leave progeny in turn—since, in other words, the doctrine of Malthus applies to animals and plants with manifold force (for these can have no artificial increase of food, and no prudent restraints on marriage)—there must in every case be a struggle for existence, either of one individual with another of the same species, or with the individuals of distinct species, or with the physical conditions of life; often, indeed, with all these at once, and that more or less intensely throughout the whole of life.

The checks to increase are most obscure, and vary in each case. In all cases the amount of food, of course, gives the extreme limit. The youngest organisms generally suffer most; seedlings, for instance, are destroyed in vast numbers, thus, even in a patch of ground purposely dug and cleared, where no choking from other plants could take place, 295 out of 357 seedling-weeds were destroyed, chiefly by slugs and insects. So, too, the stock of game on an estate depends chiefly upon the destruction of vermin. Climate, however, is highly important, and periodic seasons of extreme cold and drought seem the most effective of all checks—a severe winter sometimes destroying four-fifths or more of the birds of a locality. Epidemics, too, may occur, especially where numbers have inordinately increased. On the other hand, a large stock of individuals of the same species is essential for its preservation.

The complex relations of all animals and plants to each other require illustration. The plantation of part of a heath with Scotch fir leads to the profound alteration of its flora and fauna, while the growth of these firs again is wholly dependent upon the exclusion of cattle. Many flowers depend for fertilization on the visit of a special insect, e.g., red clover on humble-bees. But

bees are destroyed by field-mice, and consequently protected by cats; hence, not only no bees, no clover, but also the more cats, the more clover! The struggle for life is most severe between individuals and varieties of the same species, and between the species of the same genus, since these tend to fill the same place in the economy of nature; hence we see the brown rat supplanting the black, and the hive-bee supplanting its Australian congener. The structure of every being is related to that of the others with which it competes, or from which it seeks to escape, or on which it preys; as is alike evident in the structure of the tiger, and of the parasite which clings to his hair. So, too, the albumen of a seed is chiefly useful in favoring the young plant's struggle for light and air against the adult plants around.

Natural Selection.—But how will the struggle for existence act with regard to variation? Can the principle of selection, so potent in the hands of man, apply under nature? Most efficiently so. Let us bear in mind (1) the constant occurrence of variation; (2) the infinite complexity of the relations in which organisms stand to each other, and to the physical conditions of life; and consequently (3) what infinitely varied diversities of structure might be useful to each being under changing conditions of life. Can it then be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life, should also occur in the course of many generations? And if such do occur, can we doubt (remembering that many more individuals are born than can possibly survive) that individuals having any advantage, however slight, would have the best chance of surviving and procreating their kind, while injurious variations would be destroyed? This preservation of favorable variations, and destruction of injurious ones, is termed Natural Selection, or less figuratively, the Survival of the Fittest.

Taking the case of a country undergoing a change of climate, the proportional number of its inhabitants would change, some species probably also becoming extinct—and these changes would in many ways affect the survivors. A further disturbance would come from the immigration of new forms; or if that were prevented, we should have places in the economy of nature which might be better filled up. Any slight favorable modification of the old species would tend to be preserved, and we have seen that changed conditions increase variability.

Nor are such changes, often though they have occurred, necessary in order to leave places for natural selection to fill by improving some of the varying forms. No country can be named where the native inhabitants are perfectly adapted to their conditions and competitors, for as some foreigners have taken firm possession in every country, we may safely conclude that the natives might have been modified with advantage to resist them.

And when human selection has produced such great results, why may not natural? The former acts only for man's own good, on mere external and visible characters, and irregularly throughout a short period; the latter acts for the good of the being itself, on the whole machinery of its life, and incessantly throughout almost infinite time. (It is important here to remember that the objection to this agency on the ground of its presumed insignificance, is identical with that so long and unsuccessfully employed against Lyell's explanation of the origin of the physical features of the globe by summing up the existing natural changes.)

Natural selection thus leads to the improvement of each creature in relation to its organic and inorganic conditions of life, and consequently in most cases to what must be regarded as an advance in organization. Nevertheless, low and simple forms will long endure, if well fitted for their simple conditions.

Natural selection may modify the egg, seed, or young, as easily as the adult, and these modifications may effect through correlation the structure of the latter, and conversely.

Besides Natural, we have to consider Sexual Selection, i. e., not merely do individuals struggle for existence, but the males struggle for the females, and the most vigorous thus tend to leave most progeny. Special weapons, offensive and defensive, like the cock's spurs, the stag's horns, or the lion's mane, are used in this struggle, and the most useful variations are thus those which are transmitted. Again, just as man can in a short time give beauty to his domestic birds, so there is no good reason to doubt that female birds in thousands of generations, by selecting, as they are observed to do, the most melodious or beautiful males might produce a marked effect, and many sexual differences are thus explained.

The theory of natural selection may be applied in special cases, e. g. (1) to explain the evolution of swift greyhound-like varieties of wolves; (2) the origin and excretion of nectar in flowers, its use to insects, and their action in transferring pollen from flower to flower, and its advantage in intercrossing; and the resultant modification and adaptation of flower and insect to each other by the preservation of advantageous variations.

The circumstances favorable to the production of new forms through natural selection are also reviewed. These are chiefly,

great variability; large numbers of individuals; the complex effects of intercrossing; isolation in small areas, yet also extension over continental ones, especially if these oscillate in level; and considerable lapse of time. Rare species are shown to be in process of extinction. The *divergence of character* in domestic breeds, largely due to the fact that 'fanciers do not, and will not, admire a medium standard, but like extremes,' applies throughout nature, from the circumstance that the more diversified the descendants from any one species become in structure, constitution, and habits, by so much will they be better enabled to seize on many and widely diversified places in nature, and so to increase in numbers. Thus, taking a carnivorous animal, which has reached the average numbers which its territory will support, it is evident that it can succeed in increasing only by its varying descendants seizing places hitherto occupied by other animals, thus changing their food or habitat. This must hold equally of all species, and is separately demonstrated for plants. The greatest amount of life can be supported by great diversification of structure; hence in small areas where competition is severe, the inhabitants are extremely varied.

The probable effects of the action of Natural Selection, through divergence of character and extinction, on the descendants of a common ancestor are then discussed in detail with an illustrative diagram. This takes the form of a genealogical tree—the great tree of life, which fills with its dead and broken branches the crust of the earth, and covers the surface with its ever-branching and beautiful ramifications.

Laws of Variation.—(These can only be very briefly treated.) Of the cause of most variations we are still ignorant, but the same laws appear to have acted in producing the lesser differences between varieties of the same species, and the greater differences between species of the same genus. Changed conditions sometimes induce definite and permanent effects: habit, use, and disuse are potent in their effects. Specific characters are more variable than generic, and varietal than either. Rudimentary organs and secondary sexual characters are highly variable. Species closely related, of similar constitution and similarly influenced, present analogous variations, and frequently exhibit characters which can only be explained as reversions to those of their ancient progenitors; e.g., zebra-like stripes on horses, or wood-pigeon's markings on fantails, tumblers, &c.

Difficulties and Objections.—In four chapters all the miscellaneous objections raised against the theory between 1859, and the appearance of the latest edition, are successfully stated, weighed, discussed, and met, as well as the much more serious difficulties pointed out by Darwin himself. These latter are, (1) the definiteness of species and the rarity of transitional forms; (2) the enormous degree of modification in habits and structure which the theory assumes, and the power of Natural Selection to produce on the one hand an organ of such trifling importance as the tail of a giraffe, and on the other, an organ so wonderful as the eye; (3) the acquirement and modification by Natural Selection of such marvelous instincts as those of the bee; (4) the sterility of crossed species, and the fertility of crossed varieties. For these discussions, however, the reader must consult the original work.

Imperfection of the Geological Record.—On the doctrine of the extermination of an enormous number of intermediate varieties, the links between existing and remote ancestral forms—why is not every geological formation charged with such links? Why does not every collection of fossils afford plain evidence of the gradation and mutation of the forms of life? Geology, assuredly, does not reveal any such finely graduated organic chain, and this is one of the most obvious and plausible objections to the theory. The explanation lies in the extreme—the almost incredible—imperfection of the geological record. Only a small portion of the globe has been geologically explored with care, only certain classes of beings have been fossilized, and the number, both of specimens and species yet discovered, is absolutely as nothing compared with the number which must have passed away during even a single formation.

The Malay Archipelago is about the size of Europe, and, therefore, equals in area the formations best known to us; its present condition represents that of Europe, while its strata were being deposited; its fauna and flora are among the richest on the globe, yet, even if all the species were to be collected which ever lived there, how imperfectly would they represent the natural history of the world! Only few of these are preserved at all, and most of these in an imperfect manner; moreover, subsidence being almost necessary for the accumulation of rich deposits, great intervals of time must have elapsed between successive formations, so that, during periods of elevation, when variation would be most frequent, the record is least perfect. Moreover, single formations have not been continuously deposited; the duration of specific forms probably exceeds that of each formation; migrations have largely taken place; widely ranging species are most variable, and oftenest give rise to new species; varieties have been at first local; and finally, it is probable that periods of modification are short as

compared with periods of permanence. Hence we cannot find interminable varieties, and any linking variety between two forms is, of course, ranked as a distinct species, for the whole chain cannot be permanently restored. Thus the geological record is a history of the world indeed, but one imperfectly kept, and written in a changing dialect; of this history we possess the last volume only, relating to two or three countries. Of this volume, only here and there a short chapter has been preserved, and of each page only here and there a few lines.

Geological Succession of Organic Beings (Distribution in Time).—The preceding difficulties excepted, the facts of palæontology agree admirably with the theory. New species come in slowly and successively; they change in different rates and degrees; old forms pass through rarity to extinction, and never reappear; dominant forms spread and vary, their descendants displacing the inferior groups, so that after long intervals of time the productions of the world appear to have changed simultaneously. The most ancient forms differ most widely from those now living, yet frequently present characters intermediate between groups now widely divergent, and they resemble to a remarkable extent the embryos of the more recent and more highly specialized animals belonging to the same classes. These laws, and above all, the important law of the succession of the same types within the same areas during the later geological periods, and most notably between the Tertiary period and the present time (e.g., fossil and recent marsupials in Australia, and edentates in South America), cease to be mysterious, and become at once intelligible on the principle of inheritance, and on that alone.

[Since the publication of the *Origin of Species* (1859), palæontological research has been constantly furnishing the most triumphant verification of these views. The imperfection of the geological record was so far from over-estimated, that Huxley (*Science and Culture*, 1880), in comparing our present knowledge of the mammalian Tertiary fauna with that of 1859, states that the results of the investigations of Gaudry, Marsh, and Filhol, are 'as if zoologists were to become acquainted with a country hitherto unknown, as rich in novel forms of life as Brazil or South Africa once were to Europeans.'

Gaudry found the intermediate stages by which civets passed into hyenas; Filhol disinterred still more remote ancestral carnivores; while Marsh obtained a complete series of forms intermediate between that, in some respects, most anomalous of mammals, the horse, and the simplest five-toed ungulates (see MAMMALIA). Again, the belief of Darwin that the distinctness of birds from all other vertebrates was to be accounted for by the extinction of a long line of progenitors connecting them with reptiles, was in 1859 a mere assumption; but in 1862, the long-tailed and intensely reptilian bird *Archæopteryx* (q. v.) was discovered, while in 1875 the researches of Marsh brought to light certain cretaceous birds, one (*Hesperornis*) with teeth set in a groove, the other (*Ichthyornis*) with teeth in sockets, and with bi-concave vertebrae. Besides these reptilian birds, bird-like reptiles have similarly been forthcoming, and the hypothesis of Darwin is thus admirably verified. Considerable light, too, has been thrown on the pedigree of crocodiles; ammonites, trilobites, and other invertebrates have been arranged in series, while important collateral evidence is also furnished by 'persistent types' such as *Ceratodus*, *Beryx*, *Nautilus*, *Lingula*, &c., which have survived—we must assume by ordinary generation—almost completely unchanged since remote geological periods. On such grounds, therefore, Huxley asserts (*op. cit.*) that 'on the evidence of palæontology, the evolution of many existing forms of animal life from their predecessors is no longer an hypothesis, but an historical fact; it is only the nature of the physiological factors which is still open to discussion.'

Geographical Distribution.—Neither the similarity nor the dissimilarity of the inhabitants of various regions, whether of land or sea, can be accounted for by differences in climate, or other physical conditions, but are related, in the most striking degree, to the absence or presence of barriers to migration between those regions. Within the same area there exists the most marked affinity among the species, though these differ from point to point. Species appear to have arisen in separate definite centers, the few apparent exceptions being accounted for by migration and dispersal, followed by climatal and geographical changes. But for a summary of our knowledge of the existing mode of distribution of organic life, and of the way in which that distribution has been effected, as well as of the very important bearing of these facts upon the theory of evolution, which they may be said indeed, more than any other class of facts, to have suggested, see the article GEOGRAPHICAL DISTRIBUTION.

Morphological Arguments.—The physiological and distributional lines of argument being summarized, those furnished by morphology, although not less numerous and highly important, can only be very briefly outlined. These are mainly four, and are derived from (a) Classification, (b) Homologies, (c) Embryology, (d) Rudimentary Organs.

(a) *Classification*.—Naturalists arrange the species, genera, and families in each class, on what is called the Natural System. But what is meant by this system? Is it, after all, merely an artificial scheme for enunciating general propositions, and of placing together the forms most like each other—or does it, as many believe, reveal the plan of creation? The grand fact of classification is, that organic beings, throughout all time, are arranged in groups subordinated under other groups, individuals under varieties, and these again under species; species under genera; those under sub-families, families, and orders; and all under a few grand classes. The nature of all these relationships—the rules followed and the difficulties met by naturalists in their classifications—the high value set upon constant and prevalent structures, whether these be of great or little use, or, as with rudimentary organs, of none at all; the wide opposition in value between such misleading resemblances of adaptation, as for instance the fish-like form of whales, and such characters of true affinity as are afforded by the structure of their circulatory or respiratory system—all these receive a simple and natural explanation on the view of the common descent of allied forms with modification through variation and natural selection; while it is to be noted that no other explanation has ever even been attempted. The element of descent, too, is already used in linking all the sexes, ages, forms, and varieties of the same species, widely though these (e. g., Cirripedes, &c.) may differ from each other in structure: and we have only to extend it to understand the meaning and origin of the Natural System.

(b) *Homology*.—The members of the same class, independently of their habits of life, resemble each other in their general plan of organization; thus, the hand of man, the digging-paw of the mole, the leg of the horse, the paddle of the porpoise, and the wing of the bat, are all constructed on the same pattern, bone corresponding to bone, and similarly with the hind limb. Again, the mouths of insects are of innumerable varieties of form and use—witness the long spiral trunk of a moth, and the great jaws of a beetle—yet these are formed by modifications of an upper lip, mandibles, and two pairs of maxillæ. And so it is with the limbs of crustaceans, or the flowers of plants; in fact, with the organs of every class of beings.

This conformity to type is 'powerfully suggestive of true relationship, of inheritance from a common ancestor'; it admits, in short, as no one indeed denies, of a simple explanation in terms of the evolutionary theory, and thus strengthens that theory not a little. It has been attempted to explain this unity of plan in two other ways—first, by assuming it due to utility, which is negated by the facts, since organs of identical use (e. g., the wings of a bird and those of a butterfly) very frequently do not conform to the same type at all; secondly, by attributing it to a unity of design, which, however, (a) instead of being always maintained, as it should be, on the theory, is not unfrequently quite lost in highly specialized forms; and which, even if it always existed, (b) would directly suggest the unity of descent, the design thus serving only to mislead the anatomist.

Serial Homology, too, has to be accounted for—that unity of type which is found on comparing the different parts and organs in the same individual, so that the wonderfully complex and varied jaws and legs of a lobster; or the widely different leaves—sepals, petals, stamens, and pistils of a flower, are all found to be modifications of a simple limb, and a simple leaf-organ respectively. Not only are such metamorphoses apparent on comparison, but they can be actually observed to occur during the development of each individual; is then the term metamorphosis to have a more metaphorical meaning when applied to the species, or has it not actually arisen in past time, through the natural selection and transmission of advantageous variations?

(c) *Development*.—It has been already indicated that the serially homologous parts in the same individual are alike during an early embryonic period, as also are the homologous organs in animals which, like bat, horse, and porpoise, may be widely differentiated in adult life. So closely, too, do the embryos of the most distinct species belonging to the same class resemble each other, that even Von Baer was unable to distinguish whether two unlabelled specimens were lizards, birds, or mammals. This law of embryonic resemblance holds very widely, e.g., young crustaceans. The embryo often retains within the egg or womb, structures which are of no service to it, either at that or at a later period of life, like the transitory gill-arches of birds or mammals; while on the other hand, larvæ which, like those of insects, have to provide for their own wants, undergo complete secondary adaptation to the surrounding conditions. The process of development goes from the general to the special, thus there is generally an advance in organization. In peculiar conditions, however, degeneration may occur. All these facts are readily explained on the principle of successive slight variations not necessarily or generally supervening very early in life, and being inherited at a corresponding period; and it is thus in the highest degree probable that most embryonic stages show us more or less completely the progenitor

of the group in its adult state; and embryology thus rises greatly in interest (see DEVELOPMENT OF THE EMBRYO).

(d) *Rudimentary Organs*.—Rudimentary, atrophied, and aborted organs, bearing the plain stamp of inutility, are so extremely common that it is impossible to name a higher animal in which none occurs. The mammae of male mammals, the hind-legs of boas, the wings of many birds, or the teeth of foetal whales, and the upper incisors of unborn calves, are familiar instances. Such organs are intelligible on the evolutionary theory, and on that theory alone.

Recapitulation and Conclusion.—After tersely summing up the preceding mass of evidence, Darwin concludes by pointing out (a) that the theory of evolution by natural selection is no more inimical to religion than that of gravitation, to which the same objection was strongly raised; (b) its revolutionary influence on the study of all departments of natural history; (c) on psychology (q. v.); (d) on the origin of man and his history (see DESCENT OF MAN); (e) on our theories of future progress.

Envoy.—It is interesting to contemplate a tangled bank clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us. These laws, taken in the largest sense, being Growth with Reproduction; Inheritance, which is almost implied by reproduction; Variability from the indirect and direct action of the conditions of life, and from use and disuse; a Ratio of Increase so high as to lead to a Struggle for Life, and as a consequence to Natural Selection, entailing Divergence of Character and the Extinction of less improved forms. Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms, or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.

DASHKOV, PRINCESS EKATERINA ROMANOVA, daughter of Count Vorontsov, was born 1744, and from her earliest youth received a careful training. She was an intimate friend of the Empress Catharine II., and one of the heads of the conspiracy formed against Peter III., the success of which secured the throne to Catharine. Soon afterwards quarreling with Catharine, she obtained permission to travel, and visited Germany, England, France, and Italy, where she made the acquaintance of many learned men (among others, Garrick, Dr. Blair, and Dr. Robertson). The empress and she were reconciled to each other, and the princess was appointed Director of the Academy of Arts and Sciences; and in 1783, President of the Russian Academy, established at her own suggestion in imitation of the French *Académie*. On the death of Catharine in 1796, she was deprived of her offices, and ordered by Paul III. to retire to her estates at Novgorod. She died at Moscow, 4th January 1810. Besides several comedies and occasional magazine-papers, the Princess D. was mainly instrumental in inducing the Russian Academy to draw up a dictionary of the Russian language. This work was completed in twelve years. The princess herself assigned the various letters of the alphabet to different scholars, took three herself, and superintended the execution of the whole. Her very interesting memoirs were published by Mrs. W. Bradford (2 vols., Lond. 1840).

DA'SYURE (*Dasyurus*), a genus of carnivorous marsupial quadrupeds, nearly allied to the opossums; but differing from them in having only eight incisors in the upper, and six in the lower jaw, and only twelve molars in each jaw; also in their tail being



Ursine Dasyure (*D. ursinus*).

everywhere covered with long hairs, and not prehensile; in the hinder thumb being reduced to a mere tubercle, or wanting; and

in the important anatomical character of the want of a cœcum. All the species are Australian. The *URSINE D.*, or *Ursine Opossum* (*D. ursinus*), was very abundant in the north of Van Diemen's Land, when first colonized, and very destructive to sheep and poultry.

It is about the size of a badger, of a stout form, with a tail half as long as the body; the body and tail covered with coarse black hair, marked with white bands. It burrows in the ground. It is very untamable. The Spotted-tailed *D.* (*D. macrourus*) is about as large as a cat, has a tail fully as long as the body, is of a rich brown color with white spots, and as well as a rather smaller species (*D. Maugii*), the *wild cat* of the colonists, is very destructive to poultry in Van Diemen's Land.

DATE (Lat. *datum*, given), the precise time at which a document was written, or an event happened. The importance of accurately ascertaining the date of an event or writing is very obvious, but the difficulty there may be of doing so is not so apparent. It might be thought, for example, that, at least in modern times, where the day of the month and year are authoritatively set down, there can be no room for any further question; but it is not so. If, for instance, we refer to a newspaper of the reign of Queen Anne, we shall see the *Amsterdam Gazette* of the 22d February translated in the *London Gazette* of the 13th February, and abridged in the *Edinburgh Courant* of the 19th February, all of the same year, 1705. And this is but one of several seeming inconsistencies or contradictions of the same sort.

In the first place, the difference of the two *styles* by which dates are reckoned may cause a discrepancy of ten, of eleven, or of twelve days, according to the century to which the date belongs. Until 1582, there was but one style or calendar throughout Europe; but in that year Pope Gregory XIII. introduced the 'new style' or 'Gregorian calendar,' which at once corrected the long accumulated errors of the old method of computing time, by declaring the 5th to be the 15th of October 1582, or, in other words, by striking ten days out of the almanac of that year. The new style was adopted generally in Roman Catholic countries. Most Protestant countries, on the other hand, continued for a longer or shorter period to use the 'old style,' or 'Julian calendar.' It is necessary, therefore, in dealing critically with the dates after 1582, to ascertain what 'style' was in use at the time and place in question. This, in not a few cases, may call for some inquiry; but generally, the following table will serve to show when the chief states of Europe adopted the new style:

Year.	Country.
1582.	Great part of Italy, France, Lorraine, Portugal, Spain, Holland, and the greater part of the Netherlands.
1584.	The Roman Catholic parts of Germany and of Switzerland.
1586.	Poland.
1587.	Hungary.
1682.	The city of Strasburg.
1700.	The Protestant parts of Germany and of Switzerland, Guelders, Zutphen, Utrecht, Friesland, Groningen, and Overysel.
1749 or 1751.	Tuscany.
1752.	
1753.	
	Great Britain and Ireland.
	Sweden.

In Russia and Greece, the old style is still followed, and it obtains generally in the East. Thus, what was the 12th January 1879 at Paris and London, was the 31st December 1878 at Athens and St. Petersburg.

But difference of *style* is not the only cause of perplexity in dates. Countries using the same style, and therefore agreeing as to the day of the *month*, may differ as to the *year* to which they refer an event. Thus, the beheading of King Charles I. was reckoned, both in England and in Scotland, to have taken place on the 30th of January; but while England held the year to be 1648, Scotland held it to be 1649. The cause of this discrepancy was the difference which obtained as to the beginning of the year. By the English, the year was held to begin on the 25th of March; by the Scots, on the 1st of January. It becomes necessary, therefore, in considering dates, to keep in view not only the style which was used, but the day on which the year was accounted to commence. There was much variation in this respect, not only between one country and another, but even in the same country as between one time and another, as well as between its different provinces at the same time. The new years' days most commonly used were the Nativity or Christmas (25th December), the Circumcision (1st January), the Annunciation or Lady Day (25th March), and the Resurrection or Easter. The 1st of January was adopted as the commencement of the year by France in 1563, by Scotland in 1600, by England in 1752. In this last country, the inconvenience of dating by a different year from most of the other great European states had been so generally felt, that for some time before the

new mode of computation was sanctioned by act of parliament, dates falling between 1st January and 24th March were commonly expressed in both ways, thus: 2d February 1705, or 1706-7, the lower or last figure indicating the year according to the present reckoning.

Hitherto, we have spoken of dates where both the year and the day of the month are set down in figures. But in ancient writings, even where the year is expressed in figures, nothing is more common than to indicate the day of the month only by reference to some festival or other peculiarity in the service of the church. Thus, an English letter of the latter part of the 15th c. is dated in this way: 'Written at Paston, in haste, the Wednesday next after *Deus qui errantibus*;' that is, the first Wednesday after the third Sunday after Easter, on which day that portion of the church service which is called the *introit* begins with the words *Deus qui errantibus*. So, again, as late as the year 1610, the battle of Weissenburg, near Prague, is described by the contemporary chroniclers as having been fought 'upon the Sunday on which the church sings *Reddite quæ sunt Cæsaris Cæsari*;' that is, the 22d Sunday after Pentecost, which, in the year referred to, fell upon the 8th of November.

A still more common way of dating was by reference to a saint's day. Thus, the English parliament which met at Westminster on the 6th October 1399, is described in the contemporary record as meeting 'on Monday, the Feast of St. Faith the Virgin;' and the Scottish parliament which met at Scone on the 3d December 1318, as meeting 'on the Sunday next after the feast of St. Andrew the Apostle.' In order, therefore, to interpret all this class of dates—and it is a very large one—recourse must be had to the calendar and service books of the church, or to the 'glossaries of dates' and 'catalogues of saints' days' which antiquaries have compiled from them.

For centuries, it was more common to date by the year of the king's reign than by the year of our Lord. The risk of error in reducing this way of computation to that now in use is such, that in Rymer's *Fœdera*, a great collection of English state papers, printed at the public expense, in the beginning of the 18th c., many documents of all the reigns from Richard I. to Edward IV. are misplaced by a whole year. These mistakes arose chiefly from insufficient inquiry as to the day from which the king dated his reign. This was assumed to be from the day of his predecessor's death, but in point of fact the early English sovereigns dated their reign only from the day of their coronation. Where a date, therefore, has to be ascertained by reference to a regnal year, it becomes necessary to make sure not only of the time when the king came to the throne, but of the very day from which he reckoned his reign. In the case of the popes of Rome, this inquiry is at once more than usually necessary, and more than usually troublesome, inasmuch as, until comparatively recent times, scarcely any two of them in immediate succession dated or computed on the same principle. Not a few of them, indeed, adopted different computations at different times of their reign. Thus, Pius II., during his pontificate of six years (1458-1464), commenced the year sometimes on the 25th December, sometimes on the 1st January, and sometimes on the 25th March. Some popes, again, dated from the day of their election; others, from the day of their consecration or coronation. Nor is it only in interpreting regnal years into modern chronology that there is a chance of error; there is proof that occasionally the regnal years were wrongly computed at the time, by the kings themselves, or rather by the officers who wrote their charters. Thus, for example, it has been discovered that from the time that King David II. of Scotland returned from captivity in 1357, the year given as that of his reign is one year short of the truth. In dealing with regnal years, there is yet another risk of mistake to be guarded against.

Until the 16th c., it was not common for kings to distinguish themselves by numbers from their predecessors of the same name. In order, therefore, to discriminate one from another, charters or other deeds of the English Henries and Edwards, or the Scottish Roberts and Jameses, recourse must be had to such tests as the character of the writing, its seal, its style and language, and above all, the names of the persons enumerated in it.

With no other help than is to be gained from such tests, the antiquary is often called on to fix the date of a charter, containing no reference to the year of our Lord, the year of the king's reign, the year of the pope's pontificate, or any other measure of time. If the persons mentioned in the deed be men of note, he may be able to ascertain its date to a year, a month, or even a day; on the other hand, if they are obscure, he may be unable to reduce the date within a narrower range than 50 or even 100 years.

The skill of the antiquary is not unfrequently put to the proof in another way. Dates were often recorded by reference only to an event of the time. Thus, one leaf of the Scottish statute-book contains two acts of parliament, with no more explicit record of their date than that the one was passed 'at Aberdeen in Lent next after the coming in Scotland of Vivian the Legate of the

Apostolic See; and that the other was passed at Stirling 'on the Monday next before the feast of St. Margaret the Maiden next after the first coronation of Philip king of the French.' An examination of contemporary chronicles fixes the date of the one statute to 1177; of the other, to 1180.

In order to facilitate the discovery and rectification of dates, various elaborate works have been published. By far the most important—*L'Art de Vérifier les Dates des faits Historiques, des Chartes, des Chroniques et autres Monuments*—is due chiefly to the labors of the Benedictines of St. Maur. The best edition of this admirable work, is that of Paris, in eight folios, the first three containing the period from the birth of Christ till the year 1770, being published in 1783—1787; the fourth, containing the period before the birth of Christ, in 1820; and the last four, continuing the work from 1770 downwards in, 1821—1838. A reprint of this edition, in 42 octaves, appeared in Paris in 1818—1844. Of the other French works, it will be enough to name two—the *Nouveau Traité de Diplomatique*, also by the Benedictines of St. Maur (Par. 1750—1765, in 6 vols. 4to), and the *Eléments de Paléographie*, par Nat. de Wailly (Par. 1838, in 2 vols. 4to). The best English work is *The Chronology of History*, by the late Sir Harris Nicholas, published in Lardner's *Cabinet Cyclopædia*, 1838. Haydn's *Dictionary of Dates* (Vincent's edition, 1876) is a standard popular work.

DATE OF DEED. See DEED.

DATE PALM (*Phoenix*), a genus of palms, the most important species of which is the common DATE PALM, the *Palm Tree* of Scripture (*Ph. dactylifera*), a native of the northern half of Africa, the south-west of Asia, and some parts of India, and which has also been brought into cultivation in the south of Europe, and might certainly be introduced with advantage into the south of the United States, and many warm parts of America and Australia. The stem, which is straight and simple, reaches a height of 30—60 feet, and bears a head of 40—80 glaucous pin-



Date Palm.

nated leaves, of 8—10 feet long, with lanceolate acuminate leaflets, very much closed up, and a number of branching spadices, each of which on the female tree bears in general 180—200 fruits (dates, *dactyli*). A bunch of dates weighs 20 or 25 pounds. This is one of the most important and useful of all the palms, and is indispensable to millions of the human race, on account of the supply of food which it affords them. In Egypt, and the other countries on the north coast of Africa, in Persia, and in Arabia, dates form the principal food, and date palms, the principal wealth, of the people. The fleshy part of the fruit contains 58 per cent. of sugar, accompanied by pectin, gum, &c. The main ingredient, therefore, in a dietetic point of view, is the sugar. The fruit is eaten either fresh or dried, and in the latter state becomes an article of commerce. Cakes of dates pounded and kneaded together, and so solid as to be cut with a hatchet, are the store of food provided for African caravans on their journey through the Sahara. A liquor resembling wine is made from dates by fermentation, and also a kind of vinegar. In Persia, an ardent spirit is distilled from dates. The soft pith at the summit of the palm stem, along with the young leaves not yet unfolded, are eaten under the name of *palm cabbage*, and the undeveloped panicles of flowers also form an article of food to the Persians and Arabs. The liquor called *palm wine* is prepared by fermentation from the sap of the palm, the top being cut off, and a hollow scooped out, in which the sap collects. Three or four quarts are obtained daily from a single palm for ten days or a fortnight. The quantity

afterwards diminishes, till the tree becomes quite dried up. Many of the inhabitants of North Africa use the roasted date stones or seeds as a substitute for coffee, for which purpose the seeds of the *Phoenix reclinata* are also employed in the south of Africa. The seeds or stones of dates are in many places ground for the sake of the oil which is afterwards obtained from them by expression, and the remaining paste or cake is given as food to cattle.

From leaf-stalks of the common D. P., all kinds of basket and wicker work are also made, and walking-sticks, fans, &c. The leaves themselves are made into bags, mats, &c.; the fibres of the web-like integuments at the base of their stalks into cordage. The wood is used for building, fences, &c.—The TODDY PALM of the north of India, or Wild Date Palm (*Ph. sylvestris*), so nearly resembles this species, that it is doubtful if it is distinct. In some places, the trees present a curiously distorted and zigzag appearance, from the practice of yearly tapping the alternate sides for the sap or *toddy*. The incision is just below the crown, and slopes upwards and inwards; a vessel is hung below the wound, and the juice conducted into it by a little piece of bamboo. It forms a grateful and wholesome beverage; readily also fermenting into palm wine, and by distillation yielding *Arrack* (q. v.); whilst if boiled down without being allowed to ferment, it yields the saccharine sirup called *jaggery*, from four pounds of which one pound of sugar is obtained, a single tree producing about seven or eight pounds of sugar annually. The operation of tapping for toddy spoils the fruit of the tree, which is small and much inferior to the African date. It is, however, eaten.—Another species, *Ph. paludosa*, the most gregarious of Indian palms, growing only six or eight feet high, covers the whole landscape of the Sunderbunds with the liveliest verdure. *Ph. acaulis*, *Ph. farinifera*, and *P. spinosa*, are three other closely allied species; the first grows in the driest soils in the damp valleys of the Himalaya to 5000 feet above the sea. All three are dwarf species.

DATE PLUM (*Diospyros*), a genus of plants of the natural order *Ebenaceæ*, consisting of deciduous trees, whose fruit is a globose berry, natives of warm or temperate climates. The black heart-wood of some species is EBONY (q. v.), and the hard timber of others is known as IRONWOOD. Some are valued for their fruit. The COMMON DATE PLUM, or PISHAMIN, also called the EUROPEAN LOTUS and the DATE OF TREBISOND (*D. Lotus*), is a tree of 20—40 feet in height, with oblong shining leaves and small reddish white flowers, a native of the coasts of the Caspian Sea, Mauritania, &c., but cultivated and naturalized in the south of Europe. Its fruit is of the size of a cherry, and in favorable climates larger, yellow, sweet, and astringent. It is eaten when overripe, like the medlar, or is used for preserves. The tree bears fruit abundantly in the neighborhood of London, but is somewhat tender in the climate of Britain, and its fruit more austere than in more southern regions. This fruit has been supposed by some to be the *Lotus* (q. v.) of the Lotophagi. The VIRGINIAN DATE PLUM, or PERSIMMON (*D. Virginiana*), is a tree of 30—60 feet high, with ovate oblong leaves and pale-yellow flowers, a native of the southern states of North America, where one tree often yields several bushels of fruit. The fruit is about the size of a bullace, reddish, with six to eight oval seeds. It is not palatable till mellowed by frost, and is sweet and astringent. A kind of beer or cider and an ardent spirit are made from it.—The *Mabola* (*D. Mabola*) is cultivated as a fruit-tree in the Isle of France.

Its fruit is about the size of a quince, and has a very agreeable flavor.—The *Kaki* (*D. kaki*), sometimes called the KEG-FIG, is a Japanese tree, sometimes kept in green-houses in France and England. The sweetmeat called *Figues-caques* is made from this fruit in France. The fruit resembles a plum. It is occasionally brought from China as a dried sweetmeat.—The fruit of some other species of *Diospyros* is also edible, as that of *D. decandra*, a large yellow berry, which, notwithstanding a disagreeable smell, is sold in the markets of Cochinchina.

DATHIOLITE, a mineral of a grayish or greenish white color, occurring both massive and crystallized in rhombic prisms, the edges and angles of which are cut off by planes. It is composed of boracic acid, silica, and lime, with a little water. It has been found both in gneiss and in trap rocks. The Salisbury Crags and Corstorphine Hill, near Edinburgh, are localities for datholite.

DATISCA'CEÆ, a small natural order of plants, allied to *Begoniaceæ*, and consisting of herbs and trees, chiefly natives of the temperate parts of the northern hemisphere. *Datisca cannabina*, a plant much resembling hemp in its general appearance, a native of Crete, possesses very marked tonic properties. It contains also an amylaceous substance, called *Datiscin*, resembling inulin. It affords a yellow dye.

DA'TIVE. See DECLENSION.

DATU'RA. See THORN APPLE.

DAUBENTON, LOUIS JEAN MARIE, a French naturalist, was born at Montbar in Burgundy, 29th May, 1716. His father wished him to be an ecclesiastic, and sent him to acquire a knowledge of theology at the Sorbonne in Paris, but D. had no inclination for this study, and gave himself up to that of medicine and anatomy. In 1741, after he had taken his degree at Rheims, he returned to Montbar to practice his profession. In the following year, however, his old school-fellow, the Comte de Buffon, induced him to come to Paris, and assist him in the preparation of his great work on Natural History. For this office D. was admirably qualified. The sobriety of his understanding, the scrupulous care with which he pursued the smallest investigations, his perseverance and industry, were in complete contrast to the impatient spirit and rapid generalizing of his brilliant coadjutor, and enabled him to correct and moderate some of Buffon's hasty theories, as well as to substantially enrich the work with a multitude of new and important facts relative to the anatomy of animals.

Unfortunately, Buffon, who was exceedingly jealous, allowed himself to be influenced unfavorably in regard to D., on account of the high estimation in which the Parisian savans generally held the latter. The result was an estrangement between the two friends (who were, however, ultimately reconciled), and science suffered severely in consequence. D., who had contributed richly to the first 15 volumes of the *Histoire Naturelle*, ceased to have further connection with the work, and the subsequent labors of Guéneau de Montbéliard, Bexon, and Sonnini, but ill supplied the want which his absence created. D. now devoted himself almost entirely to his duties in the *Jardin du Roi*, in which he held an appointment. In 1778, he was made Professor of Natural History in the College of Medicine. During the Revolution, the Convention also appointed him Professor of Mineralogy in the Museum of Natural History. He died 1st January 1800.

Besides his labors in connection with the *Histoire Naturelle*, D. contributed largely to the first *Encyclopédie*. In the *Memoirs* of the Académie des Sciences, and in those of the Société de Médecine, are to be found a multitude of his most interesting and valuable papers on natural history and mineralogy. Cuvier composed a notice of D.'s life and works for the *Memoirs* of the Institute.

DAUBENY, CHARLES GILES BRIDLE, M.D., F.R.S., late Professor of Botany and Chemistry in the university of Oxford, devoted himself chiefly to the elucidation of natural phenomena by the aid of chemical science. His attention was at an early period directed to the chemistry of volcanic action, and one of his first productions was *An Essay on the Geological and Chemical Phenomena of Volcanoes* (Oxford, 1824), which was followed by his great work, *A Description of Active and Extinct Volcanoes* (London, 1826). It applies in a remarkable manner the principles of chemistry to the phenomena produced by volcanic changes. To the examination of mineral and thermal springs, a subject closely allied to that of volcanic investigation, D. also applied himself. In 1837, he visited America for scientific purposes, and published the results of his observations in two volumes, *Notice of the Thermal Springs of North America* (1838), and *Sketch of the Geology of North America*. Italy and Auvergne, on account of their volcanic phenomena, largely employed D.'s pen. His *Introduction to the Atomic Theory* (1831), *Lectures on Agriculture* (1841), and *Lectures on Climate* (1862), are very valuable. D. died December 12, 1867.

D'AUBIGNÉ. See MERLE D'AUBIGNÉ.

DAUCUS. See CARROT.

DAUDET, ALPHONSE, one of the most popular of living French novelists, was born at Nîmes, in Provence, in 1840. Much of his childhood was spent at Lyons, amid somewhat dismal circumstances, which he has touchingly described in his first long story, *Le Petit Chose*. After a short bondage as an ill-paid usher in a small provincial college, he came to Paris still a youth, and gradually worked his way to his acknowledged place as the most charming story-teller of the day. His earlier works were *Lettres de mon Moulin*, *Contes du Lundi*, the amusing history of *Tartarin de Tarascon*, and the delightful series of letters entitled *Robert Helmont*.

These works revealed to Frenchmen a genius of rare quality and interest, full of brightness and warmth, with all the spontaneity and loquacity of the Provençal, and a wonderful observer of all external things, lightened up by the ray of fancy and the tremor of feeling. Some of his later works, especially *Sack* and *Le Nabab*, show distinct traces of the influence of Dickens in the overdone pathos and intensification of some of the situations. His great successes in his longer works have been portraits of known individuals. *Fromont jeune et Risler aîné*, *Le Nabab*, *Les Rois en Exil*, and *Numa Roumestan*, are galleries of contemporary Parisian figures. The novelist's dexterity alone has saved him from the peril of vulgarity incident to such a choice of subjects, as it is his constant sense of beauty that has lifted him out of the contagious influence of contemporary realism. An interesting sketch of his early life has been written by his brother Ernest, himself no mean

de novelist, under the title *Mon Frère et Moi: Souvenirs d'Enfance et Jeunesse* (Paris, 1882). See also an article by Mr. Henry James, in the *Atlantic Monthly* for June 1882.

DAULATARA'D. See DOWLATABAD.

DAUMIER, HENRI, a celebrated French caricaturist, was born at Marseille in 1810. Fashion, tittle-tattle, scandal, politics, blemishes of figure, and oddities of character have in turn inspired his inexhaustible genius for mockery. Few among his illustrious contemporaries have escaped his pencil, and the worst of it is, that his caricatures have always some strikingly truthful feature about them. D. made his *début* in the *Charivari*, in a series of sketches from *Robert Macaire*, after which followed *Les Actualités*, *Les Divorceuses*, *Les Femmes Socialistes*, *Les Philanthropes du Jour*, *Les Grecs*, *Les Gens de Justice*, *Les Bons Bourgeois*, *Les Pastorales*, and *Les Papes*. The revolution of 1848 suggested two of his most remarkable series—*Idylles Parlementaires*, and *Les Représentants représentés*. D. is one of the contributors to the *Charivari*. He has been called by French critics the *Aristophanes* and the *Paul Louis Courier* of caricature.

DAUN, LEOP. JOS. MARIA, GRAF VON, commander-in-chief of the imperial troops during the Seven Years' War, was the son of Ulrich Philipp Lorenz von Daun, a distinguished officer in the Austrian service, and was born at Vienna 25th September 1705. Entering his father's regiment, he acquired no inconsiderable reputation during the Turkish campaigns, 1737—1739. The Austrian Wars of Succession also afforded him many opportunities of displaying that combination of valor and prudence for which he was famous. After the peace with Prussia in 1745, D. became Master-general of the Ordnance, fought against the French in the Netherlands, 1746—48, and in 1754 received the dignity of field-marshal. Before this, he had, in spite of many obstacles, introduced into the imperial army a new military system, and reorganized the Military Academy at Vienna. At the commencement of the Seven Years' War, he commanded the army of Moravia in 1757, and neutralized the defeat of the Austrians under General Broune near Prague, by driving Friedrich II., who had beleaguered that city, as far as Collin, and forcing the king, after a hard-fought battle, to evacuate Bohemia. On the 14th of October 1758, he gained another victory over Friedrich at Hochkirch, and but for the too late arrival of the Prince of Baden-Durlach with reinforcements, would probably have annihilated the Prussian army. On the 25th of November 1759, at Maxen, he compelled Fink, the Prussian general, with 11,000 men, to surrender. After this, however, he gained no important successes. Friedrich began to understand his tactics, and to conduct his campaigns accordingly. D. died 5th February 1766.

DAUNG, a tract within the limits of the presidency of Bombay, contains 950 square miles and 70,300 inhabitants, extending in N. lat. from 20° 22' to 21° 5', and in E. long. from 73° 28' to 73° 52'. It is sub-divided into several petty states, the whole being under one feudal chief, who is styled the Rajah of Daung. The country is valuable principally on account of its teak-forests, which are rented by the British Government.

DAUPHIN (Lat. *Delphinus*), formerly the title of the eldest son of the French king, was originally that of the sovereign lords of the province of Dauphiné. The last of these, Humbert II., dying childless (1349), bequeathed his possessions to Charles of Valois, grandson of Philippe VI. of France, on condition that the heir-apparent to the throne of France should bear the title of D. of Vienne, and govern the province. Louis the IX. conferred on the D. almost sovereign rights; but after his time these were gradually abridged, until Dauphiné was placed under the same laws as the rest of the kingdom, and the title became merely honorary. After the revolution of 1830, it was abolished altogether.

DAUPHINÉ, formerly a frontier province in the south-west of France, now comprises the departments Drôme, Isère, and Hautes Alpes. After the fall of the Roman empire, D. formed the southernmost part of the kingdom of Burgundy. It then passed under the dominion of the Franks, and after the dismemberment of the Carolingian monarchy, it became a portion of the new Burgundian kingdom of Arles. It then passed by legacy into the possession of the German emperor in 1032, and remained united with Germany till the middle of the 14th c., when it was presented to France by the last of the lords of Dauphiné. See DAUPHIN. The old rulers of the land bore the title of Dauphin (a title which probably originated in their having the figure of a dolphin for their crest), and the name was afterwards transferred to the district.

DAUPHIN'S CROWN is a circle of gold set round with eight fleurs de lis, closed at the top with four dolphins, their tails conjoined in a fleur de lis.

DAUW (*Equus Burchellii*), a South African quadruped, which may be regarded as intermediate between the zebra and the quagga, and is sometimes called the *Zebra of the Plains*, and by the Cape colonists the *Bonte Quagga*, or *Striped Quagga*. In the

language of the Bechuanas, it is called *Peetsi*. It is found in numerous herds in the wide plains north of the Orange River, is rather larger than the zebra, and of more robust figure; of a light bay color, the belly, legs, and tail white; the face, head, and body striped with black; the tail is tufted to near the root. The hoofs are much less concave beneath than those of the zebra, and are thus adapted to the plains, as those of the zebra are to the rough surface of the mountains. The D. is less easily domesticated than the quagga, but more so than the zebra.—This, or a very similar species, is found as far northwards as Congo and the Galla country.

D'AVENANT, SIR WILLIAM, an English poet and playwright, was born in the year 1605 or 1606 at Oxford, where his father kept the Crown Inn, a house at which Shakespeare was in the habit of stopping when on his journeys between London and Stratford. D., while still a child, had a great admiration for Shakespeare, and when only ten years of age, on the occasion of Shakespeare's death, the precocious boy penned an ode *In Remembrance of Master William Shakespeare*. He began to write for the stage in the year 1628, and ten years after, on the death of Ben Jonson, he was appointed poet-laureate. He afterwards became manager of the Drury Lane Theater, but entering into the intrigues of the civil war, he was apprehended, and cast into the Tower. He escaped, however, to France, and returning, distinguished himself so much in the cause of the royalists, that he was knighted by Charles after the battle of Gloucester. D. a second time got into difficulties, and was confined in the Tower for two years, when he was released, as is said, on the intercession of Milton. Once more free, he set about establishing a theater, and succeeded. After the Restoration, he was favored by royal patronage, and continued to write and superintend the performance of plays until his death, April 7, 1668. D.'s epic, entitled *Gondibert*, a poem of about six thousand lines, is now almost wholly forgotten.—**CHARLES D'AVENANT**, son of the preceding (b. 1656, d. 1714), distinguished himself as a writer on political economy and finance. His chief works are—*An Essay upon Ways and Means of Supplying the War* (1695); *Discourses on the Public Revenues and the Trade of England* (1698); *A Discourse upon Grants* (1700), &c.

DA'VENPORT, a city of Iowa, U.S., on the right bank of the Mississippi. It is connected with Rock Island by a large iron bridge; contains Griswold College, cotton, woollen and other manufactories. Coal is abundant, and a large trade is carried on by rail and river. Pop. (1880) 21,831.

DA'VENTRY, an ancient municipal borough in the west of Northamptonshire, at the sources of the Avon and Nene, 13 miles west of Northampton, and near the Birmingham Railway, Grand Junction Canal, and Watling Street. It is well built on an eminence, and has two principal streets. Pop. (1881) 3859. The chief manufactures are shoes and whips for export. D. was occupied by Charles I. in 1645, before the battle of Naseby. A mile to the east of D., on Dane's or Borough Hill, is a foot-shaped Roman camp, supposed to be Ben-avenna, one of the largest in the kingdom. Near it is one of an acre in extent.

DA'VID (Heb. 'Beloved') king of Israel, the eighth and youngest son of Jesse, belonged to the tribe of Judah, and was probably educated in one of the schools of the prophets. He first publicly signalized himself by slaying Goliath of Gath, a gigantic Philistine, who had 'defied the armies of Israel.' Previously, he had acquired a considerable reputation as a skillful harper, and had subdued by his music the paroxysms of insanity which afflicted Saul at certain seasons. By Samuel he was anointed king during the lifetime of Saul, who soon began to regard him as a dangerous enemy, and persecuted him. A kind of intermittent war between the two was the consequence, in which D. was often reduced to great straits. At first he was simply in the position of a guerilla chief, and his comrades were mainly persons in desperate circumstances—'all who were in distress, in debt or discontented.' Latterly, he lived among the Philistines as one of themselves, and from the Philistine prince of Gath obtained a present of the strong fortress of Ziklag, after which he was joined by a class very different from his original outlaws—men of consideration, and tried warriors, from various tribes. The contest between him and Saul now assumed the dignity of a civil war. It was only closed by the death of the latter, whereupon D. ascended the throne of Judah, with the city of Hebron as his capital. The other tribes elected Ishbosheth, a son of Saul to be their king, after whose murder D. first acquired possession of the entire kingdom, over which he ruled from 1055 until his death in 1015 B.C. His first undertaking in his new office was a war against the Jebusites. He took their chief city, Jerusalem, and made it his residence, as also the center of the religious worship of the Hebrews. Subsequently, he subjugated the Philistines, Amalekites, Edonites, Moabites, Ammonites, and, after a long war, the Syrians. His kingdom now stretched from the Euphrates to the Mediterranean, and from Syria to the Red Sea, and contained a

population of 5,000,000. He fostered navigation and trade, especially with Tyre, and sought to instruct the Hebrews in the arts. No less careful was he of the religion of his countrymen.

He divided the priests and Levites into classes, and appointed sacred singers and poets for the musical service of God. Law and justice likewise received improvements at his hands, through the institution of higher and lower judiciary courts, while he secured the stability of his power by the formation of a standing army. Besides this, there were twelve governors over the tribes of Israel, 'who may perhaps be compared to the lord-lieutenants of English counties.' D. was not, however, without his trials. Two conspiracies were formed against him in his own family, and although both failed, they greatly embittered his life. His sensual excesses also drove him into acts of criminality, the memory of which haunted him for ever. 'My sin is continually before me.' Yet we cannot help recognizing in the man, in spite of all his errors and sins, a sincerity of moral feeling rarely equalled in history. His passions might lead him astray, but they never blinded his conscience. The crime once committed, D. never tried to find excuses for it, and so blunt the edge of his deserved misery. The psalms which he has left reveal to us the naked soul of the royal poet wrestling with a host of black troubles, fears, and doubts, out of which, however, as from the seething bosom of chaos, there emerges at last a 'full-orbed faith,' made perfect by suffering and much tribulation. There has never been trust in God more clear, unwavering, and tender than that expressed in the 23d Psalm. It is this many-sided experience of life that has made the 'Psalms of David' (though it is uncertain who made the collection, which contains many not written by David himself) the most precious heritage of the afflicted and tried in all ages of the Christian Church.—By those theologians who look upon Jewish history as having a *typical* or *allegorical* meaning as well as a literal one, D. is regarded as a type of Christ.

DAVID I. (often called **ST. DAVID**), king of Scotland, was the youngest of the six sons of King Malcolm Ceanmohr, by his second wife, the Anglo-Saxon princess, St. Margaret (q. v.). He was born about the year 1080. During the fierce struggle for the Scottish crown, which followed the death of his father in 1093, the youthful D. seems to have found refuge in England, along with his sister, Eadgyth or Matilda, who, in 1100, married Henry I., king of England. The residence of D. at the court of this accomplished monarch would appear to have been prolonged for several years, and the assertion of a contemporary English annalist may well be credited, that 'it freed him from the rust of Scottish barbarity.'

In 1107, his elder brother, Alexander, succeeded to the throne, and D. became Prince of Cumbria, a territory which comprised what are now the shires of Cumberland, Dumfries, Roxburgh, Selkirk, Peebles, Lanark, Dumfries, Renfrew, and Ayr, and was held of the English king by the heir of the king of the Scots. Along with this great principality, he seems to have held lands in Lothian; and by his marriage in 1110 with Matilda, widow of the Earl of Northampton, he acquired possession of that earldom, together with a claim to the rest of the vast domains of her father, Waltheof, Earl of Huntingdon, of Northampton, and of Northumberland.

The first act of D., as Prince of Cumbria, was to restore the fallen bishopric of Glasgow, which he committed to the charge of his old preceptor, John. His next act was to bring a colony of Benedictine monks from the newly founded monastery of Tiron, in France, and to plant them beside his forest castle of Selkirk. This was in 1113; and even thus early, as his charters show, he had gathered round him the Bruces, the Lindsays, the Morvilles, the Umfravilles, the Percies, the Riddels, and other Anglo-Norman knights, through whose help he was to effect such a momentous change in Scotland.

In 1124, he succeeded to the Scottish throne, on the death of his brother, King Alexander I. That prince had had to fight for his crown against the heirs of the old Celtic dynasties, supported by the wild tribes of the north and the west. They renewed the struggle with his successor, first in 1130, when they advanced almost to the gates of Brechin; and again about twenty years later, when they appear to have been encountered on the plains of Murray. On both occasions, the Anglo-Norman chivalry with which D. had garrisoned the southern provinces, gave him decisive, but far from easy victories. He was less fortunate in his wars beyond the Tweed. In 1127, he had sworn, along with the other great barons of England, to maintain the right of his niece, Matilda, as heir of the English crown, should her father, Henry I., die without male issue of his own body. The event thus contemplated came to pass in 1135; and when Stephen mounted the English throne, D. took arms in behalf of Matilda, and subdued almost all the country to the south of Durham. Peace was restored by the grant of the earldom of Huntingdon, and the promise of the earldom of Northumberland, to D.'s son Henry, then in his 20th year. But the war was soon resumed; and in 1138, the king of

Scots, deserted by Bruce and others of his Anglo-Norman vassals, was signally defeated in 'the Battle of the Standard,' near Northallerton. The next year, a second peace was concluded between the two kings, when the promised earldom of Northumberland was bestowed on D.'s son Henry. In 1141, the Scottish king marched into England for the third time to assert the rights of Matilda. He was a third time defeated, and only regained his own country with difficulty.

The rest of his reign was devoted to the accomplishment of the great revolution which had been begun by his father, King Malcolm, and his mother, St. Margaret, and continued by his brothers, King Edgar and King Alexander—the establishment in Scotland of the civilization which obtained in England. By building castles, he secured the peace and safety of the country; by erecting burghs, he promoted its trade, shipping and manufactures, and laid the foundations of its freedom; by endowing bishoprics and monasteries, he provided homes for the only men of learning and enlightenment known in his time.

His descendant, King James I., standing by his tomb in Dumferline, is said to have complained that 'he was a sore snout for the crown;' but the remark, if it was ever made, would only show that the sloth and ignorance of the clergy in the 15th c. had blotted out the remembrance of the great services which they rendered to mankind in the 12th c., when they were the schoolmasters, the statesmen, the lawyers, the physicians, the bankers, the engineers, the artists, the builders, the glaziers, the agriculturists, and the gardeners of the age. One who was a hard judge of monarchs—the great scholar, Buchanan—said with much more truth, 'that if men were to set themselves to draw the image of a good king, they would fall short of what David showed himself throughout the whole course of his life.'

King D. died at Carlisle on the 24th May 1153. His son Henry had died in the previous June, and he was succeeded by his grandson, Malcolm, then in his twelfth year. The oldest Scottish painting now known to exist—an illuminated charter to the monks of Kelso, written in 1159—preserves rude miniatures of the young king and his saintly grandfather. It is engraved in facsimile in the *Liber S. Marie de Calchou*, presented to the Bannatyne Club by the Duke of Roxburghe in 1846. Some pleasing traits of King D.'s personal character—which seems to have been in many ways truly admirable—are preserved in the *Eulogium Davidis Regis Scotorum*, by his friend St. Ailred, abbot of Rievaulx, printed in Pinkerton's *Vita Antiqua Sanctorum Scotiae* (Lond. 1789). Other instructive materials for the king's life are supplied by the same writer in his tract *De Bello Standardi*, printed (together with other contemporary accounts of the battle) in Twysden's *Historia Anglicanae Scriptores Decem* (Lond. 1652); and by Joceline of Furnes in his *Vita S. Walthevi* (abbot of Melrose and D.'s stepson), printed by the Bollandists in the *Acta Sanctorum*, and in a less perfect state in Fordun's *Scotichronicon*. The remains of D.'s legislation, including the interesting code of the *Leges Burgorum*, have been carefully collected in the first volume of *The Acts of the Parliaments of Scotland* (Edin. 1844).

King D. is often called St. David. He was never formally canonized, or placed in the roll of saints of the Roman Catholic Church; but his name was inserted in the calendar prefixed to King Charles's Prayer-book for Scotland, printed at Edinburgh in 1637.

DAVID II. See BRUCE.

DAVID, FELCIEN, a French composer, was born 8th March, 1810, at Cadenet, in the department of Vaucluse. He was at first a chorister in the cathedral of Aix, and at the age of twenty entered the Paris Conservatoire. He threw himself earnestly into the social speculations of his day; became an ardent disciple of St. Simon, and afterwards of Eufautin; and finally, on the break-up of the brotherhood attempted at Ménilmontant in 1832, he betook himself, along with eleven of his fellow-dreamers, to the East, there to realize his theory of life in undisturbed peace. The little knot of enthusiasts reached Constantinople, whence they made their way to Smyrna and Cairo. As they had no means, they suffered greatly from want, sickness, and ill-usage. The plague forced them to flee from Egypt, through the desert, to the coasts of Syria. It is said that they dragged a piano with them over the sands, and often, when they rested on their toilsome march among the wild tribes of the wilderness, D., whose ear was quick to catch the native airs of the East, sent forth enchanting strains from the instrument, and made his comrades forget their misfortunes. In 1835, he reached France, and published his *Mémoires Orientales* for the pianoforte. They were unsuccessful; and D. remained in obscurity till 1844, when he brought out at the Conservatoire his *Désert*, a grand *Odesymphonie*, as he called it, the words of which were furnished by his friend and fellow-wanderer, M. Auguste Colin. Its success was sudden and complete. D. was declared a master at once, and his *Désert* was performed in all the theaters. Subsequently, he traveled through Belgium and Germany, and was everywhere greeted with applause. Less success-

ful works were—*Moïse sur le Sinaï* (1846), *Christophe Colomb*, and *Le Paradis* (1847), and *La Perle du Brésil* (1851). *Herculanum* (1859) *Lalla Rookh* (1862). Appointed an officer of the Legion of Honor in 1862; and in 1869, Librarian to the Paris Conservatoire de Musique, D. died 29th August 1876.

DAVID, JACQUES LOUIS, the founder of the modern French school of painting, and, according to his countryman, 'the regenerator of French art,' was born at Paris, 30th August 1748, and studied under Vien both at Paris and Rome. His first efforts by no means indicated the latent tendencies of his mind. His devotion to the classic style of art was first perceptible to any extent after his second visit to Rome in 1784, where he executed his 'Horatii.' It excited the greatest enthusiasm. In 1787, he painted 'The Death of Socrates;' in 1788, 'The Loves of Paris and Helen;' and in 1789, 'Brutus condemning his Son.' During the Revolution, he was artistic superintendent of those grand national fêtes and solemnities that recalled (but rather theatrically) the customs of ancient Greece. As a member of the Convention, he voted for the death of Louis XVI.; he was a hot Jacobin, and a member of the Committee of Public Safety, in all atrocities of which he shared, and, in consequence, was twice imprisoned after the fall of Robespierre.

To the period of the Revolution belong his 'Murder of Marat,' 'Murder of Pelletier,' and his 'Oath taken in the Tennis Court.' His genius culminated in the 'Rape of the Sabines' (1799). In 1804, Napoleon appointed him his first painter, and gave him a number of commissions, and among his best and most celebrated works are several historic portraits of the emperor, such as 'Napoleon crossing the Alps.' D. was warmly attached to Napoleon, and in 1814, when the Duke of Wellington paid a visit to his studio, and expressed a wish that the artist would paint his portrait, he coldly replied: 'I never paint Englishmen.' As one of the regicides of Louis XVI., he was banished in 1816 from France, and he died in exile at Brussels, December 29, 1825. D.'s later style is more free and natural than his earlier, in which his figures, although manifesting quite an ideal beauty of form, have all the rigidity of sculpture, and lack that vital expression which creates a sympathy in the mind of the beholder. Among the paintings executed by him during his banishment were—'Love and Psyche,' 'The Wrath of Achilles,' and 'Mars disarmed by Venus.' The number of his pupils who acquired distinction was very great.

DAVID, PIERRE JEAN, a French sculptor, commonly called David d'Angers, was born at Angers, 12th March 1789; went to Paris when very young; and studied art under his namesake, Jacques Louis David (q. v.). In 1811, his 'Death of Epaminondas' obtained the first prize for sculpture given by the Academy of Arts. D. now visited Rome, where he formed a friendship with Canova. In 1816, he returned to France. A statue of the Great Condé, which he executed about this time, established his reputation. In 1826, he was named a member of the Institute, and appointed a professor in the School of the Fine Arts. Two years later, he went to Germany, where he executed a colossal bust of Goethe for the library at Weimar; and in a second tour in 1834, similar busts of Dammeyer, Schelling, Tieck, and Rauch, as well as many portrait-statues of life-size. During the July revolution, D. had fought in the ranks of the people, and, in consequence, he was employed by the new government to execute the frontispiece of the Pantheon in 1835. He finished it in 1837. By many it is considered his *chef-d'œuvre*. In 1848, the well-known republicanism of the artist procured for him the honor of a seat in the Constituent Assembly. After the *coup-d'état*, he was sent into exile, and went to Greece, but soon after returned to France. He died 5th January 1856. It would be impossible to enumerate all D.'s works. The principal are—'A Young Girl at the Tomb of Botzaris,' 'A Monument of Bonclamp,' 'A Virgin at the Foot of the Cross,' a 'Saint John,' statues of General Foy, Marshal St. Cyr, Corneille, Fénelon, and Racine, and busts of La Fayette, Béranger, Rossini, Chateaubriand, Balzac, and Casimir Delavigne. There is great force of expression in many of D.'s works, but the drawing and execution are not always accurate.

DAVID, or DEWI, St., the patron saint of Wales, was, according to tradition, the son of the Prince of Ceredigion (Cardiganshire), and was born about the end of the 5th or beginning of the 6th century. Having resolved on a religious life, he spent, as was customary in those days, a probationary period in solitude, after which he commenced preaching to his countrymen. He built a chapel at Glastonbury, and founded twelve monasteries, the chief of which was at Menevia, in the vale of Ross. At the synod of Brevy, in Cardiganshire, held in 519, St. D. showed himself a strong opponent of the Pelagian heresy. Subsequently, he became Archbishop of Caerleon-upon-Usk, but transferred his see to Menevia, now called St. Davids, where he died about the year 601. St. D. was celebrated for his eloquence and success in conversion. Several works have been ascribed to him, but these are

no longer extant. His life was written by Ricemarch, Bishop of St. David's, who died about the year 1099. The *Historia St. Davidis*, by Giraldus Cambrensis, written about 1175, and published in Wharton's *Anglia Sacra*, is little more than an abridgment of Ricemarch's work.

DAVID, a town on the left bank of a river of the same name in Panama, one of the federal provinces of the United States of Colombia (formerly New Granada), and lying on the frontier of Costa Rica, in Central America. D. is in lat. $8^{\circ}23'N.$, and long. $82^{\circ}27'W.$, and is separated by a comparatively narrow part of the Isthmus of Darien from the lagoon of Chiriqui, an inlet of the Caribbean Sea, which, with sufficient depth for large ships, penetrates nearly 50 miles into the land towards the Pacific Ocean. To this position the place appears to owe its prosperity. Though of recent origin, it numbers more than 4000 inhabitants, with a constant and regular immigration. It exports rice, coffee, hides, turtle, shells, and gold-dust. Its climate is understood to be comparatively salubrious.

DAVIDS, ST., an ancient but now decayed episcopal city, in the west of Pembrokeshire, the westmost town in Wales. It is situated on the streamlet Allan, a mile from its mouth, near St. David's Head, on the north side of St. Bride's Bay. It has been the seat of a bishopric since about 519, when St. David transferred the archbishop's see to St. D. (before called Mynyw, and by the Romans Menevia) from Caerleon. It was in the middle ages a large city—the great resort of pilgrims to St. David's shrine; it is now a small village, with only a few good houses, besides those of the clergy. It has a fine cathedral, and splendid remains of religious houses, episcopal palace, and St. Mary's College (founded by John of Gaunt), within a high embattled wall nearly a mile in circuit. These were several times pillaged and burned by the Danes and others during the 9th and two following centuries. The cathedral, founded in 1180, on the site of the monastery of St. David, is cruciform. Its dimensions, in the interior, are as follows: length, 290 feet; breadth, 76; nave, 124; choir, 80; transept, 120; central tower, 127 feet high.

It contains a curious movable pulpit, an elaborately worked bishop's throne; the tomb of the Earl of Richmond, father of Henry VII.; and also sepulchral monuments of the early bishops of the see, as Giraldus Cambrensis, Anselm, &c. Among the former bishops, may be named Laud, Bull, South, and Horsley; and a very recent occupant of the see was Connop Thirlwall, the historian of Greece. The cathedral establishment includes a bishop, a dean, four canons, five vicars choral, and other officers residentiary, with four archdeacons, and 12 prebendaries, or honorary canons, non-resident. The bishop has £4500 a year, and lives at Abergwili, near Caermerthen. Pop. (1871) 2131, chiefly agricultural laborers. William the Conqueror made an offering as a pilgrim at St. David's shrine. Cairns, tumuli, holy wells, chapels, crosses, &c., abound around St. D., and especially at ST. DAVID'S HEAD, a high rugged promontory two miles north-west of the city, and the westmost point in Wales, in lat. $51^{\circ}54'N.$, and long. $5^{\circ}20'W.$

DAVIES, SIR JOHN, a poet and statesman of some reputation was the son of a legal practitioner in Wiltshire, and was born in 1570. At the age of 15 he was sent to Queen's College, Oxford, where, five years after, he took his degree of B.A., having spent two of these years in the Middle Temple, where he studied law. He was called to the bar in 1595, but forfeited his privileges, and eventually was expelled from the Temple on account of certain indiscretions. He began his political career in 1601. In 1603, he was sent by James I. as solicitor-general to Ireland, and almost immediately after, he became attorney-general. He was called to the degree of sergeant-at-law in 1606, and in the spring of the following year received the honor of knighthood. On the assembling of the Irish parliament, called in 1613, D. was chosen Speaker of the House of Commons. In 1620, he took his seat in the English parliament as member for Newcastle-under-Lyne. He died suddenly of apoplexy, December 7, 1626.

As a lawyer, the character of D. is that of a man of great learning and talent. His *Reports of Cases adjudged in the King's Courts in Ireland*, published in 1615, were the first reports of Irish cases ever published, and had a preface from the pen of D., which was esteemed by an old critic as the best that was ever prefixed to a law-book. But it is as a poet that he is chiefly notable. His *Orchestra, or a Poem on Dancing* (1596), was followed by his great work, the *Nosce Teipsum, a Poem on the Soul and the Immortality thereof* (1599). His verse is elegant without being artificial, and flowing without being careless, while its compact structure is remarkable for his times. Among his miscellaneous works may be mentioned his *Discovery of the True Cause why Ireland was never Subdued entirely until the Reign of King James I.* (Lond. 1612), a work which has always been considered of great value to political inquirers.

DA VILA, ENRICO CATERINO, a celebrated Italian historian, was born at Pieve di Sacco, in the vicinity of Padua, October 30,

1576. D., when seven years old, was taken to France for his education. At the age of 18, he entered the service of Henry IV., which he afterwards exchanged for the military service of Venice. He was shot on his way to Crema, to take command of the garrison, in 1641. D. has been rendered famous by his great work, entitled *Storia delle Guerre Civili di Francia* (Venice, 1630), a history comprising that eventful period from the death of Henry II., 1559, to the peace of Vervins in 1598.

DAVIS, JEFFERSON, born in Kentucky, June 3, 1808, first made himself conspicuous as a member of the House of Representatives, and afterwards of the National Senate, in which he represented the state of Mississippi. At the commencement of the Mexican war, he left Congress, and engaged actively in the contest. Having the advantage of a military training, and having served in the regular army, he soon acquired distinction. When Pierce was elected president in 1853, D. was appointed secretary of war, and at this period he exercised a powerful influence in the administration—ruling, in fact, the president as well as the greater number of the members of the cabinet. When Buchanan became president, he left the cabinet, but was returned to the senate by the legislature of Mississippi, which position he retained till the secession of his state. On the 18th February 1861, D. was chosen president of the Confederate States, and re-elected for six years in 1862. The manner in which the new constitution was drawn up by D., his military skill, administrative capacity, and unwearied activity very fully justified the choice; and his disinterestedness and personal bearing endeared him to all classes in the southern states. After the fall of Richmond, D. was captured when endeavoring to escape in 1865, and was kept a prisoner in Fortress Monroe for two years. He was released on bail in 1867, and finally set at liberty by the general amnesty of Dec. 25, 1868. After a visit to Europe, D. settled at Memphis, Tennessee. In 1881 he published *The Rise and Fall of the Confederate Government*.

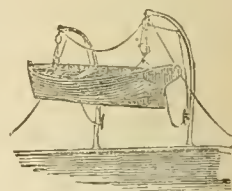
DAVIS, JOHN, an eminent navigator of the latter part of the 16th c., was born at Sandridge, near Dartmouth, and is principally distinguished for having, between 1585 and 1588, undertaken three voyages to the northern seas in search of a north-west passage. In the first voyage, he sailed as far north as the 73d degree of latitude, and discovered the strait which bears his name. He afterwards made five voyages to the East Indies, but was killed on the coast of Malacca in 1605. His work, *The World's Hydrographical Description*, appeared in 1595; *The Seaman's Secrets*, in 1595. *The Voyages and Works of D.* (including these) were issued by the Hakluyt Society in 1880, edited by A. H. Markham.

DAVIS, SIR JOHN FRANCIS, BART., born in London 1795, long resident in China as chief superintendent of Canton, and afterwards as governor and commander-in-chief of the colony of Hong-kong, is one of the best and most trustworthy authorities on China and the Chinese. In 1845, D. was created a baronet, and received the order of Knight Grand Cross of the Bath in 1854. He is the author of numerous valuable works, a *Description of China, China during the War, Chinese Miscellanies*, &c. In 1876 he founded a Chinese scholarship at Oxford, and was made D.C.L.

DAVIS' STRAIT, so called from the navigator who discovered it, forms the southern part of that inlet of the Atlantic which washes the western coast of Greenland. It thus connects Baffin's Bay, and also, in some sense, Hudson's Strait, with the open ocean. At its narrowest point, it measures 160 miles across. It is largely frequented by whaling-ships. A constant current, bringing with it, of course, much ice, flows down D. S. from the circumpolar waters. Recently, however, it has been maintained, on apparently good grounds, that, on the eastern side, an opposite current, similarly freighted, sweeps round Cape Farewell, on its way from Spitzbergen.

DAVITS are pieces of timber or iron which project, or may be made to project, over a vessel's quarter or stern, and are used as a kind of crane to hoist, suspend, or lower a boat. They are arranged in pairs, one for each end of the boat. See BOAT-LOWERING APPARATUS.—The name Davit or Fish Davit is also given to a beam of timber projecting from a ship's bow, used for hoisting the flukes of the anchor clear of the ship's sides.

DAVOS (Romansch Tavan) is a small valley lying high amongst the Alps of the Eastern Grisons, to the south-east of Coire. The height of the village of Davos-Platz is 5105 feet; but the valley, inclosed by lofty hills, has become famous as a health-resort in winter, especially for such as suffer from chest disease. The air is still and dry, and throughout the winter there is a great deal of bright, warm sunshine. Till lately a mere hamlet, the village has now eight or ten hotels, numerous villas and chalets, several doctors, and daily posts. The inhabitants of the valley, which till 1848



Davits.

was one of the 26 independent republics of the Grisons, are mostly German Protestants. See *Davos-Platz, a new Alpine Resort* (Stanford, 1878).

DAVOUT (not DAVOUST, as commonly written), LOUIS NICOLAS, a French marshal, was born 10th May 1770, at Annoux, in the old province of Burgundy; was educated along with Bonaparte at the military school of Brienne; and in 1785, became sub-lieutenant in a cavalry regiment. During the revolutionary wars, he rose to the rank of general. He accompanied Bonaparte to the East, where he mainly contributed to the victory at Aboukir, and otherwise distinguished himself both in Upper and Lower Egypt. On his return to France, he was named general of division in 1800, commander-in-chief of the consular grenadier guards in 1801, and marshal of the empire in 1804. In the campaigns of 1805, 1806, and 1807, he acted a brilliant part in the great victories obtained by the French at Uhm, Austerlitz, Jena, Auerstadt, Eylau, and Friedland. In reward of his bravery, Bonaparte created him Duke of Auerstadt (July 2, 1808). On the renewal of the war with Austria in 1809, D.'s star was again in the ascendant, and he was created Prince of Eckmühl for his services at the battle of Eckmühl. At Wagram, he performed prodigies of valor. Appointed governor of Poland, he ruled that country in a spirit of the harshest despotism, and provoked the reproaches of the emperor, but, nevertheless, did not change his system. In the Russian campaign of 1812, he gathered fresh laurels on the fields of Mohilow and Borodino. After the retreat from Moscow, D. became governor-general of the Hanse towns, and established himself at Hamburg, where he gallantly maintained himself till the first restoration of the Bourbons. On the return of Bonaparte from Elba, D. was appointed war-minister, and in this office showed a remarkable genius for the rapid organization of troops and supplies. After the battle of Waterloo, he received the command of the relics of the French army under the walls of Paris. He would have continued the contest, had he not been ordered by the Provisional Government in the capital to conclude a military convention with the allies. In 1819, he was made a peer of France. His death took place June 1, 1823. Firmness of character and dauntless courage were D.'s leading characteristics; but his military severities often went the length of harshness, and even cruelty, while his rapacity had in it something akin to barbarism.

DAVY, SIR HUMPHREY, one of the greatest chemists of his own or of any age, was born on the 17th December 1778, at Penzance, in Cornwall, where his father was a carver in wood. At the school of Truro, where he was educated until he was 15, he showed little relish for classical learning, but he was distinguished for a highly retentive memory and an early passion for poetry, which never forsook him.

Another prominent trait of his character was equally early developed: as a child, he would angle even in the gutters of the streets; and only two years before his death, and after his health had given way, he published his interesting volume, *Salmonia, or Days of Fly-fishing*. Soon after leaving school, he became apprentice to a surgeon and apothecary in Penzance. He at the same time entered upon a course of study all but universal. 'Speculations on religion and politics, on metaphysics and morals, are placed in his note-books in juxtaposition with stanzas of poetry and fragments of romance.' A system of mathematical study, sceptical philosophy, Scotch metaphysics and German transcendentalism, successively engaged his attention. The study of natural philosophy brought him nearer to that department which was to be his own; but it was not till he had reached his 19th year, that he entered seriously upon the study of chemistry. He now made the acquaintance of Dr. Beddoes, who had established a Pneumatic Institution at Clifton, and who took him as his assistant. Here D. carried on a course of experiments on the respiration of different gases, in which he had more than once nearly sacrificed his life. He thus discovered the singular exhilarating effect of nitrous oxide when breathed. The account which he published of his researches, established his reputation, and led to his appointment, at the age of 22, as lecturer to the Royal Institution of London. He delivered his first lecture in 1801; and his eloquence, and the novelty and variety of his experiments, soon attracted crowded and brilliant audiences. In 1803, he began researches connected with agriculture, on which he delivered a course of lectures. These were published in 1813, under the title of *Elements of Agricultural Chemistry*, and form an era in that science. The discoveries, however, on which D.'s fame as a chemist chiefly rests, took their origin in the views which he developed in 1806, in his Bakerian lecture, *On some Chemical Agencies of Electricity*. This essay was universally regarded as one of the most valuable contributions ever made to chemical science, and obtained the prize of the French Institute. Following out his principle, he was led to the grand discovery, that the alkalis and earths are compound substances formed by oxygen united with metallic bases. It was potash that he first

succeeded in decomposing, on the 8th October 1807. When he first saw the globules of the new metal, *potassium*, his delight is said to have been so ecstatic that it required some time for him to compose himself to continue the experiment. He next decomposed soda and the alkaline earths, baryta, strontia, lime, and magnesia; and discovered the new metals, *sodium*, *barium*, *strontium*, *calcium*, and *magnesium*. With regard to the earths proper, he succeeded in proving that they consist of bases united to oxygen. It was reserved for Wöhler and others to exhibit the bases by themselves.

In 1812, D. was knighted, married a lady of considerable wealth, and resigned the chemical chair of the Royal Institution. That he might investigate his new theory of volcanic action, he received permission from the French government—though the two countries were then at war—to visit the continent, and was received with the greatest distinction by the scientific men of France. On returning to England in 1815, he entered on the investigation of the nature of fire-damp, which is the cause of explosions in coal-mines. This resulted in the invention of the safety-lamp (q. v.)—one of the most valuable presents ever made by science to humanity. Though the value of the invention was everywhere acknowledged, the only national reward was a baronetcy after a lapse of three years. This has been contrasted with the pension of £1200 a year bestowed by the same government on Sir William Congreve for the invention of his rocket. On the death of Sir Joseph Banks, in 1820, Sir Humphrey D. was elected President of the Royal Society. His attention was shortly after called to the important object of preserving the copper-sheathing of vessels from corrosion by the action of sea-water. This he effected by altering the electric condition of the copper by means of bands of zinc; but the bottoms of the vessels became so foul from the adhesion of weeds, shells, &c., that the plan had to be abandoned.

Early in 1825, Sir Humphrey D. had begun to complain of the loss of strength, and, in 1826, he had a paralytic attack affecting his right side. He made two journeys to the continent for the recovery of his health, and died at Geneva on the 29th May 1829, at the early age of 51. The Genevese government evinced their respect by a public funeral. So widely spread was the reputation of Sir Humphrey D., that he was a member of almost all the scientific institutions in the world. Cuvier, in his *Eloge*, says: 'Mr. Davy, not yet 52 years of age, occupied, in the opinion of all that could judge of such labors, the first rank among the chemists of this or of any other age.' Besides the works already mentioned, and a great number of contributions to the *Philosophical Transactions*, Sir Humphrey D. published *Elements of Chemical Philosophy* (Lond. 1812); and *Consolations in Travel, or the Last Days of a Philosopher* (3d ed. Lond. 1831), appeared after his death. See *Memoirs of the Life of Sir Humphrey D.*, by his brother (Lond. 1836, 2 vols.); and *The Life of Sir Humphrey D.*, by Dr. Paris (Lond. 1831).

DAVY'S SAFETY-LAMP. See SAFETY-LAMP.

DAWA'LLA (*Hypophthalmus dawalla*), a fish of the family *Siluridae*, found in the rivers of Guiana, and highly esteemed for the delicacy of its flesh. It is sometimes two feet and a half long, and has a snout somewhat like that of a pike, but the mouth is furnished only with very minute teeth. The skin is destitute of scales, and the colors have that brightness so often seen in tropical fishes, green, brown, and earmine. The D. has become shy in the waters of the more populous and long-settled parts of Guiana, although easily captured in more remote regions.

DAWK, or DAK, a method of traveling in India which consists in posting by palanquin from station to station, or for any distance. The traveler must first purchase a strong palanquin, which he can have for from 40 to 100 rupees (£4 to £10), but which he can always dispose of when his journey has been completed, and generally at a profit. His clothes, together with whatever articles he may not immediately need, are carried in tin-boxes or wicker-baskets called *pettarahs*, by separate bearers, who precede or accompany the palanquin; whatever he considers necessary, however, he keeps beside himself inside. At all the stages, which are from 9 to 11 miles apart, there are relays of bearers, previously provided by the postmaster, the usual number for one palanquin being eleven. All arrangements as to cost are made with the postmaster of each presidency before starting, but the traveler is also expected to give some small sum to his bearers at the end of each stage: eight annas (one shilling) among the entire set of bearers is as much as is expected in the way of gratuity. The horse-dawk, a kind of carriage with seats for four, and capable of being used as a bed in which two can sleep, the baggage being conveyed on the top, set on wheels, and drawn by horses, is in use on the great trunk road from Calcutta to the upper provinces, but has not been established throughout the country generally.

DAWLISH, a flourishing and picturesque watering-place, on the south coast of Devonshire, 12 miles south of Exeter. It lies in a valley running east and west between the mouths of the Exe and Teign. It has recently built public-baths. Pop. (1881) 3997.

DAWN. See TWILIGHT.

DAX, a town of France, in the department of Landes, pleasantly situated on the left bank of the Adour, 20 miles north-east of Bayonne. Among its principal buildings are the high church, once a cathedral, and the bishop's palace. It is an intermediate *dépôt* for goods forwarded to Spain, and has some manufactures of earthen-ware, wine, and brandy; but it is chiefly remarkable for its hot saline springs, the temperature of which at the source is 158° F. The water, which is medicinal and nearly tasteless, was used for bathing-purposes by the Romans, who conferred upon the springs the name *Aquæ Tarbellicæ*. Pop. (1876) 9085.

DAY (probably allied to the Lat. *dies*, day, *divum*, the sky, from the root *div*, to shine) originally meant the space of time during which it is light, in opposition to the space of darkness or night; it now more usually denotes a complete alternation of light and darkness. It is the earth's rotation that causes the vicissitude of day and night. The earth being a globe, only one-half of it can be in the sun's light at once; to that half it is day, while the other half is in its own shadow, or in night. But by the earth's rotation, the several portions of the surface have each their turn of light and of darkness. This happens because the position of the earth is such that the equator is on the whole presented towards the sun; had either pole been towards the sun, that hemisphere would have revolved in continual light, the other in continual darkness.

One complete rotation of the earth does not make a day, in the usual sense. If the time is noted when a particular fixed star is exactly south or on the meridian, when the same star comes again to the meridian the next day, the earth has made exactly one rotation, and the time that has elapsed is called a *sidereal day*. This portion of time is always of the same length; for the motion of the earth on its axis is strictly uniform, and is, in fact, the only strictly uniform motion that nature presents us with. Sidereal time, or star-time, from its unvarying uniformity, is much used by astronomers. But the passage of a star across the meridian is not a conspicuous enough event for regulating the movements of men in general. It is not a complete rotation of the earth, but a complete alternation of light and darkness that constitutes their day. This, which is called the *civil* or the *solar day*, is measured between two meridian passages of the sun, and is about four minutes longer than the sidereal day. The cause of the greater length is this: When the earth has made one complete turn, so as to bring the meridian of the place to the same position among the fixed stars as when it was noon the day before, the sun has in the meantime (apparently) moved eastward nearly one degree among the stars, and it takes the earth about four minutes more to move round so as to overtake him. If this eastward motion of the sun were uniform, the length of the solar day would be as simple and as easily determined as that of the sidereal. But the ecliptic or sun's path crosses the earth's equator, and is therefore more oblique to the direction of the earth's rotation at one time than another; and besides, as the earth moves in her orbit with varying speed, the rate of the sun's apparent motion in the ecliptic, which is caused by that of the earth must also vary. The consequence is, that the length of the solar day is constantly fluctuating; and to get a fixed measure of solar time, astronomers have to imagine a sun moving uniformly in the celestial equator, and completing its circuit in the same time as the real sun.

The time marked by this imaginary sun is called *mean solar time*; when the imaginary sun is on the meridian, it is *mean noon*; when the real sun is on the meridian, it is *apparent noon*. It is obvious that a sun-dial must show apparent time, while clocks and watches keep mean time. Only in four days of the year do these two kinds of time coincide. In the intervals, the sun is always either too fast or too slow; and the difference is called *the equation of time*, because, when added to or subtracted from apparent time, it makes it equal to mean time. The mean solar day is divided into twenty-four hours, the hours into minutes and seconds. A sidereal day, we have seen, is shorter; its exact length is 23 hours, 56 minutes, 4 seconds of mean solar or common time. Astronomers divide the sidereal day also into twenty-four hours, which are of course shorter than common hours. In the course of a civil year of 365 days, the earth turns on its axis 366 times, or there are 366 sidereal days. Astronomers reckon the day as beginning at noon, and count the hours from 1 to 24. The civil day begins at midnight, and the hours are counted in two divisions of twelve each. The ecclesiastical day was reckoned from sunset to sunset.

A *day, in law*, includes the whole twenty-four hours, without any reference to the season of the year, or the amount of light or darkness. Where there is no qualifying stipulation, therefore, the obligation to pay on a certain day is discharged, if the money be paid before twelve o'clock at night, or the commencement of the following day. On the same principle, if anything is to be done within a certain time from or after the doing of a certain other thing, the day on which the first act or occurrence takes

place is excluded. If A binds himself to pay money ten days after B's death, and B dies on the 1st, the money will not be due till the night of the 11th at twelve o'clock. Where it is not absolutely necessary, for the purposes of justice, the law excludes fractional portions of time; thus, half a year consists of 182 days, and a quarter of a year of 91.

A *lawful day* is a day on which there is no legal impediment to the execution of a writ—i. e., all days except Sundays and fast-days appointed by government. Criminal warrants are an exception to this rule, and may be both granted and executed on Sundays and fast-days. By 29 Car. II. c. 7, all contracts made by persons in their ordinary calling on a Sunday are void. The exceptions to this rule will be explained under LORD'S DAY. In England, Christmas-day, Good-Friday, and Easter-day generally stand on the same footing with days appointed by royal proclamation for public fasting and humiliation; but in Scotland, there is no exception made in favor of any of the feast or fast days of the church.

Days of Grace. The time at which a bill is actually *due*, or at *maturity*, is in general three days after the time expressed on the face of it. The three additional days which are generally allowed by the custom of merchants, and which the laws of the United Kingdom recognize and protect, are called *days of grace*. If the third day of grace fall on a Sunday, the bill is payable the day before. If it fall on any of the bank holidays, the bill is payable the day after. See BILL.

DAY, THOMAS, a political writer and poet, was born in London, June 22, 1748, and studied at Oxford. The American war of independence, with which he strongly sympathized, seems to have roused his poetical energies. In 1773, he published *The Dying Negro*; in 1776, *The Devoted Legions*; and in 1777, *The Desolation of America*. But he is chiefly remarkable as the author of the famous *History of Sanford and Merton*, as also the *History of Little Jack*. He was killed by being thrown from a horse, 28th September 1789.

DAYAKS. See BORNEO, and BROOKE, SIR JAMES.

DAY-FLY. See EPHEMERA.

DAY-LILY (*Heimerocallis*), a genus of plants of the natural order *Liliaceæ*, having a perianth with bell-shaped limb, and sub-cylindrical tube, and globose seeds with soft testa. Several species are cultivated in our flower-gardens, especially the fragrant Yellow Day-lily (*H. flava*), a native of Hungary, Siberia, and the north of China. It has also been recommended to farmers as affording a supply of a most acceptable green-food to cattle. But *H. fulva*, a native of the Levant, produces more abundant foliage, and cattle are equally fond of it. Both species are fibrous-rooted perennials with linear leaves.



Day-lily.

DAY'SMAN, a name formerly given in England (and still in use in some of the northern counties) to an arbitrator, umpire, or elected judge. It has its origin in the judicial language of the middle ages, when the word *Day* was specially applied to the day appointed for hearing a cause, or for the meeting of an assembly. A daysman was thus a judge appointed to decide between parties at a judicial hearing. The word occurs in Scripture, where Job sorrowfully says, in reference to his relation to God: 'Neither is there any daysman betwixt us, that might lay his hand upon us both' (Job ix. 33).

DAY'TON, one of the most populous and wealthy cities of Ohio, in the United States, stands at the confluence of the Miami and the Mad, in lat. 39° 44' N., and long. 84° 11' W. It is connected with Cincinnati, the commercial capital of the state, on the Ohio, by the Miami Canal—the distance being 52 miles; and it is the terminus of six railways, which radiate in every direction. In the variety and extent of its manufactures, D. stands foremost among western towns in proportion to its size. The population in 1850 amounted to 10,976, having almost quadrupled within the preceding 20 years; in 1853, it had risen to 16,562, showing an addition of more than 50 per cent. in three years; in 1860, it amounted to 20,482; in 1870, to 30,473; and in 1880, to 38,678.

D'AZA'RA, DON FELIX, a very eminent naturalist, was born at Barbunales, in Aragon, 18th May 1746, was educated at the university of Huesca, obtained a commission in the Spanish army, was severely wounded in the attack upon Algiers, and in 1781 was

appointed one of the commissioners for fixing the boundaries of the Spanish and Portuguese possessions in South America. He proceeded immediately to that country, and did not return to Spain till 1801, encountering many difficulties in the discharge of his duties, in which he showed the greatest faithfulness and perseverance. He devoted himself also to the investigation of the geography, ethnology, and natural history of the regions in which he spent so many years, and published an account of his travels, and an important work on quadrupeds and birds, under the modest title of *Notes on the Natural History of Paraguay and La Plata* (Madrid, 1802, *et seq.*).—D.'s elder brother was eminent as a diplomatist.

DEACON OF A TRADE, the president, for the time being, of certain incorporations in Scotland; in which country, before the passing of the Burgh Reform Act (3 and 4 Will. IV. c. 76), the deacons of trades or crafts represented the trades in the respective town-councils. They were elected by the incorporations, but generally under the control of the town-council. The subordinate incorporation presented a list of six of its members to the town-council, by whom three of the names were struck off. The list, thus shortened, was returned, in order that the deacon for the ensuing year should be chosen from it. By the act just referred to (s. 19), it is enacted that the deacons shall no longer be recognized as official and constituent members of the town-council, the power of the crafts to elect deacons and other officers for the management of their affairs being reserved (s. 21). This more limited privilege is now exercised independently of the town-council. The deacon-convenor of the trades in Edinburgh and Glasgow (s. 22), is still a member of the town-council. One of the duties of the deacon in former times was to essay, or try, the work of apprentices, previous to their being admitted to the freedom of the trade. See **DEAN OF GUILD**. After this explanation, it need hardly be added that these deacons have no connection with ecclesiastical affairs, and are in no respect to be addressed like deacons in a spiritual sense.

DEA'CONS, literally *servants*, meant in apostolic times, properly those officers of a congregation or church that had the charge of collecting and distributing the alms, and of taking care of the poor and the sick. The office, therefore, was not a clerical one, though the term deacon or servant may have been at times applied to teachers as *minister* was, which has the same meaning. The limitations of the office of deacon to the functions above specified, continued to be recognized as late as the Council of Trullanum, 692. The Church of Jerusalem chose at first seven deacons, individuals, of whom, no doubt, as Philip, also taught and baptized, but only because they were evangelists as well as deacons. The number seven continued to be adhered to in all churches. During the 2d and 3d centuries, the duties falling to the deacons had considerably increased; and since as confidential attendants and helpers of the bishops, they had risen into consequence, it became necessary to divide the various functions among an archdeacon, deacons, and subdeacons. Deacons might now dispense the bread and wine at the communion, but not consecrate them. They had to receive the offerings and presents for the bishop, to keep the sacred vessels, to chant the introductory formulas of public worship, and to take the oversight of the morals of the congregation; and they were allowed, in many cases, with the leave of the bishop, to preach and baptize, and receive penitents into the communion of the church. At an early period, the offices of archdeacon and deacon were considered to belong to the higher orders of consecration (*ordines majores*); this was not the case with that of subdeacon till after the 12th century. At the consecration of a deacon, the sacred vessels are handed to him as symbols of his office. The peculiar robes are the dalmatica and the stole. In Protestant churches, the position of deacons varies. Among Presbyterians, their place is usually supplied by the elders; but in some Presbyterian churches (e. g., the Free Church of Scotland), the offices of elder and deacon are kept distinct. In the Church of England, a deacon is a clergyman receiving a special form of ordination, but differing in effect from a regular priest only from not being allowed to consecrate the elements at the communion, or pronounce the absolution or benediction. For this, as well as for holding any benefice or church-preferment, priest's orders are necessary. The office is of little importance, except as affording an interval of probation before admission to priest's orders. Before a person can be appointed deacon in the English Church, he must have reached the age of 23, and he usually remains in this office one year at least.

DEA'CONESSES (*ancillæ, ministræ, viduæ, virgines, episcopæ, presbyteræ*), female ministers or servants of the church or Christian society in the time of the apostles (Rom. xvi. 1). They co-operated with the deacons, showed the women their place in the church-assemblies, assisted at the baptism of persons of their own sex, instructed those who were about to be baptized as to the answers they should give to the baptismal questions, arranged the *agapæ* or love-feasts, and took care of the sick. In the 3d c., it

seems to have been also part of their duty to visit all Christian females who were suffering imprisonment, and to be hospitable to such as had come from afar. In very early times, they were consecrated to their office by ordination in the same manner as other ecclesiastical or spiritual personages; later, however, they were inducted into their office by prayer without the imposition of hands. Until the 4th c., the D. had to be either maidens or widows who had been only once married, and 60 years of age; but after the Council of Chalcedon, the age was fixed at 40. Their assistants were called *sub-deaconesses*. After the 6th c., in the Latin Church, and after the 12th c., in the Greek Church, the office of deaconess was discontinued; but the former has retained the name. In monasteries, for example, the nuns who have the care of the altar are called deaconesses. In the Reformed Church of the Netherlands, also, those elderly females are called D. who take care of lying-in women and of the poor. The advantages resulting to a Christian community from such an order are too obvious to require exposition. It has been a serious misfortune to the church at large, that the office has been allowed to fall into disuse; and the wide-spread institution at the present day in the churches of Great Britain and America of Ladies' District-visiting Societies, Dorcas Societies, &c., satisfactorily shows the necessity of practically supplying, to some extent at least, the want of this primitive office. There is a movement going on at present for the introduction of the order of deaconesses into the Church of England.

DEAD, BURNING OF THE. See **BURIAL**.

DEAD, in Seafaring Language, is very frequently employed as part of a designation or phrase having, in general, a meaning somewhat opposite to that of *active, effective, or real*. The chief of such phrases are the following: *D. eyes* are circular, flatish wooden blocks, which, with other apparatus, form a purchase or tackle for extending the standing rigging and other purposes. *D. flat* is the name for one of the midship-timbers. *D. lights* are strong wooden shutters to close cabin-windows: on the approach of a storm, it is customary to take out the glass-windows, as being too fragile, and replace them with D. lights. *D. rising* is a name for that part of a ship's bottom where the floor-timbers terminate, and the lower futtocks or foot-hooks begin. *D. ropes* are such as do not run in blocks. *D. wood* consists of blocks of timber laid upon the keel, especially fore and aft; it is piled up, and fastened to the keel with iron spike-nails; the chief object is to give solidity and strength to the ends of the ship. To these may be added *D. wind*, a seaman's designation for a wind blowing directly against a ship's course.

DEAD, JUDGMENT OF THE (in ancient Egypt). The papyrus rolls found with the Egyptian mummies contain a description of the fate of the departed subsequent to their death. Even in the least complete specimens, the most important scene is seldom wanting—that, namely, in which the dead is led by the hand of Ma, the goddess of Truth and Justice, into the judgment-hall of the nether world, before Osiris, the judge of the dead. The god's throne faces the entrance. In the middle of the hall stands a huge balance, with an ostrich feather, the symbol of Truth, in one scale, and a vessel in the form of a human heart in the other. A female hippopotamus appears as accuser. Above sit forty-two gods, each of whom specially presides over one of the forty-two sins from which the deceased has to clear himself. The gods Horus and Anubis attend to the balance, while the ibis-headed Thoth-Hermes, the justifier, writes down the result, which is naturally assumed to be favorable. Such is the judgment of the dead in the Egyptian Hades. But, according to Diodorus, a human judgment had already been passed upon the departed previous to burial. Before the sarcophagus was launched upon the holy lake over which it was to be ferried by Charon, the friends and relatives of the dead, together with forty-two judges, assembled on the shore. Each was permitted to bring an accusation against him, and if it were proved, the solemnities of burial were withheld. A false accuser, however, was severely punished. Even unjust and unpopular monarchs were often deprived of sepulture by this process.

DEAD, PRAYING FOR THE. See **PRAYER**.

DEA'D-FREIGHT, the compensation paid by the merchant who freights a whole ship to the shipmaster for the space which he fails to occupy. It is rather a claim for damages for the loss of freight, than freight itself, and consequently, apart from positive stipulation, the shipmaster has no lien for dead-freight over the goods on board. His claim must, consequently, be made effectual by a personal action against the freighter.

DEAD NETTLE (*Lamium*), a genus of plants of the natural order *Labiata*, having a 5-toothed calyx and a 2-lipped corolla, the upper lip arched, the lower lip trifid. The name D. N.—popularly in some parts both of England and Scotland, *Dec Nettle*—is also often extended to the genera *Galeopsis* and *Galeobdolon*, genera very similar to *Lamium*, the first of which is sometimes distinguished by botanists as Hemp-nettle, the second as Weasel-Chambers' Cyclo. Vol. III.—2.

snout. *Lamium purpureum*, *L. incisum*, *L. album*, and *Galeopsis tetrahit*, are very common British weeds, some of them appearing in almost every garden, cornfield, or piece of waste-ground.

L. purpureum and *L. album* are sometimes boiled as pot-herbs in Sweden. It is probably to *G. tetrahit*, or *G. versicolor*, also very common in Scotland, much larger plants, and rough with strong hairs, rather than to any species of *Lamium*, that the popular belief relates of a power, residing in the hairs of the D. N., particularly when the plant is dried, as in haymaking, of causing irritation in the hands of persons handling them, which, extending throughout the system, occasionally terminates in death. They do not, however, seem to possess any poisonous property. The subject is one perhaps deserving of more attention than it has received.

DEAD-RECKONING, a term in Navigation, signifying the calculation of a ship's place at sea, made independently of celestial observations. The chief elements from which the reckoning is made are: The point of *departure*, i. e., the latitude and longitude sailed from, or last determined; the *course* or direction sailed in (ascertained by the compass); the rate of sailing—measured from time to time by the Log (q. v.); and the time elapsed. The various principles or methods followed in arriving at the reckoning from these data are known as *plain-sailing*, *middle-latitude sailing*, &c. See **SAILINGS**. But the data themselves are liable to numerous uncertainties and errors, owing to currents, leeway (q. v.), fluctuations of the wind, changes in the declination of the compass, &c.; and therefore the results arrived at by the D. have to be corrected as often as is possible by observation of the heavenly bodies. See **NAVIGATION**, **LATITUDE**, **LONGITUDE**.

DEAD OR RETURNED LETTER OFFICE, a department in the Post-Office for dealing with letters and packages which cannot be delivered to the parties to whom they are addressed. When an inland letter is refused, it is kept one day; and a foreign or colonial letter three days, by the postmaster before being sent to this department. An inland letter is here opened, and if it contains the writer's address, it is at once returned to him; if it does not contain his address, and if of no value, it is at once destroyed. Foreign and colonial letters, after being retained from one week to two months, are usually returned unopened to the country from which they came. In 1881, this department dealt with 5,300,000 letters, 475,000 of which it was found impossible to deliver or return. About 500,000 post-cards, 4,000,000 book-packets, and 400,000 newspapers found their way to this office in the same year.

DEAD SEA (anc. *Lacus Asphaltites*), called by the Arabs Bahr Loot, or *Sea of Lot*, is situated in the south-east of Palestine, in lat. $31^{\circ} 10'$ — $31^{\circ} 47'$ N., and occupies a central position between long. 35° and 36° E. It is about 40 miles long, with an average breadth of 9 miles. The depth of the D. S. varies considerably: soundings in the north have given about 220 fathoms; this depth, however, gradually lessens towards the southern extremity, where the water is shallow. Its surface, which is lower than that of any water known, is 1312 feet below the level of the Mediterranean. The shape is that of an elongated oval, interrupted by a promontory which projects into it from the south-east.

The D. S., is fed by the Jordan from the north, and by many other streams, but has no apparent outlet, its superfluous water being supposed to be entirely carried off by evaporation. Along the eastern and western borders of the D. S., there are lines of bold, and in some cases perpendicular cliffs, rising in general to an elevation of upwards of 1000 feet on the west, and 2000 feet on the east. These cliffs are chiefly composed of limestone, and are destitute of vegetation save on the east side, where there are ravines, traversed by fresh-water springs. The north shores of the lake form an extensive and desolate muddy flat, marked by the blackened trunks and branches of trees, strewn about, and incrustated with salt, as everything is that is exposed to the spray of the Dead Sea. The southern shore is low, level, and marshy, and desolate and dreary in the highest degree; the air is choking, and no living thing to be seen. On this shore is the remarkable mass of rock called Usdum (Sodom). It is a narrow rugged ridge of hill, extending five miles north-west, and consisting of rock-salt. Large blocks have broken off from this hill, and lie strewn in all directions along the shore, adding to its dreary and deathlike aspect. To the north of Usdum, and at no great distance, is the supposed site of the ancient Sodom. Although the hills surrounding the D. S. are principally composed of stratified rock, yet igneous rocks are also seen; there are also quantities of post-tertiary lava, pumice-stone, warm springs, sulphur, and volcanic slag, clearly proving the presence here of volcanic agencies at some period. The neighborhood of the D. S. is frequently visited by earthquakes, on which occasions it has been observed that this lake casts up to its surface large masses of asphaltum, of which substance the cups, crosses, and other ornaments that are made and sold to pilgrims at Jerusalem chiefly consist. The long-entertained belief, that the exhalations from this lake were fatal, is not founded upon fact; birds

have been seen flying over, and even sitting upon its surface. Within the thickets of tamarisk and oleander, which here and there may be seen upon its brink, the birds sing as sweetly as in more highly favored quarters. A curious plant grows on the borders of the D. S., the *Asclepias procera*, which yields fruit called the Apples of Sodom, beautiful on the outside, but bitter to the taste, and when mature, filled with fibre and dust.

The water of the D. S. is characterized by the presence of a large quantity of magnesian and soda salts. Its specific gravity ranges from 1172 to 1227 (pure water being 1000). The proportion of saline matter is so great, that whilst sea-water only contains 30 parts of salts in the 1000 parts, the water of the D. S. contains about 250, or eight times more than that of the ocean. The saltness of the D. S. has been explained in several ways; but there is no need to advert to more than one. It is a circumstance attending all lakes or collections of water without any outflow, that the water acquires an infusion of salt, its feeders constantly bringing in this material, while none can go off by evaporation.

It may, moreover, be remarked that, if the D. S. was formerly at a higher level, and brought down to its present pitch by evaporation, a deposit of salt, such as we see on its banks, would be the natural consequence. Considerable deposits of common salt, sulphate of lime, and carbonate of lime have been formed along the bottom of the lake; and there is reason to believe that the deposits of rock-salt which occur in Cheshire, Poland, and other places, have been formed at remote periods by depositions in lakes similar to those of the Dead Sea.

DEADLY NIGHTSHADE. See **BELLADONNA**.

DEAD'S PART. The portion of the movable estate of the deceased which remains over, after satisfying the legal claims of his wife and children, should he have left such, is known in Scotland as the dead's part. It is so called, because it is with reference to this portion of his possessions alone that he possessed the power of disposal by will or testament. The D. P. may be increased by renunciations or discharges of their legal rights by the wife or the children, so as to include the whole movable estate, but these discharges must be express. The D. P. may also be increased or diminished by the conventional provisions of a marriage contract. See **MARRIAGE CONTRACT**, and **SUCCESSION**, **MOVABLE IN SCOTLAND**.

A distribution of the personal estate of the deceased, similar to that which is still followed in Scotland, prevailed, in accordance with the ancient customs, within the city of London and the province of York, and was probably common to the whole island (see Stephen's *Com.* ii. 222, and note). These customs have now been abolished by 19 and 20 Vict. c. 94. See **SUCCESSION**, **PERSONAL**, **IN ENGLAND**.

DEAF AND DUMB. Persons who are born deaf, or who lose their hearing at a very early age, are dumb also; hence the compound term *deaf-and-dumb*. But the primary defect is deafness; dumbness is only the consequence of it. Children ordinarily hear sounds, and then learn to imitate them; that is, they learn to repeat what they hear other persons say. It is thus that every one of us has learned to speak. But the deaf child hears nothing; cannot therefore imitate, and remains dumb.

Persons who lose their hearing later in life are not to be classed among the deaf and dumb. Having learned to speak before their hearing was lost, they can readily communicate with others, though deaf themselves; and if they are educated, there are still open to them all the stores of knowledge contained in books, from which the juvenile deaf and dumb, ignorant of all written and spoken language, are utterly excluded. It is this latter class alone which we have to deal with in our statistics, which is contemplated in our census enumerations, and for which our institutions for the education of the deaf and dumb are specially designed.

The term 'deaf and dumb' is somewhat unfortunate, as embodying and repeating the error that the affliction is twofold. It affects two organs, certainly, but only, as above described, in the way of cause and effect. The organ of hearing is wanting, but the organs of speech are present; they merely lack the means of exercise. The ear is the guide and directress of the tongue; and when she is doomed to perpetual silence, the tongue is included in the ban; though, if we could by any means give to the ear the faculty of hearing, the tongue would soon learn for itself to fulfil its proper office. To correct the error involved in this apparent misnomer, some authorities use the term *deaf-dumb* and *deaf-mute*. The latter seems to be a customary expression in America, as in France it is *Sourds-muets*. In the Holy Scriptures, the same original word is translated 'deaf' in some places (as in St. Mark vii. 32), and 'dumb' or 'speechless' in others. (See Matt. ix. 33, and Luke i. 22.)

This affliction is very much more common than, for a long time, and up to a recent period, it was supposed to be. Happily, however, along with the knowledge of its extensive prevalence, have come the means of alleviating it, by education. It was only when

the schools now in existence began their useful work, and caused inquiries to be made, that the actual numbers of the deaf and dumb began to appear. In every place where it was proposed to establish a school—in Paris, London, Liverpool, Manchester, Yorkshire, and in New York—the objection was immediately started, that children could not be found in sufficient numbers to require such schools. Their promoters, however, knew better than this, and persisted in their design. They soon had the satisfaction of converting the objectors into their warmest supporters; and the institutions thus established, in the localities just named, are now the largest, the most useful, and the most prosperous in the world.

The facts thus ascertained, and the calculations based upon them, continued to be the only statistics upon the subject of deaf-muteness in Great Britain and Ireland until the census of 1851: then, for the first time in this country, the number and ages of the deaf and dumb formed a part of the inquiry. In Ireland, further investigations were subsequently made, which resulted in the collection of a mass of valuable information upon the causes of deafness, the social condition of the deaf-mute, and other kindred subjects, which were published in *Reports on the Status of Disease* in that country. There, each inquiry was conducted under a special commission; in Great Britain, it was directed by the registrar-general, and its first purpose was to ascertain the number and ages of the deaf and dumb of each sex. It would have been well if it had been limited to this, for the educational statistics were grossly incorrect and deceptive.

The returns gave the following particulars of the number of the deaf and dumb at that date, and the proportion which they bore to the whole population:

TABLE A—FOR 1851.

	Number of Deaf and Dumb.	Total Population.	Proportion.
England.....	9,543	16,738,695	1 in 1754
Scotland.....	2,155	2,888,742	1 " 1340
Ireland.....	4,747	6,552,324	1 " 1380
Wales.....	771	1,188,914	1 " 1542
Islands in the British Seas ...	84	143,126	1 " 1704
Total.....	17,300	27,511,801	1 in 1590

This result of 1 in 1590 for all the British population was very remarkable, on account of its close approximation to the average for the whole of Europe, which was stated in the same returns to be 1 in 1593. In the course of the next ten years, the whole population had increased from 27,511,801 to 29,321,288, and the deaf and dumb had also increased, from 17,300 to 20,311.

TABLE B—FOR 1861.

	Number of Deaf and Dumb.	Proportion.
England and Wales.....	12,236	1 in 1640
Scotland.....	2,335	1 " 1311
Ireland.....	5,653	1 " 1176
Islands, &c.....	87	1 " 1649
Total.....	20,311	1 in 1492

Another period of ten years is passed. The total of the population has increased to 31,845,379, but the deaf and dumb have decreased; they have become absolutely fewer in number; and the diminution is found to exist in every registration district in England except two. In Yorkshire, the number is scarcely altered.

TABLE C—FOR 1871.

	Number of Deaf and Dumb.	Proportion.
England and Wales.....	11,518	1 in 1972
Scotland.....	2,088	1 " 1609
Ireland.....	5,554	1 " 975
Islands.....	77	1 " 1878
Total.....	19,237	1 in 1644

The distribution of the deaf and dumb, varying, as it does, so much in different districts, has always pointed to the fact that the affliction must be to some extent influenced by local causes, whatever these may be. The census of 1851 showed that, for one deaf-mute in Lancashire, there were two in Herefordshire; for one in Huntingdonshire, three in Herefordshire; for one in the East Riding of Yorkshire, two in Worcestershire; for one in Durham, two in Derbyshire, and two in Cornwall.

The results of the inquiry made ten years later, were, in the main, conformable to these. Then, as previously, the south-western division showed the largest proportion of the deaf and dumb in all England, and Herefordshire occupied the same position

among the counties; and though, in the next decennial period (1861—1871), the absolute number of the deaf and dumb had actually decreased, the relative distribution of the whole remained about the same. The numerical decrease, as compared with 1861, was found in every district in England, except the north-western (Lancashire and Cheshire), the northern, and Yorkshire. In London, and some other places, the ratio of the deaf and dumb to the whole population was affected by the residence of large numbers of deaf-mute children, collected from various parts of the country, into the institutions there established for their education. Taking the general proportion of the whole of England and Wales (as shown in Table C) to have been one deaf person in 1972, we find the average was considerably exceeded in the counties of Worcester, Cornwall, Derby, Sussex, Hereford, Devon—then, in a somewhat less degree in Bucks, Westmoreland, Northumberland, Somerset, Gloucester; with a still further reduction in Salop, Suffolk, South Wales, Norfolk, Hertford, Dorset, West Riding of York, Lincoln, Rutland, and Oxford. After this, the proportions are considerably below the average in Huntingdon, Leicester, Durham, Surrey (extra-metropolitan), Hants, Middlesex (extra-metropolitan), North Riding of York, Berks, and Notts. How are these differences to be explained? Is this affliction inevitable? Or is it in any degree preventable? The fact that in 1871 there were fewer deaf-mutes in the United Kingdom by more than a thousand (1074, actually) than there were ten years before, though the general population had increased more than two millions and a half in the same time is very significant. If we may regard it as the consequence of direct sanitary improvements, general attention to the laws of health, a more skilful treatment of the diseases which result in deafness, and the avoidance of consanguineous and other undesirable marriages, we have certainly gained a great blessing, and made a grand discovery for posterity to profit by. Guided by the light thus given, we may hope to see the number of this afflicted class brought down to the point at which it may be considered due to causes which are beyond man's control, subject alone to the will of the All-wise, who revealed himself in the earliest ages of the world as the maker of man's mouth, of the dumb and the deaf, the seeing and the blind (Exod. iv. 11). But while social science is prosecuting this important inquiry, Philanthropy has before her the work of educating these 'children of silence,' to whom the ordinary means of instruction are obviously inapplicable, and for whom, until a century ago, there existed no available means of education at all.

Mentioned, as we have just seen, at the outset of man's history, by Moses; spoken of frequently in the writings both of the Old and New Testaments; alluded to by the poets, philosophers, and lawgivers of antiquity—we have no account of any attempt at educating the deaf until the 15th c.; no school existed for them until the middle of the 18th; nor could it be said that education was freely offered, and readily accessible, until within the last fifty years. There are now in Europe and America more than 200 schools for the deaf and dumb. In the same countries where this provision is made, there cannot be fewer than 100,000 deaf-mutes. Of these about 16 per cent. are children of the proper age to be at school. Nowhere is this proportion fully reached, nor can it fairly be expected, but there has been a great improvement within the twenty years from 1851—1871. The children at the schools of the United Kingdom rose from 1300 in 1851 to 1640 in 1861; and had almost reached a total of 2000 in 1871. In Scotland, the proportion rose from 11½ per cent. in 1851 to 14 per cent. in 1871. England, which stood at 8 per cent., and Ireland, as low as 5 per cent., at the earlier date, had both reached 10 per cent. and upwards, in 1871. The actual number at school at the three dates was as follows, as nearly as can be ascertained:

	1851.	1861	1871.
England and Wales.....	816	1001	1200
Scotland.....	250	240	301
Ireland.....	234	399	478
	1300	1640	1979

In the United States, within the same period, the number of persons under instruction increased from 1162 to 3836, and altogether the work of education is advancing with very rapid strides. In this country more than 15,000 pupils have been educated since 1792—when the first public institution was opened—and at least an equal number in the United States since 1817. Add to these the pupils of the various continental institutions since 1760, when De l'Épée collected his little group of children in the environs of Paris, and Thomas Braithwood opened his school in Edinburgh, and we shall then see that the fruits of these men's labors have not been meagre, but great and marvelous. Some isolated attempts had previously been made, by different men, in different countries, and at long intervals, to give instruction to one or two deaf and dumb persons, and their endeavors had been attended with various degrees of success. These several eases excited some attention at the time; but after the wonder at their novelty had

subsided, they seem to have been almost forgotten, even in the countries where the experiments were made.

Bede speaks of a dumb youth being taught by one of the early English bishops, known in history as St. John of Beverley, to repeat after him letters and syllables, and then some words and sentences. The fact was regarded as a miracle, and was classed with others alleged to have been wrought by the same hand. From this time, eight centuries elapsed before any record of an instructed deaf-mute occurs. Rudolphus Agricola, a native of Gröningen, born in 1442, mentions as within his knowledge the fact that a deaf-mute had been taught to write, and to note down his thoughts. Fifty years afterwards, this statement was controverted, and the alleged fact pronounced to be impossible, on the ground that no instruction could be conveyed to the mind of any one who could not hear words addressed to the ear. But the discovery which was to give the key to this long-concealed mystery was now at hand. In 1501, was born, at Pavia, Jerome Cardan (q. v.), a man of great but ill-regulated talents, who, among the numerous speculations to which his restless mind prompted him, certainly discovered the theoretical principle upon which the instruction of the deaf and dumb is founded. He says: 'Writing is associated with speech, and speech with thought; but written characters and ideas may be connected together without the intervention of sounds,' and he argues that, on this principle, 'the instruction of the deaf and dumb is difficult, but it is possible.' All this, which to us is obvious and familiar, was a novel speculation in the 16th century. With us, it is a common thing for a man to teach himself to read a language though he cannot pronounce it. There are, for instance, hundreds of persons who can read French, who do not and cannot speak it. Now, it is evident, in this case, that written or printed words do impart ideas independently of sounds, yet this was a discovery which the world owes to Jerome Cardan; and it was for want of seeing this truth, which to us is so familiar, that the education of the deaf and dumb was never attempted, but was considered for so many centuries to be a thing impossible. It was in Spain that these principles were first put into practice by Pedro Ponce, a Benedictine monk, born at Valladolid in 1520, and again, a century afterwards, by another monk of the same order, Juan Pablo Bonet, who also published a work upon the subject, which was the first step towards making the education of the deaf and dumb permanent, by recording the experience of one teacher for the instruction of others. This book, published in 1620, was of service to De l'Épée 150 years later; and it contains, besides much valuable information, a manual alphabet identical in the main with that one-handed alphabet which is now in common use in the schools on the continent and in America.

From this time there was a general awakening of the attention of intellectual men, not only to the importance of the subject, but to the practicability of instructing the deaf-mute. One of Bonet's pupils was seen by Charles I., when Prince of Wales; and the case is described by Sir Kenelm Digby, who was in attendance upon the prince, on his memorable matrimonial journey into Spain. When the art died away in that country, it was taken up by Englishmen, and began forthwith to assume an entirely new aspect. Dr. John Bulwer published, in 1648, his *Philosophus, or the Deafe and Dumble Man's Friend*; Dr. William Holder published his *Elements of Speech, with an Appendix concerning Persons Deaf and Dumb*, in 1669; and Dr. John Wallis, Savilian Professor of Mathematics in the university of Oxford, both taught the deaf and dumb with great success, and wrote copiously upon the subject. In 1662, one of the most proficient of his pupils was exhibited before the Royal Society, and in the presence of the king. The *Philosophical Transactions* of 1670 contain a description of his mode of instruction, which was destined to bear ample fruits long after his death.

Before the close of the 17th c., many works of considerable merit appeared, the chief of which are the *Surdus Loquens* (the Speaking Deaf Man) of John Conrad Amman, a physician of Haarlem; and the *Didascalocophus*, or Deaf and Dumb Man's Tutor, of George Dalgarno. This treatise, published in 1680, and reprinted some years ago by the Maitland Club, is eminently sound and practical, which is the more remarkable, as the author speaks of it as being, for aught he knows, the first that had been written on the subject. He is the first English writer who gives a manual alphabet. The one described by him, and of which he was the inventor, is, most probably, the one from which our present two-handed alphabet is derived. Dalgarno was by birth a Scotchman, but was long resident at Oxford. He died in 1687, and Dr. Wallis in 1703. From that time until 1760, nothing more was done in this country—though the subject was beginning to excite some attention in France—to resume the work which had been thus far prosecuted and helped on by the writings and labors of these eminent men. In 1760, when the Abbé De l'Épée was opening his little school in Paris, the first school in the British dominions was also established in Edinburgh, by Thomas Braidwood. He commenced with one pupil, the son of a merchant in Leith, who had

strongly urged him to carry into effect the plan of instruction followed by Dr. Wallis, and described in the *Philosophical Transactions* ninety years before. This school, the parent and model of the earlier British institutions, was visited and spoken of by many of the influential men of that day, and its history and associations are imperishable.

Its local name of *Dumbiedikes* suggested to Sir Walter Scott a designation for one of his most popular characters in the *Heart of Mid-Lothian*. A visit paid to it in 1773, by Dr. Johnson, and his biographer Boswell, supplies one of the most suggestive and characteristic passages in the *Journey to the Western Islands*. In the year 1783, Mr. Braidwood removed to Hackney, near London, and the presence of his establishment so near to the metropolis undoubtedly led to the foundation of the London Asylum in 1792. Dr. Watson, its first principal, was a nephew, and had been an assistant, of Mr. Braidwood; and he states that, some ten or fifteen years previously, the necessity for the establishment of a public institution had been plainly seen, and some few but insufficient steps taken towards the accomplishment of such a design. From its foundation in 1792 until 1829, it was directed with great ability by Dr. Joseph Watson, in whose work on the *Instruction of the Deaf and Dumb* this statement is given. On his decease, he was succeeded by his son, Mr. Thomas James Watson, and he again was followed in 1857 by his eldest son, the Rev. James H. Watson. It may here be mentioned that the most remarkable circumstance in the recent history of the deaf and dumb is, that since 1871 the pure oral method of teaching, described below as the 'German system,' is gaining ground on the other in this country. (See T. Arnold's *Method of Teaching the Deaf and Dumb*, 1881; Hartmann's *Deaf Mutism*, 1881.) Enormous progress is said to have recently been made in America by the adoption of the oral method combined with the teaching of Melville Bell's 'Visible Speech' (q. v.).

The following table shows the date of the various institutions in Great Britain and Ireland in 1871:

Locality.	Date.	Locality.	Date.
<i>England and Wales:</i>		<i>Scotland:</i>	
London	1792	Edinburgh	1810
Margate Branch	1862	" Donaldson's {	1850
Birmingham	1812	Hospital }	
Manchester	1823	Glasgow	1819
Liverpool	1825	Aberdeen	1819
Exeter	1827	Dundee	1846
Doncaster	1829		
Newcastle	1839	<i>Ireland:</i>	
Brighton	1841	Dublin, Claremont.	1816
Bristol	1841	" St. Mary's {	1846
Bath	1842	St. Joseph's }	
Swansea	1847	Belfast	1831
Llandaff	1862	Strabane	1846
British Asylum {			
(Hackney) }	1851		

Of these, the largest, according to the data of the census year 1871, was that in London, with 259 pupils; the smallest at Strabane, with 15 only. Six of them have each above 100 inmates. These details are based upon the census returns of 1871, to which, however, many additions are here made, from personal inquiry and knowledge.

There were, and are, several other educational establishments in active and successful working; as, for instance, the Jews' school in London, the Roman Catholic school near Sheffield, the Llandaff Institution named above, some private seminaries, and one or two day-schools, which are not included in the census returns at all. On the other hand, the Strabane Institution is now united to the one at Claremont, near Dublin.

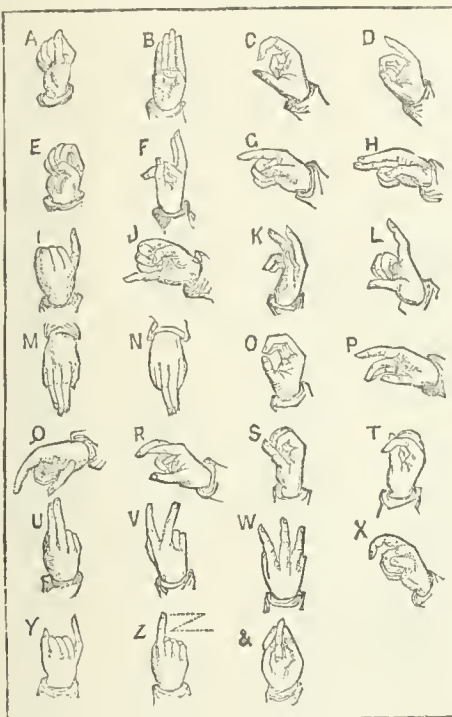
If we add the numbers thus omitted, we shall raise the English total to more than 1200, and as the numbers in Scotland and Ireland were 301 and 478 respectively, it is evident that at least 2000 deaf-mute children must have been under instruction in the United Kingdom in 1871. That number is certainly exceeded now. And, let it be remembered that it is to the present century that the honorable distinction belongs of having done so much for the deaf and dumb. This has not been by inventing the art of teaching, or by raising up the earliest laborers in this field of usefulness, but by founding and supporting public institutions for this purpose. De l'Épée, when he opened his school in 1760, had no foreknowledge of the work he was commencing. As his labors increased, he invited others to his assistance, and they were thus enabled to carry the light of instruction elsewhere, and to keep it alive when he was no more. His death took place in 1789, and his assistant, Sicard, succeeded him. Four years afterwards, this school was adopted by the French government, and now exists as the *Institution Nationale* of Paris. A pupil of this Institu-

tion, Mr. Laurent Clerc, on being applied to in 1816, consented to go to the United States with the founder and first principal of the American Asylum, and he became, like De l'Épée, *le père des sourds-muets* (the father of the deaf and dumb) in the New World. From these small beginnings of Braidwood and De l'Épée, of Heinicke in Germany, and Gallaudet in America, have arisen, within about a century, more than 200 schools for the deaf and dumb. In Great Britain and Ireland there are over 25 institutions, besides several classes provided by the London School Board, nearly 40 in the United States, 5 in Canada, and 2 in our Australian colonies. Among the English-speaking races, the increase of energy in this direction is very striking. It is believed that there are about 80 institutions in the various states of Germany and in Austria, 50 in France, 30 or more in Italy and in Switzerland, 10 in Holland and Belgium, 3 in Russia, with one or two others in the less populous and enterprising of the European nations.

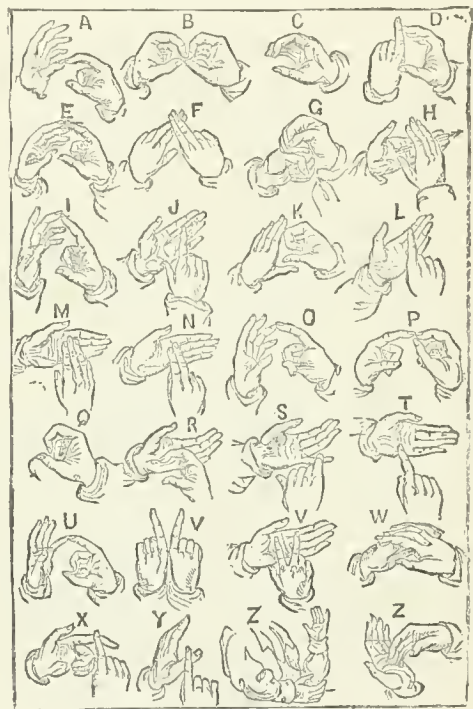
The mental condition of the deaf and dumb is so peculiar—so entirely unlike that of any other branch of the human family—that it is extremely difficult, without very close thought, to obtain an accurate conception of it. While almost every one will readily admit that there is a wide difference between a deaf and a hearing child, very few, who have not had their attention painfully drawn to the subject, possess any adequate notion of the difference, or

ing, because they cannot read; so that their original position is far worse than that of persons who 'can neither read nor write' (one of our most common expressions for extreme ignorance); it is that of persons who can neither read, nor write, nor hear, nor speak; who cannot ask you for information when they want it, and could not understand you, if you wished to give it to them. Your difficulty is to understand *their* difficulty; and the difficulty which first meets the teacher is, how to simplify and dilute his instructions down to their capacity for receiving them.

A class thus cut off from all communication through the ear, can only be addressed through the eye; and the means employed in the instruction of the deaf and dumb are—1. The *visible* language of pictures, and of signs and gestures; 2. The finger-alphabet (or Dactylogy), and writing, which make them acquainted with our own *written* language; and, in some cases, 3. Articulation, and reading on the lips, which introduce them to the use of *spoken* language. The education of the deaf and dumb must be twofold—you must awaken and inform their minds by giving them ideas and knowledge, and you must cultivate them by means of language. The use of signs will give them a knowledge of things; but to this must be added a knowledge of words. They are therefore taught, from the first, that words convey the same ideas to our minds which pictures and signs do to theirs; they are therefore required to change signs for words until the written or



One-handed Alphabet.



Two-handed Alphabet.

could tell wherein it consists. Sometimes the deaf are compared with the blind, though there exists no proper ground of comparison between them. Except that the blind are more *dependent* than the deaf and dumb, the relative disadvantages of the two classes do not admit of a moment's comparison. The blind man can be talked with and read to, and is thus placed in direct intercourse with the world around him; domestic converse, literary pleasures, political excitement, intellectual research, are all within his reach. The person born deaf is utterly excluded from every one of them. The two afflictions are so essentially dissimilar, that they can only be considered and spoken of together by way of contrast. Each of them affects both the physical and the mental constitution; but blindness, which is a grievous bodily affliction, falls but lightly on the mind; while the effect of deafness is the extreme reverse of this—it touches only one bodily organ, and that not visibly, but the calamity which befalls the mind is one of the most desperate in 'the catalogue of human woes.' The deprivation under which the born-deaf labor is not merely, or so much, the exclusion of sound, as it is the complete exclusion of all that information and instruction which are conveyed to our minds, and all the ideas which are suggested to them, by means of sound. The deaf know almost nothing, because they hear nothing. We, who hear, acquire knowledge through the medium of language—through the sounds we hear, and the words we read—every hour. But as regards the deaf and dumb, speech tells them nothing, because they cannot hear; and books teach them nothing,

because they cannot read; so that their original position is far worse than that of persons who 'can neither read nor write' (one of our most common expressions for extreme ignorance); it is that of persons who can neither read, nor write, nor hear, nor speak; who cannot ask you for information when they want it, and could not understand you, if you wished to give it to them. Your difficulty is to understand *their* difficulty; and the difficulty which first meets the teacher is, how to simplify and dilute his instructions down to their capacity for receiving them.

Yet it has been set forth by otherwise respectable authority, that the deaf and dumb are a 'gifted race,' that they are remarkable for 'their promptitude in defining abstract terms;' and those who ought to have known better, have strengthened this delusion, by putting forth, as the *bona-fide* answers of deaf-mutes, those brilliant aphorisms and definitions of Massien and Clerc, which are so often quoted at public meetings, by eloquent speakers who know nothing of the subject. It is very well known to those who are acquainted with the subject, that the so-called definitions of *Hope, Gratitude, Time, Eternity, &c.*, were not Massien's at all, but those of his master, the Abbé Sicard. The influence of these fallacies have been most mischievous; they raise expectation to an un-

reasonable height, for it is thought that what was done by 'the celebrated pupil of the Abbé Sicard,' may be done every day: and disappointment is the inevitable consequence. The honest, laborious teacher who cannot produce these marvelous results, and will not stoop to deception, has often to labor on without that appreciation and encouragement which are so eminently his due; the cause of deaf-mute instruction suffers, and a young institution is sometimes crippled by the failure of support, which was first given from one impulse, and is now withdrawn from another—not a whit more unreasonable than the first, but very unfortunate in its consequences.

The course of instruction is very much the same in all the public schools of this country, but a vigorous effort is now being made, by the advocates of what is called the 'German System,' to teach by oral instruction only. If they can produce, *on an extensive scale*, the results which have been obtained in some special and exceptional cases, they will assuredly deserve all the success they hope for, and merit the highest commendation. But it will not be sufficient merely to show that their system is superior to the one in present use, unless they can also show that it can be as extensively applied. The dispensers of the funds of our institutions are bound to uphold that system which will confer the largest practicable amount of benefit upon the largest possible number of persons. To make a few brilliant scholars, and to produce a number of ready and intelligible speakers, will certainly be a very creditable achievement; but that will not justify any claim to *supersede* the humbler but more useful system under which so many thousands of our deaf-mute fellow-citizens have been rendered competent for the duties of life, in the work-shop, in their families, and in society, and to 'walk in the house of God as friends.'

The manual alphabet in common use in the schools of this country is the two-handed one, though the other is used in some of the Irish institutions, and is regarded with favor by a few of the English teachers. The arguments in its favor, like those for the decimal currency, may probably be admitted; it would be better if we had it. But the rival system has got possession, and is in familiar use, and persons are apt to think that the inconveniences of making the change would outweigh the advantages to be expected from it. The institutions in Great Britain are supported by annual subscriptions, donations, and legacies, and by the payments of pupils for their board. The larger benefactions are invested, where the annual income from ordinary sources will admit of it. Committees, chosen from the body of subscribers, direct the affairs of these institutions, the executive officers being the head-master and the secretary; but in some cases the sole charge is intrusted to the principal. The gentlemen who fill this office have devoted their whole lives to the work; some of them have also done good service by their writings upon the subject. The census report, 1871, specially mentions the works of Messrs. Baker of Doncaster, Scott of Exeter, and Buxton of Liverpool, each of whom has helped to make it better known and better understood than it could possibly be when it was treated by men with no practical knowledge, as a merely literary topic, or a subject of philosophical curiosity. Justice also requires the mention here of the valuable writings of the late Dr. H. P. Peet of New York, and other American instructors of the deaf and dumb. The institutions in the Western World are munificently supported by grants from the states, and appear to be admirably managed. The staff of teachers is numerous, able, and efficient, and a high degree of success may fairly be expected where the work is carried on under advantages which are unknown in the schools of Great Britain. At Washington, a college has been established, and is in successful operation, under the presidency of Dr. E. M. Gallaudet, the youngest son of the founder of the American Asylum. In New York, an elder brother of this gentleman, the Rev. Dr. Thomas H. Gallaudet, has ever since 1852 conducted services in his church in the sign language, and in 1872 organized a mission to promote the temporal and spiritual welfare of adult deaf-mutes, in which he has the co-operation of three clergymen and one layman, who, during the year ending October 29, 1873, held services for deaf-mutes in thirty-one churches in the principal cities of the United States.

In London a church has been built to meet the same necessity, and religious services are conducted by two chaplains and four laymen, in various parts of the metropolis; Manchester also possesses a chaplain and lay helpers employed in the same work; in Edinburgh, Glasgow, and Dublin, also in Birmingham, and the large manufacturing towns of Yorkshire, special funds are raised, and special agents employed, to promote in like manner the social and religious benefit of the deaf and dumb. In Liverpool the same results are aimed at by voluntary agency, where, beside the Sunday services, lectures are given during the week, when a library and reading-room are thrown open, a penny bank has been brought into successful operation, and a benevolent society visits the sick, helps the needy, and buries the dead.

These are the means at present employed for the benefit of the deaf and dumb, and it is no small honor to the present century,

which has won many proud distinctions in other fields of enterprise and usefulness, that it should have done so much for those who for so many generations were utterly excluded from light and knowledge.

DEAF AND DUMB (in Law). From the imperfect methods formerly in use for the education of the deaf and dumb, they were almost everywhere held to be legally in the same position as idiots and madmen. The Roman law held them to be incapable of consent, and consequently unable to enter into a legal obligation or contract. Both in England and Scotland, the amount of their capacity is now a question of fact, which, in cases of doubt, will be referred to a jury. In the same manner, a mute will be examined as a witness in regard to a fact to which he is capable of bearing testimony, and the examination will be conducted in the manner which seems most likely to elicit the truth. (*Best, Law of Evidence*, p. 201.) The same principle will govern the estimate of his responsibility for crime. (*Stephen's Com. iv. 461.*) It is of course legally, as it is physically, impossible that a mute should act as a juror.

DEAFNESS may be complete or partial, may affect both ears or only one, may date from birth, be permanent or only temporary, and is but too often one of the distressing symptoms of advancing age. The causes of deafness are numerous. On glancing at the article **AUDITORY NERVE**, the reader will at once remark the extraordinary intricacy of the hearing-apparatus there described, and will easily conceive that although it be contained in a little nut of densest bone (the petrous portion of the temporal), still it is exposed to many deteriorating influences, and that very slight causes may disarrange the exquisite adjustment of its parts. 1. The auditory nerve may itself be unsusceptible to the stimulus of sound, from some diseased condition at its origin in the brain, or at its final subdivision in the labyrinth. This is termed nervous deafness. 2. The structures which conduct the vibrations of sound to the labyrinth may be faulty, from accident or disease. 3. The passage leading to the tympanum or drum may be blocked up. 4. The cavity of the drum may have ceased to be resonant, owing to deposits from inflammatory attacks, to loss of its membrane, or air being excluded, from obstructions in the passage between it and the gullet (the Eustachian tube).

Nervous deafness may be caused by a sudden concussion, as from a 'box on the ear,' or a general shock to the whole body, as in the case of the celebrated Dr. Kitto, who lost his hearing, when a boy, by a fall from the top of a house. The concussion from loud sounds suddenly taking the ear unawares before its small muscles have time to prepare themselves for the shock, causes the deafness which follows the firing of a cannon.

Even a loud yell close to the ear has been sufficient to destroy the hearing-power on that side. As such an accident is generally accompanied by an increased flow of blood to the part injured, it may be relieved by the application of leeches, applied behind the auricle, and the ear should for some time be protected from loud sounds as carefully as possible. In some of these cases the nerve gradually recovers its sensibility, but in many the deafness continues, and is accompanied by a distressing singing in the ears. Exposure to cold affects the auditory nerve; and gouty persons, or those who are suffering from the poisons of typhus fever, scarlatina, measles, mumps, &c., frequently become deaf. Some medicines, as quinine, produce nervous deafness; so do debility and mental excitement; but all these causes seem to act in one way—viz., to increase the flow of blood to the ear, and should be treated accordingly.

The solid conductors of sound to the auditory nerve may be injured or diseased, so that the vibrations are interrupted. One curious cause of deafness has been recently shown to exist by Mr. Joseph Toynbee of London—viz., an increasing stiffness in the little joint by which the stirrup-bone moves in the oval window of the vestibule; this stiffness prevents the base of the stirrup pressing inwards sufficiently to affect the contents of the labyrinth, therefore it ceases to keep the auditory nerve *en rapport* with the membrane of the drum. This condition may be recognized during life by the patient losing the power of adapting his hearing to varying sounds. Two persons speaking at once prevents his hearing the voice of either; there is a constant buzzing in the ear, and he gets deafer and deafer day by day. This curious disease is frequently associated with gout and rheumatism, and in its earlier stages may be influenced by the same remedies as these; but if once established, it is incurable.

Sound reaches the auditory nerve through the vibrations of the bones of the head, but chiefly through the external opening in the auricle, the passage leading from which is shut at the depth of an inch and a quarter from the surface by the membrane of the drum stretching across it. Should this passage be blocked up, so that the sounds can no longer pass along it to impinge upon the membrane, either total or partial deafness must result.

The most common obstruction is an accumulation of the wax secreted by a small ring of glands near the orifice. The object of

this cerumen or wax is to catch the particles of dust floating in the atmosphere; but sometimes it is harder than usual, and is no longer gradually expelled by the movements of the jaw in speaking and eating. At last, it fills the passage in the form of a hard plug, and sounds can neither pass through it nor by its side; if left, it gradually causes serious changes in the shape of the passage, and even symptoms resembling diseases of the brain.

Sometimes foreign bodies find their way into this passage, or tumors grow in it, and no unprofessional attempts should be made to remove them, lest the membrana of the drum be injured. It is but seldom that any instruments are necessary in addition to a stream of water thrown briskly in by means of a syringe, with a nozzle smaller than the circumference of the passage. Should the wax be very firm and hard, it is well to soften it by dropping in some oil or an alkaline solution. But even a stream of water, unless great care be taken, may injure or burst the delicate membrana tympani, and the proceeding leave the patient suffering from a more serious condition than before.

A membrane, to be resonant, must have air on both sides of it, and the membrana tympani obtains this essential by means of the Eustachian tube, the lower orifice of which, on each side of the gullet, opens for a brief period at each act of swallowing, and admits a small quantity of air, which ascends into the tympanic cavity, if the tube is in a healthy condition; but frequently in persons suffering from relaxed mucous membrane, the Eustachian passage becomes swollen and impassable, or blocked up by some thickened mucous secretion. During a common cold, persons often suffer from this cause of deafness. It has been supposed by some, that enlarged tonsils may interfere with the pharyngeal opening of the tube, and with that view they cut portions off them occasionally with great benefit to the condition of throat in which these glands are enlarged; but the latter are situated below and in front of the Eustachian tubes, and cannot be the immediate causes of the obstruction.

In some cases, the membrane of the drum may be perforated; and though the mere perforation is not sufficient to cause more than a slight degree of deafness, if the mucous membrane lining the tympanic cavity be thickened at the same time, the person is usually able to hear only the loudest sounds. If the perforation be stopped up, however, the air confined in the tympanic cavity vibrates sufficiently to stimulate the auditory nerve, through the round window of the labyrinth, and a useful degree of hearing is restored. In 1848, Mr. Yearsley of London showed that a small pellet of cotton-wool might be used for this purpose. It should be moistened with fine oil, and inserted on the end of a probe. Patients generally learn how to stick it neatly into the aperture themselves. It should be removed every three or four days, or oftener, should cleanliness require it.

Mr. Toynbee has invented an artificial membrana tympani of vulcanized india-rubber, attached to the end of a fine silver wire, by which it can be inserted or withdrawn. These beautiful little



Artificial Membrana Tympani.

instruments may now be obtained of every surgical instrument-maker, and are at least worth trying in cases of perforated membrana tympani, as they often do good, can do no harm, and are very cheap.

The india-rubber having been pared to the size likely to fit the individual's ear, it is moistened with warm water, and gently passed down the auditory passage; the sensations of the patient will easily decide when it has gone far enough, and he gladly discovers, by the sound of his own voice or that of the surgeon, that his hearing has been suddenly improved.

The deafness of aged persons has been shown, by Mr. Toynbee, to be generally caused by the effects of previous inflammatory attacks, and may frequently be much relieved by counter-irritation behind the ear, alterative medicines, and washes which restore the healthy condition of the throat and the external auditory passage.

There are numerous 'cures for deafness' advertised from time to time; some are harmless if useless, others are useless, but very dangerous, owing to the readiness with which inflammation may be set up, and the liability of the latter to extend to the brain or its membranes. The diseases which affect the ear are the same as affect other organs, and require to be treated upon the same principles. It is advisable, as soon as the first symptoms of approaching deafness are felt, to apply to one of the regularly qualified practitioners who devote themselves entirely to the subject, and to have nothing to do with these co-called cures, which benefit only the vendors.

The best English works on the subject are *Practical Observations*

on *Aural Surgery*, by William R. Wilde of Dublin, and *The Diseases of the Ear*, by Joseph Toynbee of London.

DEAK, FRANZ, Hungarian politician, was born in 1803 at Kehida, in the Hungarian county of Zala. Having studied law at Raab, he began to practise as an advocate in his native county, and soon became noted for his eloquence and enlightened patriotism. Elected in 1832 to the national diet, he, as leader of the liberal opposition, opposed, by legal and constitutional means, every attempt of the imperial government to infringe on the constitutional rights of his country. This firm and moderate policy enabled him to effect more than one reconciliation between Hungary and the Austrian emperor as her king—temporarily in 1840, and in 1867 more permanently. While upholding the independence of his country, he labored for its internal improvement, promoting measures for the elevation of the peasantry, and advocating the abolition of the odious exemption from taxes enjoyed by the nobility. His views on this last point displeased the party of the nobles, and for some years after 1840 his county did not return him to the diet. He still, however, continued to guide the councils of the moderate liberal party, and in spite of his aversion to extreme measures, he promoted the association for national defence, in the view of a possible struggle with Austria.

After the revolution of March 1848, he became Minister of Justice in the cabinet of Count Batthyányi (q. v.), and had formed the project of effecting a general reform in the administration of justice in Hungary which, however, the war rendered impossible. D. used every effort to ward off the war, and came to an arrangement with Austria. On Kossuth's coming into power (September 17, 1848), D. resigned his portfolio, and retained only his place in the diet. In the last months of 1849 at the approach of Prince Windischgrätz, he proposed to sue for peace, and was one of the deputies sent for this purpose to the Austrian general. It is well known that that step failed, and that D. was even for some time a prisoner at Pesth; he then withdrew from public affairs, and retired to his estate. When the Hungarian revolution was suppressed, he refused the invitation sent him by M. de Schmerling, Minister of Justice at Vienna, to take part in the legislative conferences, as he disapproved of the Austrian policy with regard to Hungary. He did not return to public life till 1860, when a constitution was granted to his country.

On hearing of the arrest of Count Ladislas Téli, D. set out for Vienna with M. Eötvös, and procured the release of his countryman, as well as the promise of an independent Hungarian ministry. Returned by the city of Pesth to the diet in 1861, he became in it the leader of the moderate party, at same time that the extreme party collected round Count Téli. The death of the latter (8th May) destroyed the only influence which could counterbalance that of D.; and the diet appointed him to draw up the address to the emperor. D. demanded, in that paper, the constitution of 1848, a Hungarian ministry resident in Pesth, the return without restriction, of the exiles, and the restitution of their property. Rejected at first by the emperor, this address was again drawn up with some modifications in the details; the emperor answered it by a rescript which with difficulty dissimulated his repugnance to such an arrangement; and in his turn, D., in name of the diet, protested publicly against the imperial rescript. On the 23d, the emperor pronounced the dissolution of the Hungarian Diet, which protested anew, under the direction of D., against the illegality of the measure which dispersed them. Among the events consequent on the war between Austria and Prussia in 1866, was the final triumph of D.'s policy in the establishment of a constitutional relation between Hungary and Austria. At a general election in 1869, the results of which were favorable to his policy, D. was, by an overwhelming majority, returned again for the city of Pesth. D. died in 1876. His funeral was a truly national event. A memoir was published at London in 1880.

DEAL, a municipal borough, and member of the parliamentary borough of Sandwich, maritime town and sea-bathing place, in the east of Kent, on a bold open beach, near the south extremity of the Downs, between North and South Foreland, 18 miles east-south-east of Canterbury, and 8 miles north-north-east of Dover. It has three streets running parallel to the beach, and others stretching into the country. A fine anchorage extends 7 or 8 miles between D. and the Goodwin Sands. D. has mainly arisen to supply the wants of vessels which are often detained by the winds in the Downs to the number of 400 or 500 at a time. The chief branches of industry are connected with maritime pursuits, boat-building, sail-making, piloting or hoveing, victualing and naval stores. Pop (1881) 8422. D., for parliamentary purposes, is united with Sandwich (q. v.), and Walmer. It has been one of the Cinque Ports since the 13th century. Of the three castles built by Henry VIII. in 1539, Deal Castle is now a private residence; Sandown Castle, to the north of D., was pulled down in 1864 on account of the inroads of the sea; and to the south, Walmer Castle

is now the official residence of the Warden of the Cinque Ports. At Walmer Castle the Duke of Wellington died in 1852. Julius Cæsar, with two legions, in 82 ships, landed near D. in 55 B.C. Between 150 and 200 vessels annually entered the port.

The DEAL BOATMEN, who are an enterprising and courageous body of men, are like some of the other boatmen on that coast locally known as 'hovellers.' They have become noted for giving assistance to ships in distress, and for saving the lives of crews and passengers. Besides performing these services, they have been useful in carrying off provisions to outward-bound vessels, and in bringing ashore mail-bags requiring to be forwarded by express. Latterly, in consequence of steam-tugs being much employed in expediting outward and inward bound vessels, and also from the mails from many foreign countries being landed at Falmouth and other places, to be forwarded to London by railways, the occupation of the Deal boatmen is nearly gone, and the community has sunk into poverty. Their case being made known by the press, some benevolent exertions were made to succor them. The community may be expected to diminish in proportion to the actual wants of navigation on the coast.

DEALFISH (*Trachipterus*), a genus of fishes of the ribbon-fish family, having the body much compressed, and so named D. from the resemblance of the form to a piece of deal—a resemblance which is increased by the dorsal fin extending along the whole length of the back. The tail-fin exhibits a remarkable peculiarity, rising almost vertically from the horizontal line of the vertebral



Dealfish, or Vaagmaer.

column, as if it had met with some accident, and assumed a new position. One species (*T. Bogmarus*), the VAAGMAER of the Icelanders and Norwegians, sometimes occurs on the most northerly British coasts. It is not common even on those of Iceland, and is apparently a deep-sea fish. It is a large fish, 4 to 8 feet in length, of a silvery color, with minute scales. Other species are found in the Mediterranean.

DEAL ISLAND, an island in Bass's Strait, between Australia and Tasmania, is worthy of notice chiefly as having a light-house at an elevation of 880 feet above the sea.

DEALS, the trade-name for fir-boards exceeding 6 feet in length and 7 inches in width. They are also occasionally called 'planks,' though this term is now somewhat loosely applied. Pieces of smaller dimensions are called 'battens.' Deals are usually 3 inches thick, and when sawed into thinner pieces, these are called 'boards.' When a deal is sawed into twelve or more thin planks, they are called 'leaves.' Most of the deals imported into this country are from the Baltic ports, North America, Sweden and Norway. Drammen is the principal Norwegian timber-port, though the general name for the deals from Norway is 'Christiania deals,' so named from the Norwegian capital, where the principal timber merchants reside, and through which the business of the trade is chiefly transacted. The duty on imported timber was finally abolished in 1866. For the various qualities of deals, and their application, see TIMBER.

DEAN. The institution of deaneries, as of other ecclesiastical offices of dignity, bears a resemblance to the methods of ancient civil government. Thus, for the preservation of civil order, every hundred consisted of ten districts, called tithings, and in every tithing was a constable or civil dean. In conformity to this, the spiritual governors, the bishops, divided each diocese into deaneries or decennaries (Lat. *decom*, ten), corresponding to tithings, each of which was the district of ten parishes or churches, over every one of which a D. was appointed, who in the cities or large towns was called the D. of the city or town, and in the country *rural dean*. It has been supposed, but on no certain authority, that the D. of a chapter was appointed to superintend ten canons; but it is more probable that the name was given to the office from its analogy to those above described. In the English Church there are the following dignitaries who bear this name:

1. In the province of Canterbury, it is part of the dignity of the archbishop to have prelates to be his officers, and of these the Bishop of London is his provincial D.; and when a convocation is assembled, the archbishop sends to him his mandate for summoning the bishops of the province. This is the sole example of the kind.

2. *Honorary Deans*, as the D. of the Chapel Royal of St. James's.

3. *Deans of Peculiars*, as of Battle in Sussex, founded by William the Conqueror in memory of his conquest. There are also

the Deans of the Arches in London, of Bocking in Essex, and of Croydon in Surrey, who have jurisdiction, but no cure of souls.

4. *Deans of Chapters*, as at Canterbury, St. Paul's, &c., who are governors over the canons in cathedrals and collegiate churches. Their appointment is in the direct patronage of the crown, which may appoint by letters patent; and the D. so appointed is entitled to be installed. The D. of a chapter must reside eight months in the year, and he may hold one benefice with his deanery. The income of the office is, in the case of Durham, £3000; of St. Paul's, Westminster, York, and Manchester, £2000; of other cathedrals, £1000, except St. David's and Llandaff, which have £700. See CATHEDRAL.

5. *Rural Deans*. These are very ancient officers of the church, but custom gradually transferred their duties to the archdeacon, as in the visitation of churches, parsonage-houses, &c. They may, however, act as deputies to the bishop and archdeacon; and of late the office has been revived with great advantage; and in well-ordered dioceses affords a useful channel of communication between the bishop and his clergy, and a means of joint action in matters affecting the church. There are altogether nearly 600 rural deaneries in England and Wales.

In the universities of Oxford and Cambridge, the D. is the officer who superintends the discipline of the college and the chapel services. At Christ Church which is a cathedral, the D. is master of the college.

DEAN OF THE CHAPEL ROYAL (Scotland), an office held by six (formerly three) clergymen of the Established Church, to which they are appointed by the crown. The benefice of the Chapel Royal, which was instituted by James V., was richly endowed, but it has been disputed whether the revenues now enjoyed by the deans belonged originally to the Chapel Royal of Stirling or to the Chapel Royal of Holyrood. It is known that the existing revenues were once attached to the see of Dunblane; and an act of parliament was passed in 1621, sanctioning the annexation of the revenues of the Chapel Royal of Stirling to the bishopric of Dunblane, which was the poorest bishopric in Scotland. Hence it is assumed that the whole existing deanery revenues belonged to the Chapel Royal of Stirling. But there are some facts which prove that the benefice was connected with the chapel at Holyrood equally with that at Stirling. William Couper, Bishop of Galloway, held the office of Dean of the Chapel Royal from 1615 to the commencement of 1619. He resided at the foot of the Canongate, and preached regularly in the Royal Chapel at Holyrood. This individual drew part of his revenue from the parishes of Kirkcinner and Kirkcowan in the county of Wigton, and part of the present deanery revenues is likewise drawn from the same parishes. Dr. Adam Bellenden, who was bishop of Dunblane when the act above mentioned was passed annexing the revenues of the Chapel Royal of Stirling to his bishopric, performed the duties of Dean of the Chapel Royal at Holyrood for many years subsequent to 1621.

It seems clear, therefore, that if the revenues of the benefice were ever divided between the two chapels, they were united to the see of Dunblane during the incumbency of Dr. Bellenden. The state of the case probably is, that at its institution by James V., who resided frequently at Stirling, the benefice was held by ecclesiastics chiefly resident there. The Chapel Royal is noticed as in full operation in Stirling in 1540. During the reign of Queen Mary, the Chapel Royal seems to have been at Holyrood. In 1574, again, after the Reformation, the name of Johnne Duncanson appears as minister of the Chapell Royall, or King's House at Stirling, where James VI., then very young, resided; while at Holyrood the minister was apparently the regular parish minister of Canongate, and not connected with the Chapel Royal. Afterwards, when the royal residence became fixed at Holyrood, the Dean of the Chapel Royal officiated in the chapel, of which abundant proof exists in the history of the period. The chapel at Stirling was left to decay; whereas during the reigns of James VI., Charles I., Charles II., and James VII., the Chapel Royal of Holyrood was repaired and embellished. The last of the Stuarts laid out considerable sums for the purpose only the year before the revolution. The revenues of the benefice fell to the crown, *jure corona*, on the abolition of Episcopacy in 1690, and have since been gifted at the royal pleasure. For a long period, the emoluments were not at all considerable, owing to the practice which existed of giving tacks or leases of the Teinds (q. v.) to the proprietors of the lands at nominal rents. In consequence of the termination of some of those leases in 1841, and the deans being debarred in the gift of the appointment from accepting anything but the full yearly value of the revenues, a very great increase took place in the emoluments, which, however, were again somewhat diminished by augmentations made to the parochial clergy out of the teinds in question. A large portion of the revenue is drawn from the parishes of Yarrow and Ettrick, and the remainder from Wigtown, Kirkcudbright, and Ayr shires. In 1841, the annual rental divided among the three deans was £252; in 1858,

£2018. The duties of the office used to be nearly nominal; but on the foundation of the chair of Biblical criticism in the university of Edinburgh in 1846, it was endowed with one-third of the revenues, the professor becoming one of the three deans. The Universities Commission, 1858, recommended that when the requisite vacancies occurred, the revenues should be divided into six parts, attached respectively to the chairs of divinity and Biblical criticism in Edinburgh University (the latter receiving $\frac{2}{3}$ ths of the whole), Biblical criticism in Aberdeen University, Biblical criticism in Glasgow University, and church history in St. Andrews University. This arrangement has now come fully into operation, the result being that the revenues of the Chapel Royal are divided among the incumbents of the above mentioned chairs. Besides these five deans, the Dean of the Order of the Thistle bears the title of Dean of the Chapel Royal, but draws none of the revenues.

DEAN OF FACULTY, the president of the incorporation of advocates in Scotland. Like the other officers of the faculty, the Dean is elected annually. As a rule, he is re-elected till promoted to the Bench, when he ceases to share in the deliberations, though not to be member, of the body. See **ADVOCATE**.

DEAN OF GUILD, in Scotch burghs, was the head of a mercantile body called the Guild-brethren. See **GUILD**. In former times (1593, c. 180), he was a judge in mercantile and maritime causes with the burgh, but for a very long period he has been rather what might be called a kind of Scotch edile (q. v.). His chief duty is now to see that buildings within the burgh are erected according to law, that they are sufficient, and, in case of their falling into a ruinous condition, to order them to be pulled down. Though in some of the larger burghs the D. of G. is still (3 and 4 Wili. IV. c. 76, s. 22) a member of the town-council, *ex officio*, his jurisdiction is altogether separate from that of the baillie-court. In Edinburgh, the D. of G. court, in addition to the D. of G., consists of a council of merchants and tradesmen chosen annually, and of the old or former Dean of Guild. They are assisted by the law assessors of the magistrates of the city. No building can be either erected or demolished, or even materially altered, without a warrant from this court. Opposition to the issuing of the warrant may be offered, either by a private party, or by the procurator-fiscal of the court itself, acting for the public interest. The enforcement of the act 1698, c. 8, as to the height of buildings, the thickness of the walls, &c., lies within the province of the D. of G. court. The judgments of the D. of G. court may be reviewed by the Court of Session.

DEAN FOREST, a picturesque hilly tract, 22,000 acres in extent, in the west of Gloucestershire, between the Severn and the Wye. It is mostly crown-property, and about half of it is enclosed for the growth of timber for the navy. It contains oak, beech, &c. woods; orchards, yielding the famous Styre apple cider; coal and iron mines; and stone-quarries for building, grinding, and making troughs and rollers. It is divided into six walks. The population is chiefly miners once a lawless set. The former inhabitants had many ancient privileges—acquired by birth, and by working a year and a day in the Forest—viz., exemption from rates and taxes, free pasturage, right of mining—a sixth of the produce being due the sovereign, and access to the woods for timber for their works. D. F. is governed by a lord-warden, six deputy-wardens, and other officials.

DEATH. It is one of the fundamental doctrines of physiology, that every part of the organism has its own definite term of vitality, and that there is a continuous succession of the destruction of old cells and the formation of new ones in all tissues, and especially in those in which the most active vital changes are going on, as, for example, in the nervous and muscular tissues. Even the most solid portions of the animal frame, such as the bones and (to a less extent) the teeth are undergoing a perpetual although a slower change of this nature; and throughout the whole body, there is a continuous removal of effete or worn-out tissues, and a corresponding deposition of new matter. Every blow we strike, every thought we think, is accompanied by the death and disintegration of a certain amount of muscular or nervous tissue as its necessary condition; and thus every action of our corporeal life, from its beginning to its close, takes place at the expense of the vitality of a certain amount of organized structure. This is termed *molecular D.*, and, within its proper limits, is obviously essential to the life and wellbeing of the organism.

The cessation of the circulation and respiration may be regarded as constituting *somatic D.*, or the D. of the entire organism, which must obviously be shortly followed by the molecular D. of every portion of the body.

We shall now briefly notice the principal modes in which D. occurs. D. happens either from the natural decay of the organism, as in old age, or (and much more frequently) from some of those derangements or lesions of the vital organs which occur in the course of the diseases and injuries to which we are liable. These derangements of the vital organs may occasion various modes of

dying. Dr. Watson remarks in his *Lectures on the Principles and Practice of Physic*, that life rests on a tripod, whose three vital supports are the *heart*, the *brain*, and the *lungs*. Through the impaired functions of one or more of these organs, the tendency to D. is expressed. This is much the same as Richat's statement, that 'the mode of dying may begin at the head, the heart, or the lungs.' The functions of these organs are, however, so mutually dependent upon each other, that impairment in the functions of one of them may lead to D., while the mode of dying is chiefly expressed through the functions of another.

When a person loses blood to such an extent that he faints, if the flow of blood be not arrested, the state of fainting or *syncope* continues, and the heart's action ceases. The cause of D. here is, not that the heart is unable to contract, but because its natural stimulus, the blood, does not enter in sufficient quantity to excite contraction. This is termed D. by *anæmia*. In other cases the stimulus from blood may be sufficient, but the heart may have lost its contractile power. Such a mode of death is said to be by *asthenia* (Gr. want of power). Many poisons and diseases, due to morbid materials in the blood (as, for example, cholera), prove fatal in this way.

D. may likewise be produced by suspension of the functions of respiration, as when access of the air to the lungs is impeded, or when the actions of the muscles of respiration cease, in consequence of disease or injury of the brain or spinal cord. The first of these modes is known as suffocation or *apnæa*, and we have examples of it in drowning, smothering, choking, strangulation, &c. Forcible pressure upon the chest, such as sometimes happens in great crowds, or as occurs to workmen partially buried by the fall of earth, &c., will cause D. in a few minutes, if movement of the lungs is prevented by the pressure. Tetanus and the poison of strychnine prove fatal in this way.

D. by coma, or beginning at the brain, is caused by obstruction to the circulation through that organ by pressure (as, for example, when there is effused blood within the cranium, or when a portion of bone is depressed in a fractured skull); by clots of blood within the vessels; by various narcotic poisons, such as opium, alcohol in excessive quantity, carbonic acid, &c.

To these forms of dying may be added (according to Dr. C. J. B. Williams) *necæmia*, or D. beginning in the blood, such as occurs in typhoid fevers and in other diseases of a malignant or pestilential kind. In this case, there is complete and general prostration of all the living powers. The blood, the natural source of life to the whole body, is itself dead and spreads death instead of life. Almost simultaneously, the heart loses its power; the vessels, and especially the capillaries, lose their tone, and congestion takes place in various organs; the medulla oblongata, from which the chief respiratory nerves arise, is torpid; the powers of respiration fail; voluntary motion is almost suspended; molecular nutrition ceases, and is very rapidly followed by general molecular D.; that is to say, structures and even organs die, and begin to undergo decomposition as soon as the pulse and breath have ceased; and indeed, a partial change of this kind may even precede somatic D., as, for example, when parts become gangrenous, &c.

The signs of approaching D. require a brief notice. The mind may be affected in various ways; there may be dullness of the senses, vacancy of the intellect, and extinction of the sentiments, as in natural D. from old age; or there may be a peculiar delirium, closely resembling dreaming, which usually is of a pleasing and cheerful character.

Saw ye not even now a blessed troop
Invite me to a banquet, whose bright faces
Cast thousand beams upon me like the sun?
King Henry VIII., Act iv. Scene 2.

In dreadful contrast with such visions, are those which haunt the dying minds of others, when it would sometimes almost appear as if the sinner's retribution commenced even on his death-bed.

Dementia or imbecility sometimes comes on shortly before D., and manifests itself by an incapacity of concentrating the ideas upon any one subject, and by an almost total failure of memory. The mental weakness is often exhibited by the pleasure which is derived from puerile amusements. The great dramatist, from whom we have just quoted, notices 'playing with flowers' as a token of approaching dissolution. In the form of delirium, ocular spectra seem frequently to be present, the patient apparently trying to catch some imaginary object.

There is generally well-marked relaxation and incapacity of the muscular system, and the voice is usually weak and low as D. approaches, often dwindling to a mere whisper. The mode in which the action of the heart declines is various; in most diseases of long standing, the cessation of the heart's action is gradual, the rate of the pulsations being much increased, but their energy being very much impaired. In some acute affections, the failure is shown by the irregularity of the pulse, while the force is little altered. In other cases (especially in cerebral diseases), the heart

before finally ceasing to beat, contracts violently, and suddenly stops.

The respiration is sometimes hurried and panting till just before D., while in other cases it is slow, laborious, and stertorous. The accumulation of mucus, &c., in the air-passages increases the difficulty of breathing; the sound known as the 'death-rattle' being produced by the passage of the air from the lungs through the fluid collected in the trachea and upper respiratory passages.

There is a loss of animal heat, beginning at the extremities. For further information on this subject, we may refer to the article DEATH in *The Cyclopædia of Anatomy and Physiology*, from which we have borrowed some of the matter of the preceding paragraphs.

The signs of actual D. may be arranged under three heads: 1. Signs of the extinction of the vital functions; 2. Changes in the tissues; 3. Changes in the external appearance of the body.

1. The arrest of the circulation and respiration would at first sight appear to afford decisive evidence of D.; but these functions, as in the case of hibernating animals, may be reduced to so low a condition that it is by no means easy to decide whether or not they are completely annihilated. In cases of apparent drowning, these functions are frequently suspended and again restored; and cases like that of Colonel Townsend (see any standard work on medical jurisprudence) occasionally occur, in which the patient has the power of voluntarily suspending these functions for a considerable period.

The loss of irritability in the muscular fibres (a fact which may readily be ascertained by a galvanic current) is a sign of far greater importance than either the apparent stoppage of the circulation or of the respiration. The contractility of the skin is also lost after death. When a cut is made through the skin of a dead body, the edges of the wound collapse, while a similar lesion inflicted during life presents an open or gaping appearance.

2. Among the changes in the tissues, the *rigor mortis*, or rigidity of the muscles, which ensues at a varying period after D., is the most important. It may appear within half an hour after D., or may be delayed twenty or thirty hours, according to the nature of the disease; and its mean duration is from 24 to 36 hours. It commences in the neck and trunk, then appears in the lower, and lastly in the upper extremities, and disappears in the same order.

3. Various changes in the external appearance of the body have been regarded as indicative of D. by different writers; of these, the most important unquestionably is the altered color of the surface. Livid spots of various sizes may occur from local congestions during life; but the appearance of a green tint on the skin of the abdomen, accompanied by a separation of the epidermis, is a certain sign that life is extinct.

The discrimination of true from apparent D. is obviously not a matter of mere physiological interest. The case of Vesalius, the eminent anatomist, who opened an apparently dead body in which the exposed heart was seen to be still beating, is well known; as also that of the Abbé Prevost, who, having been struck down by apoplexy, was regarded as dead, but recovered his consciousness under the scalpel, and died immediately afterwards; and a French author of the last century, Bruhier, in a work *On the Danger of Premature Interment*, collected 54 cases of persons buried alive, 4 of persons dissected while still living, 53 of persons who recovered without assistance after they were laid in their coffins, and 72 falsely considered dead.

DEATH, PUNISHMENT OF. See CAPITAL PUNISHMENT.

DEATH-BED, LAW OF, IN SCOTLAND. As the law stood till recently, if any man, whilst suffering from the disease of which he ultimately died, burdened or conveyed away his heritable estate, to the prejudice of his lawful heir, he was presumed to have so acted in consequence of his inability to resist importunity in the state of feebleness to which he was reduced, and his heir was entitled to reduce the deed. This rule belonged to the most ancient consuetudinary law of Scotland. As Lord Stair suggests (1, 12, 34, and 4, 20, 38), it probably was intended as a protection to the dying and their lawful heirs against the notorious propensities of the priesthood; and was thus referable to the same principle as the prohibition to convey heritage by will. Two tests were fixed upon by the law as establishing the existence of that degree of vigor which is technically called *liege poustie* (supposed to be a corruption for *legitima potestate*)—viz., survivance for sixty days, and going unsupported to kirk or market, and conducting himself in the ordinary manner. It was decided that it is of no consequence though the object of the visit were neither to worship nor to buy and sell, but simply to evade the law of death-bed. If the individual was in a condition to take part in the service of the church, or in the trade of the market, that was sufficient.

Extreme old age, accompanied by manifest indications of the approach of death, were held equivalent to disease. But the deed of the oldest or most infirm man, or of the man who was laboring

under the most mortal sickness, was not reducible, if another disease had supervened, of which he died, or if he were killed by accident. Redactions *ex capite lecti*, i. e., on the ground of death-bed, were abolished by Act 34 and 35 Vict. c. 81.

DEATH'S HEAD MOTH (*Acherontia atropos*), a species of HAWK-MOTH (q. v.), or lepidopterous insect of the family *Sphingidae*, not uncommon in some parts of England and of the continent of Europe, and very widely distributed over the world, being found in Africa, the Mauritius, and the East Indies. It measures almost five inches from tip to tip of the extended wings; is of a dark color, the body yellow with black markings, the thorax with pale markings which have some resemblance to a skull, and from which it derives its name; the upper wings mottled with brown, black, and yellow. The caterpillar is greenish-yellow, the back speckled with black, with transverse lines partly blue and



Death's Head Moth and Caterpillar.

partly white; and in countries where the potato is cultivated, is often to be found feeding on the leaves of that plant. This insect is most frequently seen flying about in autumn, and only in the mornings and evenings. It is remarkable for emitting a plaintive squeaking sound, which, with its dark color, and the skull-like mark on the thorax, has led to its being regarded with superstitious dislike, the sudden appearance of large numbers being popularly held ominous of evil; whilst, in the Mauritius, a notion prevails that it casts a dust from its wings which produces blindness in persons on whom it falls, and its entering an apartment is therefore regarded with dread. How the noise which it emits is produced, is not satisfactorily known. If the insect is taken and confined in the hand, this sound is sent forth sharply and strongly. The D. H. M. is interesting upon still another account, as one of those insects which enter and plunder bee-hives, feeding upon the honey; and although apparently quite defenceless, it enjoys perfect impunity whilst ravaging the stores of creatures so well provided with formidable weapons, and generally so ready to use them against an intruder. No explanation of this fact has yet been found.

DEATHS, REGISTRATION OF. See REGISTRATION.

DEATH-WATCH, a ticking sound produced by certain insects, inmates of human dwellings, and which being most readily heard in that stillness which attends times of sickness and anxiety, has become associated with superstitious notions and fears, being regarded as indicative of an approaching death in a house. The most common form of this very prevalent superstition is the belief, that when the D. is heard, some member of the household will die within twelve months. The tickings of the D. were for-



Death-watch, magnified:

A, *Anobium tessellatum*; B, *Anobium pertinax*; C, *Anobium striatum*.

merly attributed to species of wood-louse and of spider, and it is probable that they are not all produced by insects of the same kind; but the most common D. of Britain is a species of Borer (q. v.), (*Anobium tessellatum*). It is of a dusky or grayish-brown color, and about a quarter of an inch in length. It is generally in summer that its noise is heard, the number of raps given in quick succession, varying from several to more than a hundred. These are repeated at uncertain intervals. The noise exactly resembles that made by beating with the nail upon a table; and when this is done, the insect is not unfrequently induced to reply to it. It is the perfect insect, not the larva, which produces this sound. It

seems, indeed, to be a call by which the sexes are attracted to each other, and is produced by the insect's beating upon some hard substance with its head, in doing which, it raises itself upon its hind-legs, and with the body somewhat inclined, beats its head with great force and agility against the substance on which it stands. One of them was seen by Mr. Stackhouse thus to beat upon a sedge-bottomed chair, with such force that its strokes made little indentations in the outer coat of the sedge.

DEBACLE, a French word, meaning in that language the breaking up of the ice in a harbor or river, but introduced into English by geologists to express any sudden flood of water, which bears before it opposing obstacles, and leaves its path marked with confused and scattered fragments of rocks, stone, and other débris.

DEBATABLE LAND, a tract of land, chiefly level and of a moory character, but now in course of improvement, on the western border of England and Scotland. This tract of country, situated between the Esk and Sark, was at one time claimed by both kingdoms, and hence its name. In 1542, it was divided by royal commissioners, appointed by the two crowns. By their award, this land of contention was separated by a line drawn from east to west, betwixt the two rivers. The upper half was adjudged to Scotland, and the more eastern part to England. Yet the Debatable Land continued long after to be the residence of the thieves and banditti to whom its dubious state had afforded a refuge.—The jest of James VI. is well known, who, when a favorite cow had found her way from London back to her native country of Fife, observed, 'that nothing surprised him so much as her passing uninterrupted through the Debatable Land.'—Scott's *Minstrelsy of the Scottish Border*. The Graemes, a troublesome clan of freebooters who inhabited the D. L., were transported to Ireland, at the beginning of the 17th c., and prohibited from returning on pain of death. See **BORDER**.

DEBATE is an exchange of opinions, differing from conversation in this, that the speakers succeed one another according to certain regulations, and that the subject is treated formally, and in general with a view to coming to some practical conclusion. The term is usually understood of the discussions of political representative bodies. The debates of the English parliament are divided into two stages. The first concerns the general principle of the measure, and is conducted with strict parliamentary formalities; when this is carried, the details are discussed in a committee of the whole House, when a less formal and more free interchange of opinions is admitted. Parliamentary debates are sometimes decried by men of absolute tendencies as useless, and even mischievous. How, it is said, can a couple of speeches, *pro* and *con*, produce a rational conviction on any subject; it is more likely that the judgment will be run away with by specious oratory. But this proceeds upon a false conception of the great object of public D., which, though it seldom influences the votes on the actual question, serves to justify the proceedings of public men to their constituents, and forms one of the chief ailments of public opinion and of the political life of a community.

DEBENTURE. There are two kinds of documents to which this term is applied, which may be described separately.

Excise General D.—This is a certificate authorizing the exporter of certain classes of goods to receive a drawback equal in amount to the excise duties which had been paid on them. The object of the document is to certify two things—first, that the excise duties had actually been paid; and, second, that by a certificate from an officer of customs the goods had been shipped, and *bona fide* exported to foreign parts, and not reloaded in Great Britain. This kind of D. is executed by an officer of excise (Inland Revenue); it is partly printed and partly written on a sheet of stamped paper, for which the exporter pays. As concerns the export of beer, there is an excise D. slightly differing in form.

Railway D.—This is the term applied to a deed of mortgage given by a railway company for borrowed money. By virtue of acts of parliament constituting, and giving additional powers to, a railway company, the company is authorized to borrow a specified sum (see **CAPITAL ACCOUNT**, also **RAILWAYS**, Legislation and Management). The deed by which the loan is effected is simple in its appearance and nature. It consists of a sheet of paper duly stamped; and its contents, embraced in a single page, are partly printed and partly written. All expenses connected with it, brokerage included, are borne by the company. At the head of the deed is the name of the railway company, in large letters, with the words Mortgage, No. —, and the amount in figures. It then proceeds: 'By virtue and in terms of an act, &c. [the act or acts being recited], We, the — Railway Company, in consideration of the sum of —, paid to us by —, Mortgage the said undertaking, and all the tolls and sums of money arising by virtue of the said acts, and all the estate, right, title, and interest of the company in the same, to hold unto our said assignee, —, until the said sum of —, together with interest for the same, at

the rate of — for every hundred pounds by the year, payable as hereinafter mentioned, be satisfied. And it is hereby stipulated that the said principal sum shall be repayable, and the said company are hereby bound to repay the same on the [here date of repayment is inserted]. But if the parties hereto shall mutually think fit, the same shall thereafter remain as a loan to the said company, for such further period, and at any such rate of interest, as shall be mutually agreed upon by a minute indorsed hereon to that effect, and signed by us and our said assignee, or —. And in respect of the interest to become due on the said principal sum at and prior to the said [date of repayment], the said company shall pay to the bearer of the interest-warrants herewith issued, the several sums contained in such warrants at the times therein respectively specified. In witness whereof, these presents written, in so far as not being printed, on the face of this sheet of stamped paper by [here follow the name of secretary of the railway company, the name of place, date, and the signatures of three directors, with the signatures of witnesses.] Such is a railway debenture. Along with it are given warrants for the payment of interest at the periods specified, which are paid on presentation. These interest-warrants, which are sometimes called Coupons (q. v.), are small slips of paper bearing the sum, date, and signatures. The object in giving them to the debenture-holder is to save him all trouble. They are paid to any one presenting them.

Brief, simple, and effective, a railway D., with its accompanying interest-warrants, is perhaps the most convenient deed of mortgage ever invented. In few and unequivocal words, it pledges the whole railway for the loan, and it must necessarily be redeemed before any shareholder can claim a dividend from the undertaking—each D. ranking according to its number. Railway debentures are, therefore, reckoned a safe form of investment, and are eagerly taken up by individuals who have sums of a few hundred pounds to lend for several years at a stipulated rate of interest. These debentures possess the further advantage of being saleable, and through the agency of stockbrokers they pass from hand to hand. In the event of neither interest nor principal being paid, the holder is entitled to enforce the mortgage. Similar debentures are issued by various public trusts under statutory authority, and by joint-stock companies, in virtue of contracts pledging the credit of the undertaking.

DEBLAI', in Fortification, is any hollow space or excavation in the ground, made during the construction of fortifications or siege-works. The cavity itself is the D., while the earth taken from it is the *remblai*.

DEBORAH (Heb. signifies a *bee*), a Hebrew prophetess, the wife of Lapidoth, who lived in the time of the Judges. She dwelt in Mount Ephraim, and uttered her judicial oracles from her tent under the palm-tree between Bethel and Ramah. To deliver her land from the oppressive yoke of the Canaanites, under which it had groaned for twenty years, D. called to her aid Barak, son of Abinoam, probably a man of heroic temper. An army was raised among the tribes of Naphtali and Zebulun, and a battle took place in the plain of Esdraëlon, where the Canaanitish host was completely routed, and Sisera during his flight, as D. had predicted, was murdered by a woman. This victory secured to the Israelites a peace of forty years' duration. The 'Song of Deborah' (as it is generally called, though its composition is not ascribed to her in the Book of Judges) is a choice fragment of primitive Hebrew poetry.

DEBOU'CHING, in military tactics or evolutions, is the marching out of a body of troops from a wood, defile, or other confined spot, into open ground.

DEBRECZIN, a large straggling town of Eastern Hungary, situated in the midst of an extensive plain, about 120 miles east of Pesth. Like many of the Hungarian towns, D. is a mere collection of villages, united on no particular plan. The houses for the most part are mean structures of not more than one story in height, and the streets, if such they can be called, being un paved, are exceedingly dirty; in certain seasons of the year, planks are laid down to enable passengers to cross. Notwithstanding its generally squalid character, however, D. is possessed of some very handsome public buildings, including a town-hall, a Protestant college, with a staff of 24 professors and 2000 students, and several churches, monasteries, and charitable institutions. A bronze statue to the popular poet Csokonai, was erected in 1871, and there is also a monument, consisting of a dying lion on a pedestal of rock, to the Honvéds, who fell at the battle of D. in 1849.

The inhabitants, who are very industrious, are dependent chiefly on agriculture, but a number of them are engaged in the manufacture of coarse woollens, sheep-skins, leather, earthenware, soap, saltpetre, and tobacco-pipes, which are famous throughout Hungary. The cattle and swine markets of D. are among the most extensive in Europe, and its grain market is also large. The population of D. in 1880 was 51,122. With the exception of 2000,

its inhabitants are all Protestants. They have suffered much on account of their faith, especially in 1567 and 1686. D. took a prominent part in the revolution of 1849, and was for some months in that year the seat of the national diet, after it had been forced to remove from Pesth.

DEBRUISED, a term peculiar to English heraldry, used to indicate the grievous restraint of an animal and its being debarred of its natural freedom by having any of the ordinaries laid over it (*Dictionary of Display*).



Debruised.

DEBT, that which one person owes to another, or the duty which, as responsible beings, all owe towards God. Life is figuratively spoken of as a loan, and the act of dying is called 'paying the debt of Nature.' More commonly, however, the term D. is limited to money legally due, and exigible by process of law. To speak in legal phraseology, D. may originate either in agreement or by operation of law, or as a consequence of injury, though in the latter case it more commonly assumes the form of a claim for Damages (q. v.). Liquidated D. (in Scotland, liquid), is where the exact amount has been ascertained; contingent D., is where the liability depends on the occurrence of an event which may or may not happen; future D., is where the liability is existing, but the time for payment has not yet arrived. This may, in Scotland, be secured by Arrestment or Inhibition where the debtor's solvency is doubtful; but in England there is, in general, no method of affixing a liability upon property before the D. becomes payable, except in the case of bankruptcy, when a future or contingent D. may be proved against the estate, as in Scotland. The main division of debts in Scotland, however, is into movable and heritable—the former being primarily chargeable only upon the debtor's personal funds, although they may, by adjudication, be made also a charge upon his real estate; and the latter being directly a charge upon his real estate. The former have always been treated as personal estate so far as regards the creditor's succession, while until 1868 the latter were considered as heritable estate. Now, there is no distinction. In England also a debt may be secured on the debtor's real estate, as by mortgage or equitable lien; but these mortgages were always regarded as personal estate, although until 1874 the formal title was in the heir, not the executor. In England, a debt of record is one proved to exist by the records of a court.

The most important are judgment debts, which have not only certain facilities in execution and attachment, but must be paid in full out of the personal estate before any debts due on contract. Specialty debts in England, are debts by contract created by a deed or an instrument under seal. Such debts were formerly entitled to a preference over simple contract debts, such as the liability under a bill of exchange. But that was altered by the Act 32 and 33 Vic., c. 46. In the administration of a deceased's estate, the order of preference among debts (as recognized by the Judicature Act of 1873) is (1) expenses; (2) crown debts; (3) judgment debts; (4) recognizances and statutes; (5) special and simple contract debts; (6) voluntary bonds and covenants.

DEBT, ACTION OF, in England. This lay for the recovery of a debt in its technical sense, of money ascertained in amount due by one to another. Where this had been ascertained by a bond or judgment, action of debt was the only proper action; but where the debt arose from breach of contract under seal, it might also be sued for by an action of covenant; or where the contract was not under seal, by an action of assumpsit. These distinctions or special pleading, however, have been entirely abolished by the Judicature act, 1873, and relative rules. An action of debt still belongs to the Common-law Division of the High Court of Justice, although, where the debtor is dead, the creditor may get payment by bringing an administration suit in the Chancery Division. Actions of debt, when on contract under seal, must be brought within 20 years; on other contracts, within six years. The time in both cases is taken from the accruing of the cause of action—i. e., the breach of contract; but if a subsequent acknowledgment in writing has been made by the party liable, or he has paid the debt in part, or paid interest, the time will run from such subsequent act.

DEBT, NATIONAL, is the amount which any state admits itself to owe to those who may have advanced money for the use of the government on occasions when its expenditure has exceeded its ordinary income. As in the case of individual debtors who sometimes engage to pay more than they obtain from the lender, the amount of a national debt may not be the amount which the nation has borrowed; it is often greater, from the necessity of holding out to capitalists, as an inducement to make a large advance, that they will be set down as creditors for more than they have given. On the other hand, it may happen, though of rare occurrence on a large scale, when money is bearing low interest, a nation may give its creditors the alternative of receiving payment, or allowing a de-

duction from the nominal amount of their debt, and they may prefer the latter alternative.

When the term, 'the national debt,' is used by itself, it is always understood to refer to that of our own country, which until recently was the heaviest in the world. It amounts, in round numbers, to 763 millions of pounds. It is now exceeded by that of France. That country having been entirely bankrupt during the first Revolution (see *ASSIGNAT*), its existing debt may be said to date no further back than the Consulate, when credit was restored. On the first return of the Bourbons, before the battle of Waterloo, it amounted to 123 millions of pounds; it had increased before the Franco-German war to 460 millions; and between 1870 and 1876 it mounted up to 936 millions. At the end of the period, 1870-80, it was only 794 millions. The debt of the kingdom of Italy is very large in proportion to its resources, amounting to 390 millions at the end of 1878. That of the Austrian empire, exclusive of the special debt of Hungary, amounted, on 1st July 1881, to 316 millions. The separate debt of Hungary amounted to 43 millions. Spain, the most heavily indebted country in Europe, in proportion to its resources, had in 1881 a debt of about 510 millions, an increase of 91 millions since 1875. Turkey is believed to have a debt of about 260 millions, of which 184 millions consist of foreign loans. The debt of Russia is estimated at 425 millions. Holland had not long since a debt of 100 millions; it has been reduced from year to year, and now amounts to 79 millions. The Belgian debt is 61 millions. The debt of Prussia in 1880 was close on 100 millions; that of the annexed states, which it was arranged, on the enlargement of Prussia, should bear only the burden of the obligations incurred on their behalf, 7 millions. At the end of 1871, the German empire had a debt of 35 millions, incurred for extraordinary expenditure on the army and navy, but in 1881 the total debt was over 83 millions. The debt of the United States of America in 1862 was 107 millions. In 1866, at the close of the civil war, it had mounted up to 580 millions. Since that time the surplus of every year's revenue has been devoted to its gradual reduction, and on 1st Dec. 1881, its net amount was 355 millions of pounds.

The national debt of the United Kingdom has arisen along with the supremacy of parliament and the necessity for a standing army. Through the reigns of the Tudors and the Stuarts, the nation's protection against the power of the crown was the absence of a standing army, whose existence was regarded with great jealousy by the Commons. But when the control of parliament over the prerogative was strengthened, jealousy in this direction was no longer necessary.

Accordingly, it was when parliament triumphed in the Revolution settlement that the national debt began. The first regular loan was obtained in 1693; it consisted of the capital of the newly created Bank of England, amounting to £1,200,000. This accommodation to the government was, in fact, the price paid by the bank for its privileges. As the nation was engaged in an expensive war, this beginning was rapidly followed up, and at the peace of Ryswick, in 1697, the national debt exceeded 20 millions. Before the accession of the House of Hanover in 1714, it had exceeded 50 millions, and the rapid rise of this burden was a strong argument in the hands of the Jacobites against the Revolution settlement. Whenever a loan was negotiated by the government, special terms were offered according to circumstances. In one case, there might be a terminable annuity, say of 60 or 100 years—that is to say, a certain percentage being paid during that period, at the end the debt was to be extinguished by such payments. See *ANNUITY*. In other instances, there was a perpetual annuity. In a loan negotiated on the latter terms, that annuity was always rather under than above what a borrower would give to a private lender, although such a borrower was bound to repay the money, while the nation was not. It came to pass, in fact, through one of the most curious processes in the whole mystery of finance, that a loan never to be repaid was considered a more eligible investment than a loan to be repaid. The government made this gain—for a distinct gain it was—by the convenience to the public, who, always having money for which they were glad to get the secure interest of the funds, were always ready with a new lender when the old one wanted to be paid. Hence has come the perpetual shifting of the fundholders. And as long as there are moneyed persons who will buy thus into the stocks without any considerable reduction, there is a sure test that the debt is not beyond the capacity of the nation. Raised, however, as we have seen by special loans, each on its own conditions, the different funds became exceedingly varied and complicated. It was one of the projects of the great South Sea schemers of 1720, to conjoin them all into one uniform fund, but this plan was interrupted by the failure of the whole affair. Afterwards, in 1751, a general uniform arrangement was carried out, and the stocks were then called the Consolidated Fund. See *CONSOLS*. Meanwhile, the progress of the national debt was in round numbers as follows: In 1756, when the war of the Austrian Succession began, it was 75 millions; and seven years afterwards, when this war ended, it was

140 millions. Increased by the American war and the war with France and Spain, memorable by the defence of Gibraltar, it had increased to the amount of 260 millions when, in 1793, the great European war of the French Revolution broke out. At the peace of Amiens in 1803, the debt was 620 millions.

When the treaty of Vienna was resumed, after the battle of Waterloo, the amount had risen to 885 millions. It has since decreased, although some further loans have been incurred. The largest of these is connected with one of the most honorable actions of which the British Empire, with all its traditions of glory, can boast—the advance of 20 millions, in 1834, for the emancipation of the colonial slaves. The latest considerable addition made to the national debt was during the Russian war of 1854, when 16 millions were raised by loan. In 1857, the amount of the D. was close to 812 millions, but steadily decreased till 1878, when the unfunded debt became nearly as large as in 1858. In 1881, the total debt, including terminable annuities, was £763,045,940. In 1881, the 'funded debt' was £709,078,526; unfunded (exclusive of annuities) £22,077,500. The distinction between funded and unfunded is, that the government do not profess to repay the former—they only give the creditor an annuity, terminable or perpetual, and, if he wants payment of his money, he can only get it by selling his right to this annuity; the other consists of temporary loans; liable to fluctuation, and renewed from time to time.

It must be kept in view, however, that from a peculiarity of phraseology, the enormous amount of the national debt is partly fictitious, the whole sum neither having been borrowed nor being virtually due. When capitalists have advanced money, they have been content with a small percentage—3 or 3½—but they have often insisted that for each £100 advanced by them, they should have more than £100 of actual stock. If the condition of the market were such that the capitalist wanted 4½ per cent., and the interest or annuity obtained by him was only 3 per cent., he would insist on having stock to the extent of £150 for his £100. If 5 per cent. interest were paid on the nominal amount of the national debt, it would be a charge of more than 40 millions a year—the actual burden is between 26 and 27 millions. Such is, however, the reliance on the national credit, and the convenience of having the stocks for investment, that the stockholders are content with little more than 3 per cent. interest, the right to an annuity of £3 being actually to be procured for somewhere about £90.

The literature of the country has teemed with projects for getting rid of the incumbrance of the national debt, many of which go far wide of the mark, from the supposition that the debt is the incumbrance. In fact, the incumbrance is in the expenditure—the sacrifice of the nation's capital which has caused the debt—the debt itself is merely the shape in which that loss presses, and it must press in some shape. The millions have been exploded in powder and shot, and in other extravagances, and can never be recalled; all that we can do is, by industry and frugality, to make new millions, and replace the loss. Hence it is the supremest folly to suppose that the nation would profit by abolishing or wiping off the national debt—by repudiation, as it is called. Such an event would only be the ruin to a large number of people who are in the position of being the nation's creditors, and would perhaps bring ill-gotten gain to a small number. It would be difficult to estimate precisely how such a calamity would act.

In the first place, if it were seen to be in prospect, the funds would go rapidly down by the holders selling out, so that as long as the chances of stability would induce any one to buy at a very reduced price, the circle of sufferers would be, as it were, widening. The poorest of those interested would be the chief sufferers in the awful scramble. The working-classes, besides any savings which they might have directly invested in the funds, would lose about 40 millions, which they have invested through savings' banks and friendly societies. Widows and unmarried women with narrow fixed incomes would be the next sufferers. It is unnecessary to go further; for the general paralysis of capital and stoppage of manufacturing industry, along with loss of national reputation, would be incalculably disastrous. There is no way of reducing the national debt, except by saving up through taxation from the expenditure of the country. The process of reduction in this form is, however, always met by the consideration, whether the repeal of a disadvantageous tax, or the reduction of the interest of the D., is the better alternative. One thing is very clear, that from the progress of general wealth and increase of population, the national debt, assuming it to remain at its present amount, is always pressing with less and less severity on the country, and is therefore becoming more and more manageable. Some persons, looking at only one side of the matter, have gone the length of saying that, as a ready and safe means of investment, the national D. is a kind of blessing; though the slightest consideration would have shown, that it can never be advantageous for the community at large to be taxed to pay interest to a limited number of individuals. Whatever be the incidence of taxation to pay the interest, now amounting in the aggregate to about £27,000,000 per

annum, it is the proud boast of England that she has ever kept faith with the national creditors—never repudiated a farthing of her debt. As a natural consequence, the British funds are sought as a secure means of investment by people of capital in all lands. See Wilson's *National Budget and National Debt* (1882); also the article FUND.

DEBTOR AND CREDITOR, LAWS OF. In the history of this, as of almost every other branch of jurisprudence, we may, if we will, trace the march of social progress in general. In the earlier stages of life in the state, the arrangements for borrowing and lending are rarely such as to enable the citizens to avail themselves with security of their mutual resources, or to assign such limits to the powers of the creditor as either the claims of humanity or his own true interests demand.

On the one hand, lending is confounded with alms-giving; and the exaction of interest, and even of capital is regarded as an act of inhumanity towards the poor. On the other hand, no sooner do the creditor's rights come to be recognized in anything like a legal sense, than there seem to be no logical grounds on which any limits can be set to them. If he is entitled to exact the debt at all, he is entitled to seize the goods of the debtor; and if the debtor has no goods, he is entitled to his services. But the possession of his services implies the possession of his person; any possession of his person implies the possession of his life. Moreover, from the exaggerated notions of the domestic ties which usually prevail in early times, the person of the individual, where that individual is the father of a family, brings along with it that of his wife, his children, and his slaves. The creditor thus becomes the absolute master of the life and liberty of his debtor, and of all those who are dependent upon him. The arrangements of the Mosaic Law are an illustration of the manner in which, in the ruder forms of society, the laws of debt thus combine a degree of lenity with a degree of severity which are equally alien to modern views. In this as in many other respects, they are, as Michaelis has pointed out (vol. ii. p. 300), a recognition of the consuetudinary law of the stage of society to which they belonged, rather than a system special to the Jews. If an Israelite became poor, it was a duty to lend to him, and no interest was to be exacted, either in money or in produce. If he was a foreigner, the case was different, and the taking of interest was legal (Exod. xxii. 25; Deut. xxiii. 19, 20; Lev. xxv. 35—38). When the Sabbatical year arrived—i. e., at the end of every seven years—there was a general remission of debts as between Israelite and Israelite; and the near approach of the year of remission was not to be recognized as an apology for declining to lend to an indigent brother (Deut. xv. 1—11). Pledges, it is true, might be taken, but even here the same humane principles prevailed. The upper millstone was sacred, for to take it would be to deprive the debtor of the means of subsistence. If raiment was the pledge, it must be returned before nightfall, when it might be required for a covering and the widow's garment could not be taken in pledge (Exod. xxii. 26, 27). In strange contrast to this is the provision (Lev. xxv. 39) that a poor Israelite may be sold to one possessed of substance, even when modified by the special provision that he shall serve as a hired servant, not as a bond-servant, and shall be set at liberty when the year of jubilee arrived. Michaelis says that the judicial procedure for debt was quite summary, the most important causes being decided probably in a single quarter of an hour; and he remarks that Moses nowhere thinks it necessary to mention how a debt was to be proved before a judge.

There was, however, an extensive system of appeal; from the judge over 10, the case was carried to the judges over 50, 100, and 1000, and finally to Moses himself. As every Israelite was entitled to claim the land of his fathers at the jubilee year, and thus to place matters on the footing on which they were after the settlement in Palestine, debts and burdens on land were limited to claims to the fruits of forty-two harvests; but houses, with the exception of those of the Levites, might be sold in perpetuity (Lev. xxv. 29, 30, 32, 33). Children were often given in pledge (Job xxiv. 9), and ultimately into slavery, in payment of debt (2d Kings iv. 1). Subsequent to the Captivity, the pressure of debts upon the poor became so intolerable, that Nehemiah espoused their cause, and insisted on a general remission (Nehem. v.), exacting from the rich an oath that they would never afterwards press for payment. Debts of the character here alluded to probably resembled those which the recipients of parochial relief in our own day owe to the community, rather than debts in the commercial sense. In Matt. xviii., Christ refers to the custom of selling the debtor, his wife and children, and all that he had, in payment, rather as a general custom of all nations, than as one peculiar to the Jews—the 'certain king' being a typical instance of a man of substance.

Both in Greece (Plut. Vita Solonis 15) and in Rome (A. Gell. xx. 1, 19; Liv. ii. 23) the creditor had a claim to the person of the debtor. Previous to the time of Solon, this arrangement had produced consequences at Athens closely analogous to those

which afterwards led to the struggles between the patricians and plebeians at Rome; and his abolition of it forms one of Solon's many claims to the character of an enlightened legislator. By the Twelve Tables, it was enacted at Rome that if the debtor admitted the debt, or had had judgment pronounced against him for it, thirty days should be allowed him for payment. At the expiration of that period, he was liable to be given into the hands of his creditor, who kept him sixty days in chains, exposing him on three market days, and proclaiming his debt. If no one stepped in to release him, the debtor at the end of that time might be sold for a slave, or put to death. If there were several creditors, the letter of the law permitted them to cut their debtor in pieces, sharing him in proportion to their claims; but Gellius tells us that no Shylock ever was found at Rome. To treat him as a slave, however, and make him work out the debt, was the common practice; and the children in his power, in accordance with the whole constitution of society at Rome, followed his condition. The *lex Poetelia* (326 B.C.) alleviated the condition of the debtors (*nevi*), by prohibiting the voluntary alienation of personal freedom. It is uncertain whether it also put an end to the involuntary alienation by the execution of judgment debts.

'During the *Republic* a debtor could not be taken as a slave to satisfy a judgment debt. The imprisonment of the debtor in a public prison took the place of his reduction to slavery' (c. vii. 71, 1). Great prominence was given by the plebeians to a change in the laws of debtor and creditor, on the occasion of their first secession, in 494 B.C.; and subsequently during the whole course of the struggles between the two orders. There can be but one opinion in modern times as to the propriety of abolishing the right of private imprisonment. At Rome the creditor was not bound to maintain his debtor in prison, but it was an offence to prevent food and bedding being supplied. In 320 A.D. Constantine abolished imprisonment for debt, unless the debtor was contumacious.

During the feudal period, the person in general was not attachable for debt, imprisonment being inconsistent with the duties of warlike service, to which every man was bound; and it was for the encouragement of commerce, and in consideration of the merchant having to deal with strangers and foreigners, that it was first introduced by the mercantile communities of Europe (Bell's *Commentaries*, seventh ed., ii., p. 431). By the statute of Merchants, it was enacted, at Acton Burnel, in 1282, that in lending money, a merchant might bring the borrower before the lord mayor of London, or the chief warden of another good town, and cause him to acknowledge his debt and day of payment. A recognizance was then enrolled, and an obligation written by the clerk, and sealed with the king's seal and the debtor's. Failing payment, the creditor was entitled to produce this obligation, and to demand a warrant to seize the person of his debtor, and to commit him to the Tower. The history of the law of imprisonment for debt in this country is stated with great clearness by Mr. Bell in the section of his *Commentaries* to which we have just referred, but it is impossible to condense it within the limits of the present article. Further information on the subject will be found under IMPRISONMENT, DILIGENCE, EXECUTION, SANCTUARY, INSOLVENCY, &c. Generally, it may be stated here, that up to the passing of the later bankrupt acts, the prisons of this country were crowded with debtors. It was ascertained by parliamentary returns, that in the 18 months subsequent to the commercial panic of 1825, 101,000 writs for debt were issued from the English courts. The returns for 1880, which do not distinguish between debtors and other civil prisoners, give as the number of debtors and others under civil process in prison in England and Wales, 7771. In 1880 there were 145 persons imprisoned in Scotland under decrees of aliment. See also DEBTS.

DEBTORS, ABSCONDING. The existing laws for the arrest of debtors absconding from England having been found insufficient, in consequence of the delay which was occasioned in obtaining the necessary process, the 'act to facilitate the more speedy arrest of absconding debtors' (14 and 15 Vict. c. 52) was passed in 1851. The evil was felt chiefly by creditors residing at a distance from London, whose debtors were able to perpetrate frauds upon them by embarking for distant countries from various towns and seaports in England; and authority was given to county-court judges to issue warrants to arrest the debtors till judgment could be obtained, or the debtors found bail to meet any judgment likely to be obtained. But the legislature having since changed its views as to the general expediency of arresting and imprisoning persons for debt, the above act was repealed in 1869, and the Debtors Act, 32 and 33 Vict. c. 62, contains the only enactment now in force on this subject. By the 6th section, where the plaintiff in any action in a superior court of law proves, at any time before final judgment, by evidence on oath, to the satisfaction of a judge of one of those courts, that the plaintiff has good cause of action against the defendant to the amount of £50 or upwards, and that there is probable cause for believing that the defendant is about to quit England unless he be apprehended, and that the

absence of the defendant from England will materially prejudice the plaintiff in the prosecution of his action, such judge may, in the prescribed manner, order such defendant to be arrested and imprisoned for a period not exceeding six months, unless and until he has sooner given the prescribed security, not exceeding the amount claimed in the action, that he will not go out of England without the leave of the court. But if the action is for a sum in the nature of a penalty, it shall not be necessary to prove that the absence of the defendant from England will prejudice the plaintiff, and the security given is different.

As to the mode of dealing with absconding debtors in Scotland, see *MEDITATIO FUGÆ*.

DEBT, IMPRISONMENT FOR. In England, imprisonment for debt was abolished by the Debtors Act, 1869, 32 and 33 Vict. c. 62, except in certain cases; the most important of which are those of a defaulting trustee and of a judgment debtor who is able, but refuses to pay. In certain actions for £50, defendants about to leave the country may be imprisoned. In Scotland, imprisonment for debt was abolished by the Debtors (Scotland) Act, 1880, 43 and 44 Vict. c. 34, generally known as Cameron's Act; except in the case of taxes, fines, or penalties due to the Queen, and rates and assessments lawfully imposed, and also sums decreed for aliment. By the Civil Imprisonment (Scotland) Act, 1882, 45 and 46 Vict. c. 42, imprisonment was further limited, (1) in the case of assessments, to a period of six weeks; (2) in the case of aliment to debtors wilfully failing to pay, though possessed of means, or being able to earn the same. These acts do not exclude imprisonment where a debtor is *in meditatione fugæ*, or where he refuses to perform an obligation *ad factum præstandum*.

DEBTS, RECOVERY OF. Courts of law, besides deciding questions of fact or law really in dispute, serve an important purpose in facilitating the recovery of debts, against which the debtor has no defence. The great majority of the cases in which the services of courts are required is of this kind. The statistics of the English county courts give a striking illustration of this. Of the number of cases which are entered for judgment, it appears that about 95 per cent. end in favor of the plaintiff; whereas, had there been any question really in dispute, the defendants, with the advantages they possess, might have been expected to be at least as often right as the plaintiffs. Another cause which has operated in the same direction is, that the consequences of issuing a decree are now much less serious, as a creditor holding a judgment has not now the exorbitant powers over his debtor that he once had. The theory, accordingly, on which judicial proceedings are based, has very much changed. Formerly, lawyers thought that every case should come into court, prepared for being disputed on every point, and thus a great deal of expense was incurred before it was known whether there was to be any dispute at all. The end now in view is, that there should be a cheap means of obtaining judgment in undisputed causes; and that, at the same time, every precaution should be taken, that if the defender has any good ground of defence, he should have the opportunity of stating it; and that, when stated, it should receive due attention. Various law reforms have been carried to facilitate the recovery of debts with this end tacitly, at least, in view.

Understanding by debt the price of services rendered, or goods furnished, it may be useful to point out shortly the proceedings that must be taken to recover it. If the debt exceed £50 in amount, the creditor must, in England, proceed in one of the superior courts of law; and, in Scotland, he may proceed either before the superior court or before one of the sheriff-courts; but in any view, he must prepare for considerable expense—the services of professional advisers being in practice unavoidable. If the debt do not exceed £50, the creditor may proceed in the English or Scotch county courts (in Scotland called the sheriff-courts), and the proceedings are simple and expeditious.

In England, the first step to recover a debt not exceeding £50 in the county court, is for the creditor to go to the registrar of the district within which the defender resides, or to the jurisdiction of which he is on some other ground amenable.*

He there fills up a printed form, called a *plaint*, shortly stating the claim and the ground of it. The registrar upon this issues a summons, and gives it to the bailiff of the court, who serves a copy of it on the defendant. This summons names a day on which the parties must appear before the judge. No written pleadings are in general necessary; but if the debtor has any special defence—such as, that he has a counter-claim against the plaintiff, or that he (the defendant) was a minor at the time the debt was contracted, or that he has been discharged under the bankruptcy acts—he must give the creditor notice in writing five days before the hearing. If he simply denies the debt, he has nothing to do but to attend the hearing, with what witnesses he may require. If the witnesses are not likely to come voluntarily,

*The leading County Court Acts are those of 1846 (9 and 10 Vict. c. 95); 1856 (19 and 20 Vict. c. 108); 1867 (30 and 31 Vict. c. 142); 1875 (38 and 39 Vict. c. 50). The practice is contained in the County Court Rules of 1875 and 1876.

summonses to enforce their attendance (as well as the production of documents) may be obtained at the registrar's office. At the hearing, the judge (unless a jury have been required) proceeds himself in a summary way to try the cause. He examines the witnesses on oath, keeping no record of the evidence; and, on hearing the parties, gives judgment at once. If he decides for the plaintiff, he may make the sum payable at once, or in cases below £20, by instalments. The costs are according to a fixed scale, which may be seen in the court or in the registrar's office.

There are provisions for parties having their case tried by jury, and also for appeal on questions of law. Either party who wishes it, may ask for a jury; and if the sum claimed exceed £5, the demand must be complied with. If there be a jury, the number of jurymen is five, and their verdict must be unanimous. The party dissatisfied with the verdict may ask for a new trial, and the judge, if he thinks right, may grant it on such terms as he thinks reasonable. This power to try by jury is used very rarely indeed—less than one per cent. of all the cases which go to trial being tried in that manner. The right to appeal is against decisions in point of law, and against the admission and rejection of evidence. The appeal is to a Divisional Court of the High Court of Justice. It is taken by requiring the judge to state a case for the opinion of the higher court, and thereafter entering it for discussion there. The appellant must give security for the costs of the appeal, and (if defendant) for the amount (both of principal and costs) contained in the judgment. The right of appeal is not much exercised, and the parties have it in their power to agree beforehand (in writing) that there is to be none. Leave to appeal is required where the sum sued for is less than £20. Before trial, cases may be removed by *certiorari* to the High Court of Justice, but that is in the discretion of the superior judge.

When judgment is for the creditor, and the order for payment is not complied with, execution may issue against the goods of the debtor. Although imprisonment for debt was (in the general case) abolished in England in 1869, it still remains the law that in the county courts, in certain cases, the debtor may also be imprisoned. The debtor is summoned to show cause why he has not obeyed the judgment. At this hearing (whether the debtor attend or not), the creditor may get an order to commit, if he can show to the judge's satisfaction that the debtor has had, since the judgment, sufficient means to pay, and has refused to do so. This imprisonment may be for six weeks, but it is not held to be equivalent to payment. Of course the debtor is protected by bankruptcy or liquidation.

Although it is competent to proceed in the county courts for sums as large as £50, they are not much used for sums above £20. When the debt does not exceed £20, there is a certain compulsion on the creditor to resort to the county court, for if he resort to a superior court, and recover no more than that sum, he will have no costs, unless he satisfies the court that he had sufficient reason for taking that course. In point of fact, there is only about one case for a sum exceeding £20, for a hundred which do not exceed it; and the average amount sued for is between £2 and £3.

In Scotland, under the Small Debt Act, 1 Vict. c. 41, as amended in 1853, debts not exceeding £12 may be recovered in the Sheriff Small-debt Court. The creditor takes two copies of his account to the office of the sheriff-clerk for the circuit in which the debtor lives; from him he obtains a summons, in which the day for the trial is fixed; and this summons he takes to an officer of the court (sheriff-officer), who serves a notice, with one of the copies of the account, on the debtor, at least six days before the trial. The presence of a witness at citation was dispensed with by the Citation Amendment Act of 1871, which also abolished lockhole citation; and under the Citation Amendment Act of 1882, citation by registered letter instead of by messenger-at-arms will be allowed in the general case, it being formerly allowed only where the debtor hid himself, or refused access, or had gone for 40 days. Both parties may employ an officer to cite witnesses. The creditor must appear at the trial, either by himself or by one of his family, or by such other person as the sheriff may permit. Law-agents require special permission to appear, unless where both parties consent. If the defender intend to plead a counter-claim, he must cause a sheriff-officer to give a copy of it to the pursuer, at least one free day before the trial; otherwise, there are no written pleadings. On the day fixed for the trial, if the debtor does not appear, decree is given against him, with expenses, as a matter of course; against which he can afterwards be 'reponed' only on consignment of the expenses and a sum of 10s. If both parties appear, the judge hears the case. If the pursuer or the defender have clearly no good ground of action or defence, he disposes of it at once; but if not, he examines the witnesses on oath.

No record of the evidence is taken. At any time before judgment, the case may be remitted to the 'ordinary court' of the sheriff, where it is conducted by agents on written pleadings and written proof. Otherwise, the whole proceedings are concluded in one day, adjournments not being permitted, except in special cases. After judgment, there is no appeal, except on the ground of want of jurisdiction, malice, oppression, or wilful neglect of

the statutory forms, in which cases there is an appeal to the Court of Justiciary. The judgment provides for execution against the debtor's goods. This process is often used for the recovery of small rents.

The Debts Recovery Act, 1867 (30 and 31 Vict. c. 96), has extended the Scottish small-debt jurisdiction, with important alterations, to £50. The class of debts that may be sued for between £12 and £50, has been limited to those which most require summary proceedings—namely, those which prescribe if not sued for within three years, such as all ordinary merchants' accounts, and accounts for professional services or for servants' wages. The principal differences between this and the proper small-debt proceedings are, that agents are allowed to appear; that there are two days in court, one at which the grounds of action and defence are stated, and an adjourned one, at which the witnesses are examined; that the judge makes a note of the pleas of the parties; that a record is kept (if required) of the admissions in fact and of the evidence; and that there is a right of appeal, if the debt does not exceed £25, from the sheriff-substitute to the sheriff, and if it exceed £25, also to the Court of Session. If the judge be not asked to take a note of the evidence, there is no appeal in matters of fact. All the fees and costs, whether payable to the sheriff-clerk, the officers of the court, or the law-agents, are distinctly stated in the act, and must be hung up in every court. In other respects, the proceedings are analogous to those in the Small-debt Court, and, like them, may proceed either at the principal town of the county, or at one of the towns at which sheriff's circuit-courts are held.

In England and in Scotland, there are other courts which deal with the recovery of debts beside the county courts. The Sheriff's Court of the city of London has a jurisdiction similar in general to that of the English county courts; and there are local courts, such as the Court of Passage at Liverpool, and the Manor Court at Bradford, which exercise jurisdiction in small as well as other debts. In Scotland, the magistrates of royal burghs, and the justices of peace, possess a small-debt jurisdiction for debts not exceeding £5 in amount. In the latter case, the Royal Commission of 1870 recommended a reform, especially as regards fees and execution against goods.

DEBTS, SMALL. See **SMALL DEBTS.**

DEBUT (*début*), a French word which has been adopted into the English language, and signifies generally a beginning, or entrance, but is specially applied to the first appearance of an actor or actress on the stage at all, or to a first appearance in a particular theater. In these circumstances, the actor is called a *débutant*; the actress a *débutante*.

DE'CA, Gr. signifying 'ten,' is of frequent occurrence in composition; as in *Decapolis*, a union of ten cities; *Decalogue*, the ten commandments; *decamètre*, a measure of ten mètres, &c. From *deca* is formed

DE'CADE, a collection or group of ten. As applied to time, decade was used in the calendar of the French Republic to designate their week of ten days. Each month, of 30 days, was divided into three decades. The days of each decade were named *primidi*, *duodi*, *tridi*, *quartidi*, *quintidi*, *sextidi*, *septidi*, *octidi*, *nonidi*, and *decadi*. The tenth, or *decadi*, was the day of rest; and, as the Republic acknowledged no definite religion, was devoted to the practice of and exhortation to virtue. The republican year numbered 36 decades, and had thus only 360 days. The remaining five (in leap years, six) were devoted as holidays at the end of the year without being numbered.

DE'CACHORD, a kind of guitar with ten strings, similar to the common guitar, only larger in the body, and with a broader finger-board. The lower strings have no frets, being only used as open notes.

DECA'DENCE (Fr.), a term used with reference to works of art belonging to a school which had passed the period of its highest excellence before they were produced. In Greece, art in all its forms reached its acme in the time of Pericles; and though there are many exquisite works which were produced at a later period, they all belong, more or less conspicuously, to the decadence of Greek art. In Rome, again, both art and literature culminated in the time of Augustus, and from that time we have a decadence, which soon becomes very obvious and rapid. The school of the *Renaissance*, again, came to perfection with Raphael; even the Caracci belong to its decadence; and the decline was continuous through the *rococo* of Louis Quinze, till art became almost extinct all over Europe. In the beginning of the reign of George IV., it probably reached as low a point in England as it ever attained in any civilized country; and it is only within the last thirty years that it has begun to revive. Let us hope that its decadence is far distant.

DE'CAGON is a plane geometrical figure of ten sides. When the sides are equal, the figure is called a regular decagon. A decagon may be formed from a Pentagon (q. v.), by forming any irregular triangles on its side in such a way that no two of them

shall have their sides in the same straight line. A regular decagon is got from a regular pentagon by describing a circle round the latter, bisecting the arcs between its angular points, and drawing lines joining the angular points to the points of section.

DECAISNEA, a genus of plants of the natural order *Lardizabalaceæ*, nearly allied to *Stauntonia*. It contains only one known species, recently discovered, a native of the Himalaya mountains, where it grows at an elevation of 7000 feet. It is a very remarkable plant, and the only one of its natural order which is not a climber. It sends up from the root several straight erect branches like walking-sticks, which bear spreading pinnated leaves, two feet long, standing out horizontally. The flowers are unisexual, green, and in racemes. The fruit is yellow, resembles a short cucumber, being about four inches long, and one inch in diameter. It is full of a soft milky pulp and large black seeds. Two or three fruits grow together. The pulp is sweet and wholesome, much eaten by the natives of the Himalaya.

DE'CALOGUE (Gr. *Dekalogos*, 'ten discourses') is the term usually applied by the Greek Fathers to the law of the two 'tables of testimony' given by God to Moses on Mount Sinai. These tables were made of stone, and the commandments inscribed thereon are said to have been 'written by the finger of God.' The commandments are not numerically divided in the Pentateuch, and it has been supposed by some that the number *ten* was chosen, because *ten* was considered the most perfect number. As, however, there are *ten* distinct injunctions, it is superfluous to allege any other reason for the division than the simple fact, that this is the correct enumeration. Philo-Judæus divides them into two *pentads*, the first ending with 'Honor thy father and mother,' &c.; but the general opinion among Christians is, that the first table contained those which enjoin upon us our duty to God (comprising the first four), and the second, those which enjoin upon us our duty to our fellow-creatures (comprising the last six). The Talmudists make the introductory words, 'I am the Lord thy God, who brought thee out of the land of Egypt, out of the house of bondage,' to be the first commandment, and in consequence, to keep the number *ten* are obliged to run the next two into one. But the words quoted obviously contain no *command* at all, but merely express the grand general reason why the Israelites should yield implicit obedience to the injunctions which follow. Hence Origen commences the D. with, 'Thou shalt have no other gods before me.'

His division is that in use in the Greek, and in all the Protestant churches except the Lutheran; while from the writings of Philo and Josephus, it appears that such was also the received division of the Jewish Church. The Masoretic division is that which is adhered to in the Roman Catholic and Lutheran Churches. According to it, the first two commandments, that concerning the worship of God, and that concerning the worship of graven images, constitute but one. The number *ten*, however, is here also preserved by dividing the tenth into two, the first of which is made to be, 'Thou shalt not covet thy neighbor's house,' and the second, 'Thou shalt not covet thy neighbor's wife, nor his manservant, &c., to the end.' There are two versions of the D. in the Pentateuch; the first is contained in Exodus xx., the second in Deuteronomy v. These are substantially and almost verbally the same, except in regard to the fourth commandment, for the observance of which the reason assigned in the former differs entirely from that in the latter.

DECAMPS, ALEXANDRE-GABRIEL, a celebrated French painter, was born at Paris in 1803. He was a pupil of De Pujol, but soon began to strike out a style of his own, which was long in becoming popular. About 1830 he made a tour in the East, and for several years after his return he painted chiefly Eastern subjects. Gradually, but slowly, his works grew into favor. He painted landscapes, genre-pieces, and historical pictures; but his animal pictures are those which first attained to popularity among his countrymen. The monkey was his specialty; and into such pictures D. introduced much of that humor for which he was so distinguished. D. was made a chevalier of the Legion of Honor in 1839, and became officer in 1851. He died at Fontainebleau on the 22d of August 1860.

DECANDOLLE, AUGUSTIN PYRAME, one of the most eminent of botanists, was born at Geneva, 4th February 1778, and was descended from an ancient noble family of Provence, which was compelled to seek refuge in Geneva from religious persecution about 1558. His father was a syndic of Geneva, and had an estate near Yverdon, where much of D.'s boyhood was spent. He received his education in the gymnasium of Geneva, distinguished himself by his attainments in classical scholarship and his love of poetry, as well as by his delight in the study of history, to which and to the profession of law he proposed to devote himself. But after he had begun his studies for this profession, the union of Geneva with the French Republic in 1798 made such a change in his prospects, that he thought proper to relinquish it for that of medicine; having also in the meantime learned to delight in the

physical sciences, particularly chemistry and botany, to which the lectures of Vaucher at Geneva in 1796 very much contributed. From this time forth, these were the great pursuits of his life, and he never ceased to study and investigate the relations of these two sciences to each other. He went to Paris, where he prosecuted his studies, and where his botanical publications soon won for him a distinguished place among the scientific men of his time. A work on Succulent Plants (Par. 1799—1803), one on the species of *Astragalus* (Par. 1802), and some less important works, were followed by his extremely valuable *Essai sur les Propriétés Médicales des Plantes* (Essay on the Medicinal Properties of Plants), (Par. 1804). In 1802, he was called to a professorship in the Academy of Geneva, but preferred to remain in Paris, and delivered his first botanical lectures in the Collège de France. In 1804, appeared the first volume of his *Flore Française*. Employed by the government, he visited all parts of France and of the kingdom of Italy in 1806—1812, investigating their botany and agriculture; but the events of 1814 prevented the production of the great statistical work in which it was intended to embody the results of these investigations. On the fall of Napoleon, he was compelled to retreat to Geneva, where a professorship of botany was founded for him, and where he spent the remainder of his life. His *Théorie Élémentaire de Botanique* (Par. 1813) was followed by two other works, the fruits of his studies in systematic botany and the properties and natural affinities of plants, and by which the true knowledge of that science has been wonderfully promoted, his *Regni Vegetabilis Systema Naturale* (2 vols., Par. 1818—1821), and his *Prodromus Systematis Naturalis Regni Vegetabilis* (vols. 1—10, Par. 1824—1846). D.'s labors established on a surer basis, and improved in many of its most important respects the natural system of botany which Jussieu had attempted to found. See **BOR-ANY**. The latter years of D.'s life were years of sickness and suffering, and he died of dropsy on 9th September 1841. He bequeathed his collections—including a herbarium of more than 70,000 species of plants—to his son ALPHONSE DECANDOLLE, on condition of his keeping them open to the public, and of his carrying on the *Prodromus*. The younger Decandolle accordingly devoted himself to this work, which he completed with the 17th volume. He also is a botanist of no mean fame, and author of several botanical works, among which are an *Introduction à la Botanique* (1835), and the *Géographie Botanique* (1855); also an *Histoire des Sciences* (1872).

DECAPITATION. See CAPITAL PUNISHMENT.

DECAPODA. See CRAB and CRUSTACEA.

DECAZEVILLE, a town in the department of Aveyron, south of France. It has extensive blast-furnaces and iron-works, said to be superior to any in France, and which, with the iron and coal mines of the neighborhood, afford employment to the mass of the inhabitants. Pop. (1876) 5968.

DE'CCAN (Sans. *Dakshina*, the south), a term applied sometimes to the whole peninsula of Hindustan to the south of the Vindhya Mountains, which separate it from the basin of the Ganges, and sometimes restricted to that portion of the same which is rather vaguely bounded on the north by the Nerbudda, which falls into the Gulf of Cambay, and on the south by the Kistna or Krishna, a tributary of the Bay of Bengal. Independently of this indefiniteness of meaning, the name, like that of the **CARNATIC** (q. v.), is rather of historical interest than of actual use.

DECE'MBER, the last month of the year. In the old Roman calendar, before the time of Julius Caesar, the year began with March, and that which is now the twelfth, was then the tenth month; hence the name (*decem*, ten). Our Saxon ancestors called it *Mid-winter-month* and *Yule-month*.

DECE'MVIRI. The most famous body known under this title were the ten persons who were appointed as a sort of legislative committee, to draw up a code of laws at Rome. The ground-work on which the D. proceeded, was the information which had been previously collected by three commissioners who were sent for that purpose to Greece. On the return of the commissioners, after a year's absence, a violent dispute arose between the patricians and plebeians as to which of the orders should be intrusted with the revision of the laws. The dispute ended in favor of the patricians, and ten patrician lawgivers were consequently appointed, to whom, moreover, the whole government of the state was intrusted during the year for which they were to hold office. The experiment was eminently successful; the work of legislation was carried on with zeal and success, and the state was governed with prudence and moderation. Their labors not being quite finished, a new body of D. was appointed; only *one*, the notorious Appius Claudius, belonging to the previous commission. In their magisterial and executive capacities, the new D. acted in the most tyrannical manner. In place of the fasces alone being carried before the decemvir who presided for the day, as on the former occasion, each of the ten

was now attended by twelve lictors, who carried not only the rods, but the axe which was the emblem of sovereign power. Every species of outrage was committed on the persons and families of the plebeians, and when the term of their appointment expired, the D. refused either to resign or to allow successors to be appointed to them. At length, the iniquitous decision of Appius Claudius (q. v.) in the matter of Virginia brought affairs to a climax. A popular insurrection broke forth, the D. were driven from their office, and the tribunes and other ordinary magistrates of the republic were reappointed. The occurrence is the subject of one of Macaulay's most spirited *Lays of Ancient Rome*.

DECE'NNARY. See TITHING.

DECE'PTION ISLAND, near South Shetland, in the Antarctic Ocean, is worthy of notice for the contrarieties which it presents. Under the reign of all but perpetual winter, it possesses hot springs and a volcano. In these contrasts it so far resembles Iceland with its Hecla and its geysers. But D. I. seems to be peculiar in this, that its very material consists of alternate layers of ashes and ice. It contains a deep lake of five miles in circuit.

DECI'DUOUS TREES (Lat. *de*, and *cadere*, falling off) are those which annually lose and renew their leaves. In cold and temperate countries, the fall of the leaf in the autumn, and the restoration of verdure in spring, are among the most familiar phenomena of nature, connecting themselves also very intimately with the feelings, habits, and circumstances of mankind. The greater part of the trees and shrubs of temperate regions are deciduous; but within the tropics, the forest retains always its luxuriance of foliage, except in countries where the diversities of condition, occasioned by the wet and dry seasons, are extreme, and there many trees lose their leaves in the dry season, from causes apparently the same with those which produce the same effect on the approach of winter in colder countries, and which are connected with a sort of rest of the plant, or partial suspension of the active functions of vegetable life. Trees not deciduous are called EVER-GREEN (q. v.).

DE'CIMAL FRA'CTIONS (Lat. *decem*, ten) are such as have for their denominator any of the numbers 10, 100, 1000, &c.—i. e., any power of 10. See FRACTION. Thus, $\frac{7}{10}$, $\frac{23}{100}$, $\frac{19}{1000}$, are decimal fractions. In writing such fractions, the denominator is omitted, and the above stand thus: 0.7, or .7, .23, .019. That these numbers do not express integers is intimated by the point to the left; and the denominator is always 1, with as many ciphers annexed as there are figures in the decimal. A cipher is prefixed to 19, because otherwise it would read as if it stood for $\frac{19}{100}$. The expression £5.647 is read, Five pounds and 647-thousandths of a pound; or, Five pounds, and six-tenths, four-hundredths, and seven-thousandths of a pound. That these two readings are equivalent appears from this, that $\frac{647}{1000} = \frac{600}{1000} + \frac{40}{1000} + \frac{7}{1000} = \frac{6}{100} + \frac{4}{1000} + \frac{7}{1000}$. It thus appears that the first figure of a decimal to the left expresses tenths of the unit; the second hundredths; the third thousandths, &c. In this property lies the great advantage of decimal fractions; they form merely a continuation of the system of notation for integers, and undergo the common operations of addition, multiplication, &c., exactly as integers do. To explain the principles which determine the position of the decimal point after these operations, belongs to a treatise on arithmetic.

The disadvantage attending decimal fractions is, that comparatively few fractional quantities or remainders can be exactly expressed by them; in other words, the greater number of common fractions cannot be *reduced*, as it is called, to decimal fractions, without leaving a remainder. Common fractions, such as $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{7}{16}$, for instance, can be reduced to decimal fractions only by multiplying the numerator and denominator of each by such a number as will convert the denominator into 10, or 100, 1000, &c. (The common process is merely an abridgment of this). But that is possible only when the denominator divides 10, or 100, &c., without remainder. Thus, of the above denominators, 2 is contained in 10, 5 times; 4 in 100, 25 times, and 25 in 1000, 4 times; therefore, $\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10} = .5$; $\frac{1}{4} = \frac{1 \times 25}{4 \times 25} = \frac{25}{100} = .25$; $\frac{9}{25} = \frac{9 \times 4}{25 \times 4} = \frac{36}{100} = .36$. But neither 3 nor 7 will divide 10 or any power of 10; and therefore these numbers cannot produce powers of 10 by multiplication. In such cases, we can only approximate to the value of the fraction. Thus, 10, 100, 1000, &c., divided by 3, give 3, 33, 333, with a remainder in each case; and $\frac{2}{3} = \frac{2 \times 333}{3 \times 333} = \frac{666}{999}$. As this denominator is nearly equal to 1000, $\frac{2}{3} = \frac{666}{1000}$, or .666 nearly. As 10, and therefore its powers, are composed of the two factors 2 and 5, it is obvious that any fraction whose denominator contains any other factor than these, cannot be reduced exactly to a decimal fraction.

DECIMAL NOTATION. See NOTATION.

DECIMAL SY'STEM. This name is applied to any system of weights, measures, money, &c., in which the standard unit is divided into tenths, hundredths, &c., for the denominations below it, and multiplied by 10, 100, &c., for those above it. The nature of this method of division will be best explained by an example from the French system, where it has been most rigidly carried out. The *mètre* (= 39.37 English inches) is the unit of length, and the foundation of the whole system. For the higher denominations of length, the Greek words *déca*, *hecto*, *kilo*, and *myria*, are prefixed to signify *multiplying* by 10, 100, 1000, 10,000; so that *décamètre* = 10 mètres, *kilomètre* = 1000 mètres, &c. The Latin words *déci*, *centi*, *milli*, on the other hand, are used to express *division* by 10, 100, &c., and thus furnish names for the lower denominations; *décimètre* = $\frac{1}{10}$ of a *mètre*, *centimètre* = $\frac{1}{100}$ of a *mètre*, &c. Similarly with money; the *franc* being the unit, a *décime* is the tenth part of a franc; and a *centime*, the hundredth part.

Belgium and Switzerland have adopted both the French franc as the standard unit and the division into tenths. The Italian *lira* is the same as the franc.

The decimal system in regard to money, with various units of reckoning, is now in use also in Germany, the Netherlands, Sweden, Russia, Austria, Spain, Portugal, Greece, Turkey, the United States, China, and Japan. The French metrical system of weights and measures has been introduced into Germany, Belgium, Switzerland, Spain, Portugal, &c.

This plan of decimal gradation in weights and measures is the only rational one, because it is in accordance with the universally adopted decimal notation. If thoroughly carried out, the facilities it would afford in every department of life are scarcely calculable. For one thing, it is not too much to say that one-half the time now spent in Great Britain in learning arithmetic might be saved. That study might, in addition, be made an effective means of intellectual discipline; whereas at present the time must be spent in acquiring something like a ready but blind application of complicated rules.

The most striking instance, perhaps, of the inconvenience of the arbitrary mode of division is furnished by the thermometer. In this case, nature has fixed the fundamental measure, and made it the same for all nations—the interval, namely, between the freezing and boiling points of water. And yet, in England, this space is divided into 180 parts or degrees; in Germany and the continent generally, into 80°, and only in France has it been divided into 100°. Thus, the basis of uniformity made to our hand has been thrown away, and every observation of temperature made in one country has to be painfully translated before it can be understood in another. See METRE.

DECIMA'TION, a military punishment, rarely inflicted in the present day. When a considerable body of troops committed some grave military offence, which would be punishable with death if committed by an individual, the punishment was awarded to one-tenth of them by lot, instead of to the whole number, in order that the army might not be too much weakened.

DE'CIMI, in Music, is an interval of ten diatonic degrees, as from C to E, or third above the octave, as which it is always treated in harmony. There are only two cases in which it is treated differently from the third: 1st, in double counterpoint, where a necessary difference must be made although the same harmonic rules apply; and 2d, in thorough-bass, where the figure 9 shall rise a degree to 10, instead of falling a degree to 8.

DE'CIUS, C. MESSIUS QUINTUS TRAJANUS, a Roman emperor, was born at Babalia, in Lower Pannonia, towards the close of the 2d c., and was the first of a line of monarchs who claimed descent from an Illyrian stock. Being sent in 249 A.D. by Philip, the ruling emperor, to restore to subordination the army of Moesia, which was in a state of revolt; the troops proclaimed him emperor against his will, and forced him to march upon Italy. Philip encountered the forces of D. near Verona, but was defeated and slain. D. assumed the government of the empire in the end of the year 249 A.D., but his brief reign was one of restless warring with the Goths, fighting against whom he was killed near Abreinn, in the close of the year 251.

During the reign of D., it was determined to revive the censorship, and to persecute the Christians, in order by the first to check the growing immorality of the state, and by the second to bring back the purity of the Roman religion, and regain for Rome the favor of the gods. The censorship was never fully restored, but a barbarous persecution of the Christians took place. In Rome, Antioch, and Jerusalem, the several bishops were massacred; Origen, famous among the early Fathers, was subjected to the most acute tortures; dreadful cruelties were also perpetrated at Alexandria. Many Christians, in Africa, disowned their religion, until the persecution had passed.

DECK is a nearly flat planked covering to a ship, forming a flooring to the persons above it, and a shelter to those below it.

There may be several such in a ship, one under another; not only does each serve the purpose here named, but it helps to strengthen the vessel, by holding the sides together. In ships of war, the number of decks varies with the rate or size. First and second rates have four whole decks, stretching throughout from stem to stern. Smaller ships have two whole and one half decks; while a still smaller class have only one of each.

Where there are several decks in a ship, they are distinguished by different names. Thus, the *upper* or *spar* D., open to the sky, stretches from stem to bow, and is conventionally divided into *quarter-deck*, *waist*, and *forecastle*. The *main* or *gun* D. is immediately below the upper deck. The *middle* D. is next under the main D., and is rather thicker and stronger. The *lower* D. is in the broadest part of the ship, and is made very strong, to receive the heaviest guns. The *orlop* D. is the lowest of all, and is often only temporary; it is chiefly occupied as store-rooms. Some of the above are wanting in all but the largest ships; and other names are occasionally substituted. A *flush* D. is a continued floor from stem to stern, upon one range, without any break.

DECKANEE' HEMP. See HIBISCUS.

DE'CKER, SIR MATTHEW, BART., a political economist, was born at Amsterdam towards the close of the 17th century. He came to London in 1702, was naturalized as an English subject in the following year, and having embarked in commerce, attained the greatest success; received a baronetcy in 1716, and three years afterwards, took his seat in parliament as member for Bishop's Castle. He sat in the House, however, only for four years. His death took place March 18, 1749; the baronetcy then became extinct, and his daughters succeeded to his estates.

D., in 1743, published a pamphlet, which in twelve years ran through seven editions, in which he proposed to raise all the public supplies from one single tax—namely, a tax upon houses. According to D.'s calculation, there were then in England, exclusive of Wales, 1,200,000 houses; of these he meant to tax only one-half, counting off 500,000 as inhabited by the working-classes, and 100,000 as being uninhabited. By this means, he proposed to raise an annual revenue of £6,000,000, which sum was £1,000,000 more than the expenses of the government of that day required. The surplus was to be applied as a sinking fund for the purpose of discharging the debt.

DECLAMATION (Lat. *declamare*, to speak loudly, hence to exercise one's self in rhetorical delivery), is the art of speaking according to rules, whereby the sense of the words, as well as the feeling and sentiment, is naturally and characteristically represented. Recitation, therefore, whether spoken or sung, is subject to the laws of D., from which it derives its value and significance. Perfect D. implies correctness of speech, distinctness and clearness of enunciation, and a well-toned voice. D. is therefore clearly of a musical nature. In music, however, D. is so far different from the D. of speaking, that the singer must adhere to what the composer has written, as it is the latter who fixes the whole of the intonation, modulation, and phrasing, and also the *tempi* and expression, and who not unfrequently sacrifices the correctness of the D. to the charm of some peculiar melodic phrase or pleasing rhythm, or a vocal musical embellishment. The truth and beauty of correct musical D. are always endangered by a translation of the original words into another language, a work which, with the greatest care and ability, it is in many cases almost impossible to accomplish word for word, or syllable for syllable, so as to fit accurately to the accent of the music. The master-works of many great composers suffer much in this respect, at which our musical public seem quite indifferent, while listening to translations of operas so carelessly executed as to destroy their greatest beauties, and frequently altogether to distort the sentiment. In earlier times, as well as now, considerable trouble has been taken to establish D. as a science. The ancients had a kind of note, or sign of intonation, which they placed over or under the words, possibly to decide whether the accent should be given by a high or by a low tone, and thus to regulate the modulation of the voice. That the theatrical D. of the ancients resembled the musical recitative of the present day, is generally admitted. In the German language, there are numerous works written on the art of declamation.

DECLARATION, in Common Law, was the pleading in which the plaintiff in an action at law sets forth his case against the defendant. The plaintiff might declare as soon as the defendant had made appearance in answer to the Writ of Summons (q. v.), or, where the summons were not specially indorsed (see INDORSEMENT), on failure of the defendant to make appearance. If the plaintiff failed to declare within a certain time, the defendant might obtain judgment of *Non Pros.*; and if the failure continued for a year after the writ of summons is returnable, the plaintiff was deemed out of court. On application to a judge, a plaintiff, if not prepared, might obtain time to declare; and a defective D. might be amended. Since the Judicature Act of 1875, the D. is no longer used in actions, and the *Statement of Claim* takes the place

both of it and of the former BILL IN CHANCERY. By ord. xix. of the Judicature Act it is provided that, 'unless the defendant in an action shall state that he does not require the delivery of a statement of complaint, the plaintiff shall, within such time and in such manner as hereinafter prescribed, deliver to the defendant after his appearance a statement of his complaint and of the relief or remedy to which he claims to be entitled;' and within eight days the defendant must give the plaintiff his defence or counterclaim. Such statements are to be as brief as the nature of the case admits.

DECLARATION, in lieu of an oath. Quakers, Moravians, and Separatists, who object to swear on religious grounds, have been permitted by several statutes to substitute a simple D., or *affirmation*, as it is called, for an oath. See AFFIRMATION. The members of all other Christian sects may still be compelled to swear, whatever be their scruples, in criminal cases. But as regards civil cases, it was enacted by the Common Law Procedure Act of 1854 (17 and 18 Vict. c. 125, s. 20), that any person who should declare that the taking of an oath is, according to his religious belief, unlawful, should be entitled to substitute an affirmation, or D., and that persons making a false affirmation should be subject to the same punishment as for perjury. In the following year (1855), these provisions were extended to Scotland by 18 Vict. c. 25, s. 1; and by s. 2, the Queen is empowered, by an order in council, to direct the provisions of the act to be applied to all courts in Scotland; by which would seem to be meant all courts other than the 'courts of civil judicature' mentioned in the first section, i. e., to all criminal courts.

DECLARATION, DYING. The rule that secondary or hearsay evidence is inadmissible, suffers an exception, both in England and Scotland, in the case of a declaration made by a person under the conviction of his impending death, and who does not survive the trial. Such declarations are of peculiar value for the ends of justice, where the party emitting them dies of injuries which are the subject of the prosecution.

In cases of murder, the dying D. of the sufferer as to the circumstances of the crime is always admitted as evidence on the trial of the prisoner, provided that it was deliberately emitted while the deceased was in possession of his faculties, and that it is proved by creditable witnesses. If it be possible, the dying D. should always be committed to writing, and tested in the most complete manner that is consistent with the circumstances in which it is emitted. In cases of necessity, however, it may be proved by parole evidence. As to the other cases in which secondary or hearsay evidence is admissible, see EVIDENCE.

DECLARATION IN CRIMINAL PROCEEDINGS. In Scotland, the statement made by the prisoner before the magistrate (see STATEMENT) is called his declaration. It is the duty of the magistrate to take this D. immediately on the prisoner being brought to him—that is to say, if he is in his sober senses. The magistrate must previously inform him that it is entirely at his own option to declare or not, but that if he chooses to declare, the D. may be used in evidence against him on his trial. In practice, the examination is generally conducted by the procurator-fiscal, who knows more of the facts of the case than the presiding magistrate. It is taken down by the clerk of court, the magistrate usually dictating to him the form of words which he conceives will most accurately convey the meaning of the prisoner, in case of his statement being of such a rambling description as to render the writing down of the very words impossible. The D. ought to contain the name, age, and designation of the prisoner, the parish, and county in which the crime is said to have been committed, and all similar particulars. When completed, it must be read over to the prisoner, who, if he is able to write, signs every page of it along with the magistrate. If he cannot or will not write, the magistrate signs it in his stead. There must, moreover, be two witnesses present, who shall sign the D., and who, if necessary, can speak to the manner in which it was taken. If the prisoner does not understand English, a sworn interpreter must be employed. The D. will be incompetent to be produced as evidence if the magistrate has delegated the duty of taking it to his clerk, or to any one not a magistrate. As the D. is not emitted on oath, it will not be allowed to be produced or used for the purpose of criminating any one else whom the prisoner may have named as a participator in his crime.

DECLARATION OF RIGHTS. See RIGHTS.

DECLARATOR, a form of action in the Court of Session in Scotland, the object of which is judicially to ascertain a fact, leaving its legal consequences to follow as a matter of course. Such are declarators of property, of contravention under an irritancy in an Entail (q. v.), of non-entry, of marriage, of bastardy, and many others.

The declaratory conclusions of such actions are generally followed by petitory or possessory ones, for the purpose of giving effect to the right declared; but this is by no means necessarily

so. A substantial interest on the part of the pursuer must, however, in all cases be shown, as it is not competent to ask the court to declare a mere abstract fact or right. The existence of this special form of action has contributed to diffuse in Scotland a false view as to the nature of actions and judicial proceedings generally, from which many even eminent lawyers have not been free. It is said that decrees upon actions properly declaratory 'confer no new right, but only declare that a right exists in the pursuer,' as if in this case they were an exception to decrees in general, whereas it is obvious that no decree can confer a new right on the pursuer, otherwise than by committing an act of injustice against the defender. In England there are no actions of D., an arrangement often wondered at in Scotland, but in which the English seems to be more logical than the Scotch law, inasmuch as all actions are actions of declarator.

DECLENSION, a grammatical term applied to the system of modification called *cases*, which nouns, pronouns, and adjectives undergo in many languages. How the words Declension (Lat. *declinatio*, a declining or leading away) and Case (Lat. *casus*, a fall) came to be applied to this species of inflection, has never been made altogether clear. The relations in which one thing stands to other things may be expressed in either of two ways. Some languages make use of separate words, called prepositions; in others, the relations are expressed by changes in the termination of the name of the thing. Thus, in Latin, *reg* being the root or crude form of the word for 'king,' *regis*, or *rex*, is the word in the nominative case, signifying 'a king' as subject or agent; *regis*, in the genitive case, 'of a king'; *regi*, in the dative, 'to a king.' An adjective joined to a noun, usually takes a corresponding change. The number of cases is very different in different languages. The further we go back in the history of the Indo-European languages, the richer do we find them in these modifications. Sanscrit had eight cases, Latin six, and Greek five. The names of the Latin cases, which are often used also in regard to the English language, are—the Nominative, which names the subject or actor; the Genitive, expressing the source whence something proceeds, or to which it belongs; the Dative, that to which something is given, or for which it is done; the Accusative, the object towards which an action is directed; the Vocative, the person addressed or called; and the Ablative, that from which something is taken. The Greek has no Ablative case. The Sanscrit, in addition to the Latin cases, has an Instrumental case, and a Locative case. The grammar of the inflecting languages is complicated by the circumstance, that all nouns do not form their cases in the same way. This makes it necessary to distribute nouns into various classes called 'declensions.' In Latin, as many as five declensions are usually given. See INFLECTION.

As we descend the stream of time, the case-endings become rubbed off, as it were, and prepositions are used in their stead. The languages descended from the Latin (French, Italian, &c.) have lost all the cases of nouns and adjectives. The Gothic languages, of which Anglo-Saxon is one, had cases almost as numerous and perplexing as those of the Latin. German is still to a great extent encumbered with them. English has only one case in nouns differing from the nominative—namely, the genitive, or possessive. See NOUN. The declension of pronouns (q. v.) has been more persistent than that of nouns and adjectives. Languages of the agglutinating order have, in general, a great abundance of cases. In Finnish, nouns have fifteen cases. Thus, *karhu*, a bear; *karhun*, of a bear; *karhuna*, as a bear; *karhutta*, without bear; *karhussa*, in the bear; *karhusta*, out of the bear, &c. In the Magyar, twenty cases may be reckoned; and the languages of the North American Indians are richer still—perhaps we should say, more embarrassed. What case-endings and other inflectional terminations were in their origin, as well as the comparative merits of the highly inflected and the analytic languages, will be considered under INFLECTION.

DECLINATION. If a great circle be drawn through the pole or the heavens and any star, the D. of the star is the portion of the circle intercepted between the star and the equator. See POLE. The place of a point in the heavens is determined by its right ascension and D., just as a point in the earth's surface is determined by its latitude and longitude.

DECLINATION NEEDLE. When a magnetic needle is suspended or made to rest on a point so as to be free to move in a horizontal plane, it finds its position of rest in a line joining two fixed points on the horizon; and when made to leave that position after several oscillations, it returns to it again. At certain places on the earth's surface, these two points, are the north and south points of the horizon; but generally, though near, they do not coincide with these. A vertical plane passing through the points on the horizon indicated by the needle, is called the magnetic meridian, in the same way that a similar plane, passing through the north and south points, is known as the astronomical meridian of the place. The angle between the magnetic and astronomical

meridians is termed the declination or variation of the needle. Thus, if NS (fig. 1) be the line of the astronomical meridian, and *ns* the line joining the poles of the needle, the angle NC*n* is

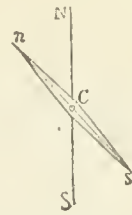


Fig. 1.

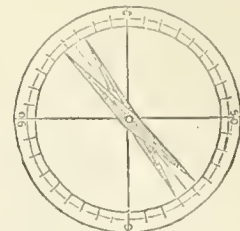


Fig. 2.

the declination. The declination is east or west according as the magnetic north lies east or west of the true north.

Instruments for determining magnetic declination are called declination needles or declinometers. In this instrument there are two things essential—the means of ascertaining the astronomical meridian, and a needle for showing the magnetic meridian. Fig. 3 represents a common form of the declinometer. Upon a tripod provided with levelling screws stands the pillar P, to which is fixed the graduated azimuthal circle CC. The compass-box B, with the vernier V, attached to it, moves on the azimuthal circle by means of a pivot at the pillar P. Two uprights, U, U, are fixed to the side of the compass-box, on the tops of which rests the axis of the telescope T. A graduated arc A, is fixed to the bottom of one of the uprights, and the angle of elevation of the telescope is marked by the vernier on the arm E, attached to the axis of the telescope.

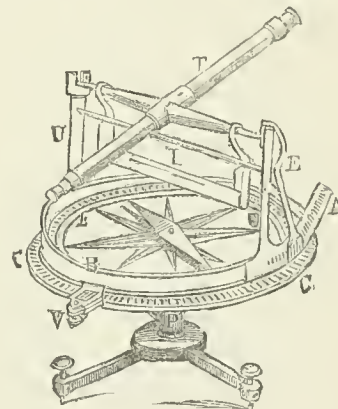


Fig. 3.

A level L, is also hung on the axis of the telescope, for adjusting the instrument. Inside the compass-box is another graduated circle F, the line joining the zero-points of which is parallel to the axis of the telescope. All the fittings are in brass or copper, iron, of course, being unsuitable. It will be easily seen that the compass-box and telescope move round as one piece on an axis passing through the center of the azimuthal circle. When an observation is made, the telescope is pointed to a star whose position with regard to the astronomical meridian is known at the time of observation. The telescope with the compass-box is then brought to the proper number of degrees on the azimuthal circle, until its axis is in the meridian of the place. If, when the telescope is in this position, the north end of the needle stand at the zero-point of the inner circle, the declination would be 0°; but if it lie east or west of this point, the declination is shown by the degree at which the needle stands. It is difficult to construct a needle so that the line joining its poles exactly coincides with the line joining its visible extremities.

If this coincidence be not perfect, the geometrical axis of the needle according to which the reading is made lies to the right or left of the magnetic axis, and consequently of the true reading. To remedy this, the needle is so made that it can rest either on its lower or upper surface. In finding the true reading, the position of the needle is marked, and then it is turned upside down, and again marked, the mean of the two readings giving the true one. This is easily seen in fig. 2. The declination of the needle may be also ascertained by the 'Dipping Needle' (q. v.). The ordinary compass which must be used by making allowance for declination, is a declination compass. See MAGNETISM.

DECLINATURE, in Scotch Law, a preliminary plea declining the jurisdiction of the judge, either on the ground of his being interested in the suit, or of the case being beyond his province.

In England, it is spoken of as a plea to the jurisdiction on the ground of interest, &c.

DECO'CTION is the term applied in pharmacy to the solution procured by boiling an organic substance with water.

DECOLORIMETER is an instrument for determining the power of portions of bone-black or animal charcoal to abstract coloring matter. See **BONE-BLACK**.

DECOMPOSITION is a term employed in chemistry to signify the separation of more simple substances from a compound. Thus, when the red oxide of mercury (HgO) is heated, it suffers *D.*, and is resolved into mercury (Hg) and oxygen (O); and water (HO), when subjected to a current of voltaic electricity, is decomposed into hydrogen (H) and oxygen (O).

DECOMPOSITION OF FORCES. See **COMPOSITION**.

DE'CORATED STYLE of Gothic Architecture. During the reigns of the first three Edwards, from the latter part of the 13th till nearly the end of the 14th c., Gothic architecture may be said to have been in full bloom in England. It attained perfection somewhat earlier in France and Germany, and somewhat later in Scotland, and consequently the buildings on the continent which correspond to what is called the *D. S.* in England, belong, for the most part, to the beginning, and those in Scotland, for the most part, to the end of the 14th century. The decorated style arose so gradually out of the style which preceded it, and merged so gradually into that which followed it, that it is not wonderful that different periods of duration should be assigned to it by different writers. The longest, probably, is that mentioned by Britton, from 1272 to 1461; and the shortest by Rickman, from 1307 to 1392.

In fixing on the middle of the 14th c. as its highest point, however, they are all pretty much agreed, and the same agreement is exhibited in recognizing it as the most perfect of the Gothic styles. The decorated was a higher development of the early English style, all the peculiarities of which, both in its forms and in its adornments, it exhibited in greater perfection and richness; and it is remarkable that when we pass from it to the more elaborately florid style which succeeded it, the degeneracy in sculpture is as perceptible as in architecture. It seems, indeed, as if the school of art which we regard as the peculiar production of the middle age, then attained, in all its branches, to a point which admitted of no further progress in that direction. Nor is this remark confined to art, as addressed to the eye, for that it applies equally to poetry will be at once admitted, when it is remembered that the era which we have assigned to the decorated style throws it almost entirely within the period which is covered by the long life of Chaucer. It is a striking instance, moreover, of the intimate relation which subsists between the æsthetic and the general life of a nation, that it was at this very same period that the social, political, and religious institutions of medieval life culminated. Chivalry and feudality were in the fulness of their vigor, and the church had only just begun to give employment to the innovating minds of the first reformers. Of all the epithets which have been employed to characterize this style—absolute Gothic, pure Gothic, complete Gothic, and the like—that of the 'middle pointed,' is, perhaps, the most descriptive; the simple pointed arch, described from an equilateral or obtuse-angled triangle, being retained, but the window being enlarged, divided by mullions into several lights, and the heads filled with tracery. Of this, as of all the other styles of architecture, the most characteristic feature of all is unquestionably the capitals of the pillars. Of the



Decorated English Capital:
York Cathedral.

foliage which is employed in the decorated capital, Mr. Bloxam remarks, that it 'may generally be distinguished from that of the early English by its not rising from the neck moulding with stiff stems, but being carried round the bell in something of a wreath-like form. . . . It often exhibits much of natural freedom; and we frequently find the oak, the ivy, the hazel, the vine, the fern, &c., very beautifully and closely copied from the natural leaves.'

DECOUPLE, or **UNCOUPLED**, in Heraldry, is severed or disjointed, so that the ends stand at a distance from one another, as a *chevron decouplé*.

DECOYING OF CHIL'DREN. The crime of stealing human creatures, the *plagium* of the Roman law and of the law of Scotland, is severely punished by the legislation of every civilized country. In countries where slavery does not exist, the theft of a human adult is a crime which can scarcely occur. Where a free man is wrongously captured or detained, the crime is not theft, but wrongous imprisonment, which will be dealt with by the criminal law as an injury to the public, while at the same time the individual will be entitled to recover damages for the injury

which he has personally sustained. Formerly, it was regarded as treason to the king, inasmuch as it was a wrongful detaining of his free liegeman without his license or commission, and as such was punishable with death, both in England and Scotland (Hume's *Com.* i. p. 83). The only form in which the crime has been dealt with in modern times is that of child-stealing, for which sentence of death was pronounced in Scotland so lately as 1817; but the libel is now invariably restricted, in which case sentence of transportation has usually been pronounced. In England, the offence is statutory, it being enacted by 9 Geo. IV. c. 31. s. 24, 'That if any one shall maliciously, either by force or fraud, lead or take away, or decoy or entice away, or detain any child under the age of ten years, with intent to deprive the parent or parents, or any person having the lawful care of such child, of its custody, or to steal any article upon or about its person; or if any person shall receive or harbour such child for such purposes, every such offender shall be guilty of felony, and liable to be transported for seven, or to be imprisoned for two years; and if a male, to be thrice whipped.' The act does not apply to any person who shall have claimed to be the father of an illegitimate child.

DECREE, in Theology. See **PREDESTINATION**.

DECREE, or, as it is frequently called in Scotland, a *Decreet*, is a final judgment of a court, whereby the question at issue is set at rest. In England, it is more commonly applied to the final judgments of courts of equity.

DECREE IN ABSENCE, in Scotland, is equivalent to a judgment by default in a common law court, or a decree *pro confesso* in Chancery.

DE'CREMENT, **DECRES'CENT**, and **DECOURS**, are heraldic terms by which the wape of the moon is indicated. A *moon decrecent*, is a half moon with her horns turned to the sinister.

DECREPITA'TION is the term applied to the crackling sound heard when a substance like common salt is thrown upon a fire. A series of minute explosions occur, owing to the water between the plates of the crystalline particles becoming expanded by the heat, and ultimately bursting them.

DECRESCE'NDO, in Music, is the reverse of *crescendo*—viz., a gradual diminishing of the sound. The executing of the *decrescendo* is very difficult, whether on one or more notes. Like the *crescendo*, it is frequently combined with a slight *ritardando*, especially in descending passages.

DEC'RETALS. The body of the canon law consists, 1st, of the *Decretalium*, a collection made by Gratian, a Benedictine monk, after the middle of the 12th c., in imitation of the Roman Pandects, and drawn from the opinions of the Fathers, popes, and church-councils; 2d, of the *Decretalia*, collected by Pope Gregory IX., nearly a century later, from the decretal receipts or epistles of the popes, as the code of Justinian was from the constitutions of the emperors. To these, additions were made by several succeeding popes. See **CANON LAW**.

DEDU'CTION is a particular kind of reasoning or inference. In ordinary language, to deduce means to trace one thing to another as its cause, to show that one proposition follows from some other proposition or propositions. In logic, its signification is more definite. It is usual to oppose Deduction to Induction (q. v.), and to say that the latter consists in reasoning from particulars to generals, the former in reasoning from generals to particulars. In fact, however, every step in a deduction is also an induction. The several steps of a train of deductive reasoning consist of Syllogisms (q. v.), and the major proposition of a syllogism is an induction, or a general proposition expressing the result of a previous induction. The whole object of this kind of reasoning is to show that some particular case or phenomenon really has the marks which bring it under the class to which the general proposition was meant to apply. Thus, the equality of the angles at the base of an isosceles triangle is deduced from the general proposition, 'That magnitudes which can be applied to one another so as to coincide are equal,' by showing that the angles in question can be so applied.

Deduction is more properly opposed to Experiment. Suppose the question to be as to the relation between the spaces and times in falling bodies, the point may be determined in two ways. We may institute experiments, and observe how far bodies *do* fall in different times, and conclude a general proposition from the particular instances we observed; or we may bring the case under two general principles already established, those, namely, expressed in the first law of motion, and in the nature of gravity as a moving force, and calculate from these how far bodies *will* or *must* fall in given times. The conclusion or law arrived at in both cases is the same; but in the one case it is experimental, in the other deductive. It is the tendency of all sciences to become more and more deductive. Knowledge put on a deductive basis is sometimes spoken of as science, *par excellence*, and the immediate results of observation as empiricism. Mathematics is essentially a deductive science, and most of the truths in natural

philosophy have been gradually put on similar grounds. Chemistry remains almost wholly experimental; it can predict or deduce little or nothing regarding an untried case, except, perhaps, the proportion in which two bodies will combine. See REASONING.

DEE, the name of two rivers in Scotland. The larger and more important rises in five wells 4000 feet above the sea, near the top of Braeriach Mountain, in the neighborhood of Cairntoul and Ben Macdui, 25 miles north-west of Castleton of Braemar. After flowing 12 miles south-south-east, it joins the Geauley, at the height of 1294 feet above the sea. It then tumbles through a narrow chasm in the gneiss rock, called the Linn of Dee, across which a person can leap. After this it runs east-north-east through Aberdeenshire and a small part of Kincardineshire, and ends in the German Ocean at the harbor of Aberdeen. In this course, 96 miles in all, it receives a number of tributaries—the Lui, Muie, Fegh, &c. The basin of the Dee, which is about 1000 square miles in area, consists of granite and gneiss in nearly equal areas. In the gneiss occur many beds of primitive limestone, and some masses of trap-rock and serpentine. On the Dee are Balmoral Castle and several villages much resorted to in summer—Castleton of Braemar, Ballater, Aboyne, Kincardine O'Neil, Banchory-Ternan, and Cults. The soil on the Dee is light and sandy, and requires much rain. A railway extends up Deeside for 43 miles, from Aberdeen to Ballater. See BALMORAL and BRAEMAR.—The smaller DEE rises in Kirkcudbrightshire, near the northern boundary of that county. Its general direction for the first 40 miles is south-easterly, after which it flows west to the Solway Firth, into which it falls at Kirkcudbright Bay. The D. divides Kirkcudbright into two nearly equal portions, and near the center of the county it expands to about the average breadth of a quarter of a mile, preserving this appearance for about 10 miles of its course, and forming successively Loch Ken, Loch Dee, and Long Loch. It is about 50 miles in length, and is navigable for the last 7 miles. The waters of the D. are noted for their salmon, which are of a darker hue, and are fatter than those of most rivers in the south of Scotland.

DEE, a river in England, draining parts of the shires of Merioneth, Denbigh, Flint, and Salop, in Wales, and the west of Cheshire. Near Trevor, it is crossed by the Ellesmere Canal, on an aqueduct 1007 feet long and 120 high; and also by the stone viaduct of the Chester and Shrewsbury Railway, of 19 arches, each 90 feet span and 150 feet high. Below Trevor, the D. winds first south-east, and then north-east and north to Chester, which city it nearly encircles. At Chester, it is 100 yards broad, and runs alongside marshes in an artificial tidal canal 9 miles long, and admitting ships of 600 tons. It ends in the Irish Sea, in a tidal estuary 9 miles long and 3 to 6 miles broad, and forming at high water a noble arm of the sea; but at low water a dreary waste of sand and ooze, with the river flowing through it in a narrow stream. Its whole course is 80 miles long, and its chief tributaries are the Treveryn, Alwen, Ceirog, Glyweddog, and Alyn. Its upper basin chiefly consists of Silurian strata, and its lower of new red sandstone. Canals connect the D. with the rivers of Central England. The ancient Britons held its waters sacred.

DEE, JOHN, a celebrated astrologer and mathematician, was the son of Rowland Dee, 'gentleman-sewer' to Henry VIII., born in London, 13th July 1527, and educated at St. John's College, Cambridge. After residing for some time at the university of Louvain, he went in 1550 to Paris, where, at the College of Rheims, he read lectures on the *Elements* of Euclid with very great success. In 1551, he returned to England, was presented by Cecil to Edward IV., and pensioned; but during the reign of the 'Bloody Mary' he nearly lost his life. He again set out for the continent in 1564, ostensibly for the purpose of presenting to the Emperor Maximilian a book which he had previously dedicated to him. Lilly, however, in his *Memoirs* (p. 224), affirms that he acted as Queen Elizabeth's 'intelligencer' or spy, and this theory is probably the true one. Lilly says that he was 'a ready-witted man, quick of apprehension... and excellent in all kinds of learning'; while the professional mask which he wore, the pretensions he made of being able to raise and converse with spirits, served to prevent all suspicion.

The impression that D. had dealings with the devil, seems to have become more prevalent the longer he lived. In 1576, a mob assembled around Mortlake, his country residence, and, attacking the house, broke his instruments, and destroyed his library, which was large and costly, and his family escaping with difficulty.

In the year 1581, having taken into his service an apothecary of the name of Kelly as assistant, D. visited various continental courts, pretending to be able to raise spirits. Whether he took to this strange profession through a sincere belief in what he professed, or adopted it merely as a blind, a pretext for visiting foreign courts at which he had more serious business to transact, it is impossible to say. In 1595, he was appointed warden of Manchester College, where he resided nine years, and whence he returned to Mortlake. His death took place in 1608, in the 81st year of his

age. He died very poor. Dee's writings are very numerous; they are chiefly scientific treatises, and many of them are still in manuscript in the Cottonian and other collections. In 1842, the Cambridge Society published the *Private Diary* of Dr. John Dee, with a catalogue of his library of scientific MSS. made by himself.

DEED, in Law, is a formal written expression of something done by the party or parties from whom it proceeds. The term is applied to almost every form of legal writing, and will subsequently be treated under various heads. See INDENTURE, CHARTER, WILL, DISPOSITION. As to the manner in which deeds are executed in England, see SIGNING, SEALING, and DELIVERING; and in Scotland, see TESTING CLAUSE, WITNESS, HOLOGRAPH, REGISTRATION OF DEEDS AND WRITS.

DEEMSTER, DEMPSTER, or DOOMSTER, the name of an officer formerly attached to the High Court of Judiciary in Scotland, who pronounced the doom or sentence of condemned persons. The office was held along with that of executioner. At the conclusion of a trial, this dread official was produced in open court, in presence of the wretched criminal, as is graphically described by Scott in his tale of *Old Mortality*. See notes to that work, and also notes to *Heart of Mid-Lothian*. The office of deemster has been long abolished. In the Isle of Man (q. v.) and Jersey (q. v.), DEEMSTERS are a kind of judges.

DEER, (Ger. *thier*, meaning 'beast'—a sense which the Eng. *deer* once had; Gr. *ther*, Lat. *ferus*), a Linnaean genus of ruminant quadrupeds, now constituting the family *Cervidae*, which some naturalists have divided into a number of genera, whilst others still regard it as forming only one, the distinctions between its groups not seeming to them sufficiently marked or important for generic characters. Deer are animals of graceful form, combining much compactness and strength with slenderness of limb and fleetness. They use their powerful horns for weapons of defence, and sometimes of offence; but in general they trust to flight for their safety. They have a long neck, a small head, which they carry high, large ears, and large full eyes. In most of them there is, below each eye, a sac or fold of the skin, sometimes very small, sometimes of considerable size, called the *suborbital sinus*, *lacrimal sinus*, or *tear-pit*, the use of which is not well known. Deer have no cutting teeth in the upper, but eight in the lower jaw; the males have usually two short canines in the upper, but neither sex has any in the lower jaw; the premolars are three, and the true molars three on each side in each jaw. They are distinguished from all other ruminants by their branching horns (antlers), which in most of the species exist in the male sex only; they are solid and deciduous, i. e., fall off annually, and are renewed with increase of size, and of breadth of palmation, and number of branches, according to the kind, until the animal has reached old age, when the size of the horns begins to diminish on each annual renewal. The size and development of the horns are indeed closely connected with the sexual system, and their annual renewal takes place just in time for the rutting season, when they are much used in fierce combats. Females with diseased ovaries sometimes exhibit horns like those of the male.

The annexed cut represents the horns of the stag at different ages. During the first year, there is only a slight protuberance; the second year is marked by the *brow antler* (1); the third year, by the *bay antler* (2); the fourth, by the *tray antler* (3); the fifth, by the *crockets* (4); the sixth, by the *beam antler* (5), the various parts of which are termed (A) *crockets*, (B) *tray*, (C) *bay*, (D) *brow*, (E) *pearls*, (F) the *beam of the antler*; beyond the 6th year (6).

The horn of a deer is a continuation of bone from the outer table of the skull, and is at first clothed with a velvet-like covering (the '*velvet*'), continuous with the outer integuments of the head,



which, however, is soon rubbed off—the animal appearing to be impelled by some irritation to rub against trees or rocks—leaving the horn hard and solid, with traces of the course of the many vessels which were employed for its production. The growth of the horn is very rapid. When the old horn has been cast, there is a wound which bleeds a little, but is soon skinned over with a fine film, and the new horn almost immediately begins to sprout. Cast-horns are very rarely found in deer-forests, a circumstance

that has never been quite satisfactorily accounted for. The growth of the horn is attended with much heat, and the blood-vessels which supply the head enlarge in size. The last part of the process is the formation of a rough circle of bony tubercles (the *burr* or *pearl*) at the base of the horn, bearing some proportion to the size of the horn and the age of the animal. It is by these, as they enlarge, that the nutritive vessels of the 'velvet' are compressed and obliterated.—Deer are pretty uniformly clothed with hair, longer and thicker in those which inhabit cold, than in those which inhabit warm climates. The tail of all the species is short. The horns of some are broadly palmated, those of others are rounded; and importance has been attached in classification to their having or wanting a distinct *snag* or short branch projecting in front from the base of the antler; which is present, for example, in the stag, fallow-deer, reindeer, and axis, and wanting in the roebuck, elk, and cariacon. The broad palmation of the horns of species inhabiting the coldest climates has been supposed to be intended for turning over the snow in search of food. One of the most beautiful adaptations in nature is a peculiarity of the foot of the reindeer, by which the hoofs separate to a remarkable width, and the greater extent of surface prevents the foot from sinking in soft snow. Deer are found in almost all parts of the globe except Australia and the south of Africa, their place in the latter region being supplied by antelopes in extraordinary number and variety.

Some of them live amidst the snows of very northerly regions, and some in tropical forests; the greater number inhabit the warmer temperate countries, and they are chiefly found in wide plains and hills of moderate height, none dwelling on those lofty mountain summits which are the chosen abode of some animals of the kindred families of *Antilopidae*, *Capridae*, and *Moschidae*, as the chamois, the bouquetin, and the musk. The flesh (venison) of most kinds of deer is highly esteemed for the table, and they have long been regarded as among the noblest objects of the chase. Only one species, the reindeer, can be said to have been fully domesticated and reduced to the service of man; although individuals of many species have been rendered very tame.

See AXIS, CARIACOU, ELK, FALLOW-DEER, MUNTJAK, REIN-DEER, RUSA, STAG, WAPITI, &c.—The MUSK (q. v.), although sometimes called Musk-deer, is not of the deer family.

DEER, or DEIR. OLD, a village and parish in the north-east of Aberdeenshire, in the district of Buchan. Here are vestiges of a Cistercian monastery founded about the year 1219, by William Cumyn, Earl of Buchan, on the site of a church believed to have been planted by St. Columba, and his disciple St. Drostan, about the year 580. A few MSS. which had belonged to the monks of Deir, found their way, after the Reformation, to the University Library at Cambridge; and among them one has been recently discovered, which has come to be known among archaeologists and philologists as the *Book of Deir*. It contains a copy of the gospels (in the Latin version of St. Jerome) and of the Apostles' Creed, in the handwriting of the 9th c., with a portion of a *Missa de Infirmis*, or 'Communion of the Sick' (containing a Celtic or Gaelic rubric), in a later hand. On the blank leaves at the beginning, in the handwriting of the early part of the 12th c., are a few notes or memorials, in the Celtic or Gaelic language, recording 'How Columelle and Drostan came from Hi to Aberdour, and how Bede the Pict, who was then Maormohr of Buchan, gave them the towns of Aberdour and Deir,' and how succeeding maormohrs, chiefs of clans, kings, and others, added to the immunities and endowments of the church of Deir. These notes or memorials are of great philological interest, as the only known examples of the Celtic speech of Scotland in the 12th century. They are also of great historical interest, as opening up glimpses of the social state of the country during the obscure period between the 7th and 12th centuries. The *Book of Deir* has been edited for the Spalding Club, by John Stuart, LL.D., the secretary. Mr. Bradshaw of Cambridge discovered the MS.

DEER-FORESTS are tracts of country devoted to the use of red deer, or fallow deer, either for sporting or for breeding purposes. The requisites of a Scotch deer-forest are a great extent of quiet ground, high mountain tops and corries, plenty of moorland and pasture. There is now little wood in Scotch deer-forests, and almost all other game, and cattle and sheep, must be excluded. The forest of Athole is nearly 200,000 acres in extent. The requisites of an English deer-park, on the other hand, are wood, lawn, with sufficient underwood, rough grass and ferns, in an enclosed and undulating country of rich soil. In Scotland, deer stalking and driving have largely increased during the 19th c. In 1812 there were only five forests; in 1882 there are more than seventy, and some have been greatly enlarged.

In England, since 1750, when fox-hunting superseded deer-hunting, deer are kept chiefly for breeding and ornament; being sometimes fed in stalls. There are, however, several packs of staghounds which hunt the red deer, e. g., in the high ground of Somerset and Devon. Before the civil war there were 700 parks

in England; now only 300, of which only 30 have red deer. Among the great Scotch forests may be noted: in *Aberdeenshire*, Ballochbuie, Mar, Glen, Tanar, Glen Muick; in *Inverness-shire*, Abernethy and Glenmore, Rothiemurchus, Ben Alder, Gick and Ruthven, Glen Feshie, Glen Strath Farar, Guisachan, Invermarkie; in *Perthshire*, Blackmount, Athol, Glen Bruar, Glen Artney; in *Ross-shire*, Dundonnell, Strathconan, Torridon, Kintail, Applecross, Wyvis, Diebidale, Kinlochewe, Glen Carron; in *Sutherland-shire*, Morsgail, Reay, Gildermorie, Parph. These forests occupy a space of nearly 3,000,000 acres. They are occupied chiefly by English noblemen and others, not the owners. The best-known English parks are at Erridge in Sussex, Talton in Cheshire, Northwich in Worcester, Duncombe in Yorkshire, Eastwell in Kent, Downton in Leicester, and the royal park of Windsor. Originally, in both England and Scotland, the king's nobles and the church held special forest jurisdictions of the most oppressive kind. Thus, in Scotland, the forester might forfeit cattle and other goods found within the forest. In England, the Norman lawyers pretended that all game belonged to the king. King John had 18 forests, 13 chases, 781 parks. A chase was an open forest, not subject to special forest law; a park was an enclosed chase on the land of the owner; a *purlieu* was an addition made to an old forest. The *Charta de Foresta* disafforested large tracts of land, and prevented the arbitrary creation of forests. In Scotland, the Stuarts passed many statutes for the protection of deer, and so late as 1680, in the case of Faskellie, the Court of Session recommended the king not to grant new forests, as hurtful to the lieges. In 1850 the Duke of Athol claimed a right to enter on the neighboring estates to recover deer, but this was not permitted. It is the opinion of many that deer-forests have displaced crofters and sheep in the Scotch Highlands. This was denied by a Select Committee of the House of Commons, who reported on the Game Laws in 1872. Although the majority of evictions have been caused by the enlargement of sheep-farms, many have been caused by deer-forests, which have also hindered the development of sheep-farms. Pasture which is sufficient for deer, is also sufficient for sheep, at least in summer. All such questions must be left to the judgment of the landlord, who may miscalculate his interest, or may be unable for want of capital to make forest-land ready for pasture. The damage done by straying deer is very serious, and the committee of 1872 suggested that the tenants of farms marching with a forest, might call on the owner of the forest to pay half the expense of a deer-fence. For the use of deer-forests, see the *Hand-book of Deer-stalking*, by Alex. Maerea (Edinburgh, 1880). One-tenth of the heather should be burned every year, the heather living 10 or 12 years; and in each forest a sanctuary should be provided. See also Manwood's *Forest Laws*; Shirley's *Account of English Deer-parks* (Lond. 1867); Macdonald on *Cattle, Sheep, and Deer* (Lond. 1872). Some dissatisfaction has been expressed that deer-forests and other shootings are not entered in the Valuation Roll for the purpose of assessment, unless they are actually let.

DEERMOUSE, or JUMPING MOUSE (*Meriones*), a genus of American rodent quadrupeds allied to mice and to jerboas, and differing from the gerbils of the warm parts of the Old World only in the greater length of their hind legs, the nakedness of the tail, and the existence of a very small tooth in front of the molars of the upper jaw. The D. or Jumping Mouse of Canada (*M. Canadensis*), common in that country, and often seen in summer and autumn, is a beautiful agile little creature, of the size of a mouse, with a very long tail, and very long slender hind legs. It is capable of taking leaps of four or five yards. It burrows, and passes the winter in a state of lethargy.—Another species, the Labrador Jumping Mouse (*M. Labradoricus*), inhabits the still more northerly parts of North America.

DEER-STALKING is the art of following the red deer by cautious manœuvring, for the purpose of shooting it with the rifle; and as practiced in the Highlands of Scotland, is perhaps unequalled as a sport in fatigue as well as in excitement. The extensive tracts of hill-land over which deer roam, and on which they are stalked, are termed 'deer-forests,' few of which, however, notwithstanding the appellation, can boast of a single tree; and where these 'forests' belong to noblemen and others peculiarly addicted to the sport, deer are strictly preserved, to the almost total exclusion of sheep and cattle. This sport is more highly esteemed, and greater sums are paid for it by its devotees than for any other in Scotland. This arises chiefly from two causes: 1st, from the intense excitement occasioned in the pursuit of the red deer; and 2d, from the comparative scarceness of good forests. Deer-stalking demands many expensive accessories, among which may be mentioned—deer-hounds, to pursue and bring to bay wounded game; one or more guides to accompany the stalker; and hill-men to *drive* the deer, when that method of obtaining shots is determined upon, &c. However excellent a marksman the deer-stalker may be, and though he may be tolerably conversant with the general 'lie' and bearings of the

ground, he is almost always accompanied by an experienced guide, upon whose cool judgment, keen eye, and thorough knowledge of every knoll and rock of the 'forest,' depends greatly his chance of obtaining a shot. A dress resembling in color as nearly as possible that of the ground to be gone over; a rifle of first-rate make, and previously practiced with at various distances; a deer-hound or more, that watch constantly in perfect silence for the slightest look or sign from their master; a robust constitution, to stand the fatigue of walking, crouching (sometimes in water), crawling, and advancing on the back, feet first, are some of the requisites the deer-stalker must possess. And when we add to these the most unflinching perseverance and untiring patience, we have not said all, for unless he is gifted by nature or experience with *nerve* to take instant and careful advantage of the rare opportunities a day's stalk may offer, his previous care and toil must go for nothing.

The deer-stalker should always be provided with a good telescope. The season for killing red-deer begins on the twentieth of October, and closes on the ninth of June. This sport depends more upon the vicissitudes of wind and weather than perhaps any other. Deer are gifted with very keen scent, a fact of which the stalker is well aware, and for which he must allow by advancing upon his game *up* the wind. They are also far-sighted, and exceedingly prone to take alarm at the slightest sound, faculties which warn the stalker never to let himself or his attendant be seen, and to observe the strictest silence. Deer, if disturbed, for the most part look for the cause as proceeding from the *low grounds*, and rarely from above; this peculiarity is duly taken advantage of by the sportsman, who accordingly advances upon his game, wind permitting (frequently by the most circuitous and precipitous paths), *down* hill. When thus approaching deer that are feeding in the valley below, the utmost caution is requisite, both as regards speed and the mode of progression. The stalker must advance inch by inch on his back, by resting himself on his elbows, and drawing himself forward by his heels; he must observe every motion of the deer, stopping when they stop feeding, and retaining his position, irksome though it be, till his game recommence pasturing; he must never, even for an instant, display the slightest unusual motion during his toilsome and stealthy advance, and must submit implicitly to every signal and whisper from his guide. During protracted stalks, especially when the nature of the ground between man and deer is free from sheltering knolls, the stalker's patience is tried to the utmost by his having to pause so frequently in his progress; the stalk, however, is usually directed not so much *directly* towards the deer, as for some intervening knoll or rock where a little relaxation of limb and breathing-time may be obtained, ere firing. Thus, if fortunate in properly winding the deer, and if the stalk has been successfully accomplished, the herd may be reached within 50 or 100 yards. The game may possibly consist of either a single stag, or some hinds and one or two stags; the finest of the latter is usually the aim of the true stalker, and the most deadly spot to aim at is behind the shoulder. If mortally hit, the animal frequently bounds away for twenty or more yards, and then falls dead; if not mortally struck, it will sometimes fall at the shot, and spring up again, and follow the retreating herd. It is then the deer-hound is slipped. When a deer is killed, and cannot be immediately conveyed home, the attendant instantly disembowels it, that the venison may not be tainted.

This operation is termed *grallocking*. The best stag in the herd is that which is the fattest, and has the finest antlers. See DEER. When there are more than one sportsman, or where the peculiarities of the ground are such as to render the task of stalking unusually difficult, hill-men are employed to drive the deer towards certain passes, behind which the shooters are previously concealed. On such occasions, the excitement produced by the gradually approaching and unsuspecting herd, mingled with the grandeur of the whole scene, as they at length rush through the fatal pass, is enough to try the nerves even of the most experienced stalkers. The Black Mount, belonging to the Earl of Breadalbane, and the Forest of Athol, belonging to the Duke of Athol, are the finest deer-forests in Scotland. The best work we know of on the subject of deer-stalking is Scope's treatise, published in 1838; 3d edit. 1847.

DEER-STEALING. By 24 and 25 Viet. c. 96, s. 13, it is enacted that any person who shall unlawfully hunt, snare, or carry away, kill or wound any deer kept in the enclosed part of a park, chase, or other enclosure, shall be guilty of felony, and shall be liable to two years' imprisonment, and hard labor. If the deer be in the unenclosed portion of the park, the punishment is a fine not exceeding £50, which the justice may modify as he shall see fit. The second offence, in every case, is to be considered felony. Suspected persons found in possession of venison, or of the head or skin of the deer, or of snares or engines for taking deer, who shall not be able to satisfy the justice that they came lawfully by the venison, or had a lawful occasion for the snare, may be fined a sum not exceeding £20. A like penalty

is imposed (s. 15) for setting engines for taking deer, and pulling down park-fences. By s. 16, deer-keepers and their assistants may seize the guns, snares, dogs, &c., of offenders who do not deliver them up on demand, and resistance on their part is declared to be felony. In Scotland, the offence of breaking into a deer-park and shooting deer is punishable as theft. Shooting a stray deer without the owner's consent, is punishable by fine. Though not entitled to kill deer trespassing on his property, the proprietor may drive them off (Stair, ii. 3, 68; Ersk. ii. 6, 14); and one of two co-proprietors may drive off deer against the will of another (Irvine, *Game-laws*, p. 13). There is a reference to deer in the present acts which regulate the duty on game licenses, and persons shooting them are always liable to the penalties imposed by these statutes. Hunting them with hounds is, however, excepted (see Paterson's *Game-laws*, p. 130.)

DEFAMATION. See LIBEL.

DEFAULT, JUDGMENT BY. Where the defendant in a cause has failed to make appearance or to lodge a sufficient plea, or other pleading, in due time the plaintiff may proceed to sign judgment by default. Where a writ of summons has been specially endorsed (see INDORSEMENT), the plaintiff on lodging an Affidavit (q. v.) of the service, may immediately sign judgment by default, and in eight days from the last day for appearance, execution may issue against the defendant. If the writ of summons have not been specially endorsed, the plaintiff may file an affidavit of service, or notice in lieu of service, and a statement of the particulars of his claim, and may after the expiration of five days enter final judgment for the amount. Judgment by default, for want of a plea, &c., may in like manner be signed on failure of the defendant to deliver a sufficient plea in the prescribed time. Judgment by default is not necessarily final. In case of non-appearance, it will be set aside on the defendant making affidavit as to the cause of non-appearance, and disclosing a ground of defence on the merits. If judgment have been for want of a plea, &c., it may also in general be set aside on an affidavit of merits. But in both cases, the defendant must suffer the costs of the proceedings.

DEFEASANCE, DEED OF (in English law). An instrument which defeats the force or operation of some other deed or estate; and that which in the same deed is called a condition, in a separate deed is called a defeasance. Defeasance is of two sorts, one applicable to freehold estates, the other to terms of years and other executory interests—*Bythewood*. Defeasance of the freehold is a collateral deed made at the same time with a feoffment (q. v.), or other conveyance, containing certain conditions, upon the performance of which the estate thus created may be defeated or totally undone.—*Stephen's Commentaries*. This deed owes its origin to the restrictions on the conveyance of land imposed by the feudal law. Under that system, every tenant of land was, by virtue of his tenancy, vassal; under a superior lord, to whom he owed suit and service. The consent of the lord was necessary for every change of vassal; and the law would not recognize a condition whereby, in a particular event, the land should revert to the original tenant, and the over-lord be thus forced to change his vassal. Hence, when a holder of land wished to obtain money on the security of his land, the conveyance to the lender was *ex facie* absolute; but a deed of defeasance was executed, in virtue of which the borrower, on payment of his money, could recover his land. In this manner mortgages were originally effected. In process of time, the practice of inserting conditions in the original conveyance became established, and from that period, deeds of defeasance have ceased to be in general use.

Lord Talbot, in the case of *Cotterel v. Purchase* (Ca. tem. Talbot 61), said he should always discourage the practice of drawing absolute deeds, and making a defeasance which wore the face of fraud.*

Defeasance of executory interests may be made at any time after the creation of the estate to which it refers. It must be made with the same formalities as those which created the estate, and between the same parties or their representatives.

DEFENDER OF THE FAITH, a title conferred on Henry VIII. by Pope Leo X., as a reward for writing against Martin Luther, in 1521. When the king afterwards suppressed the religious houses at the Reformation, the pope not only recalled the title, but deposed him. The title was afterwards confirmed by parliament (35 Henry VIII. c. 3), and has ever since been used by the sovereigns of this country. The corresponding title in Spain is, Most Catholic, and in France was, Most Christian King.

DEFERENT, an old term in Astronomy, signifying a circle on which the center of another circle moves, while a body is supposed

*The mode of conveying land in security in Scotland was formerly almost identical with that which in England was effected by a defeasance. The Scotch deed was called the absolute disposition with a back bond. See WADSET, DISPOSITION, HERITABLE SECURITIES.

to be moving on the latter itself. If we suppose the sun to be moving round a center in space, while the earth moves, say in a circle round the sun, then the sun is moving in the deferent. The term originated in the Ptolemaic System (q. v.).

DEFICIENT NUMBERS. A number is said to be deficient whose aliquot parts, or factors, added together make a sum less than the number itself: thus, 16, whose parts, 1, 2, 4, 8, make together only 15, is a deficient number.

DEFILADING is that part of the art of fortification which consists in determining the directions and heights of the lines of rampart, so that the interior may not be commanded by the fire of any works which the enemy may raise. Defilading is divided into horizontal and vertical. The object of the first is to prevent the lines being commanded in the direction of their length, or enfiladed; the prolongations of the lines, therefore, must avoid all points where hostile works could be erected.

Vertical defilading determines the height of rampart necessary to protect the interior from direct fire.

DEFI'LE, in Military Language, is the name given to any passage which is of such a nature that it must be traversed by troops only in column with a narrow front. Wherever free lateral movement is obstructed, is a defile; and a defile is a 'pass' when it cannot be avoided, without making a long circuit.

DE'FINITE PROPO'RTIONS, LAWS OF, in Chemistry. See **ATOMIC THEORY**.

DEFINITION is the explanation or statement of the meaning of a word, viz., either the meaning it usually bears, or that which the speaker or writer, for the particular purposes of his discourse, intends to annex to it. To give merely another synonymous name—to say, for instance, that 'Man is a human being'—is not commonly considered a definition at all. Names requiring definition mostly imply, or connote, a set of attributes. To define such a name, then, is to enumerate all the attributes connoted by it. Hence, definition is a kind of analysis. If we were to define 'Man' as 'a rational animal,' the definition would be imperfect; for no one would call such beings as Swift's Houyhnhnms men, which shows that, in the common acceptation of the word man, it connotes among other things a certain form. Definition, then, is of the nature of essential propositions; it conveys no information about the object to any one who is aware of the connotation of its name; it is only a statement of all the attributes, the absence of any one of which would make the object cease to be called by that name.

The definition 'Man is a rational animal,' though incomplete, is correct so far as it goes; though it does not enumerate all the essential attributes—i. e., all the attributes connoted by the name man, yet those it does enumerate are connoted by the name, and are sufficient to mark out its denotation—that is, to distinguish all the beings known to exist to whom it can properly be applied. Such is generally held, therefore, to be a complete definition, though logically imperfect; but to say that 'Man is a featherless biped,' involves a different kind of imperfection. The attribute featherless, though actually true of all men, and therefore serving to distinguish them from the only other bipeds, the birds, is no part of the meaning of the word, but is what logicians call an *accidental* attribute. This kind of imperfect definition is called a description. Such definitions are very common in science, and serve special purposes of classification. In Cuvier's *Animal Kingdom*, man is defined or described as 'a mammiferous animal having two hands.'

A distinction is generally drawn between definitions of names and definitions of things, or *nominal* and *real* definitions. A real definition is intended, it is said, 'to explain and unfold the nature of the thing.' In objection to this view, it is replied, that no definition can unfold the whole nature of a thing, and every true proposition respecting it unfolds some part of its nature: of all the propositions, then, unfolding its nature, how shall we distinguish those that define it from the others? This question has never been answered. The fact seems to be, that 'all definitions are definitions of names, and of names only,' but that many expressions that pass for definitions, are something more. They not only define the name of the thing, but they comprise a tacit assumption, that a thing with such attributes does or may exist. This is the case with the definitions of geometry; and it is from these tacit postulates that the consequences are deduced, and not from the mere definition of the meaning of a word.

As there can be no accurate discussion unless all the terms employed have a distinct meaning recognized by all parties, it is often necessary to have recourse to formal definitions of important names. One of the most effectual devices ever yet discovered for settling the signification of terms, is to declare the meaning *opposed* to what is intended; in this way any ambiguity in the language is at once done away with. Thus, the word 'natural' conveys no clear meaning of itself; but if we state what we mean to *exclude* when we use it, we narrow the variety of significations to

some one. We may oppose it to 'moral,' and then it means something connected with the world of matter; we may oppose it to 'constrained' or compelled, giving it the meaning of spontaneous or free; other contrasts are the 'artificial,' the 'distorted,' in copying or representing things, &c.

The scholastic logicians made definition consist in stating, first, the 'genus' that a thing belonged to, and secondly, the 'difference,' or peculiarities that separate it from all the other members of the same genus. This suits for natural history, and for all subjects analogous thereto. For example, if we were attempting to define 'Poetry,' we could not do better than proceed *per genus et differentiam*. Poetry belongs to the class of Fine Arts: it has all the characters common to Painting, Sculpture, Architecture, Music, &c. Consequently, if we are well acquainted with these other subjects, we can draw from them part of the characteristics that belong to Poetry; for example, its having for its end refined pleasure. We then inquire into the *difference* between it and the others, which we find to be the use of a peculiar medium or instrumentality—viz., thoughts expressed in language. If we would give a more particular account of the meaning, we should find it necessary to specify the *kinds* of poetry, or to find out the *differences* of epic, dramatic, lyric, &c.; which would be to define, not the subject itself, but its subordinate species. See J. S. Mill's *Logic*, vol. i. 182.

DEFLAGRA'TION is applied to the rapid combustion of ignited charcoal when a nitrate (such as nitrate of potash) or a chlorate (such as chlorate of potash) is thrown thereon. As chlorates do not occur naturally, it follows that deflagration with a natural salt indicates a nitrate; and if the deflagration be accompanied by a violet flame, it is characteristic of nitrate of potash (ordinary nitre or saltpetre); and if by a strong yellow flame, it is indicative of nitrate of soda (cubical nitre).

DEFLE'CTION is, generally, a change of course or line of motion of a moving body. The word deflection is also used as synonymous with Diffraction (q. v.).

DEFLUXION (Lat. *defluxio*), a discharge from a mucous membrane, especially of the air passages. It is synonymous with Catarrh (q. v.).

DE FOE, DANIEL, was born in London, 1661, and was the son of James Foe, a butcher. The prefix De was not added to the family name of Foe by our author until he had reached manhood. De F., whose father was a dissenter, was educated at a dissenting academy at Newington Green, where he remained until he had nearly reached the age of nineteen. In 1682, he began his career as author, publishing a pamphlet which contained strictures upon the clergy of that day. This was followed in 1683, by another pamphlet, entitled *A Treatise Against the Turks*. In 1685, he took part in the rebellion of the Duke of Monmouth, but luckily escaped being punished on its suppression. After this he engaged in trade, but a series of misfortunes finally determined him to forsake it.

In 1701, he published his famous satirical poem, *The True-born Englishman*, which was written in vindication of King William, and in answer to a poem in which he had been attacked, called *The Foreigners*. This poem proved a wonderful success; 80,000 pirated copies of it were sold on the streets at a trifling price.

During the same year, when the deputation that presented the famous petition of the freeholders of Kent to the House of Commons were illegally thrown into prison, De F. drew up, a few days after, a remonstrance, known in history as the *Legion Memorial*; and is said to have himself, in the disguise of a woman, presented it to the Speaker as he entered the House. In 1703, a complaint being made in the House of Commons regarding one of his recent publications, called *The Shortest Way with Dissenters* (1702), the whole tenor of which seems to have been misunderstood, he was apprehended, tried, found guilty, pilloried, fined, and imprisoned. While in prison, he wrote a *Hymn to the Pillory*; and here also he projected *The Review*, a periodical which he established on his release in August 1704, and continued to conduct for nine years. In 1706, Lord Godolphin, who admired the practical talent and literary vigor of De F., employed him as one of the staff of the commissioners to Scotland to bring about the Union. De F.'s knowledge of revenue, trade, and taxes was found to be of great value; and it is supposed that he was rewarded with a pension for his services on that occasion. His visit to Scotland enabled him to write a *History of the Union*. For some years after, De F. seems to have lived in comfortable circumstances, but gradually his numerous political enemies gathered voice again, and De F. was literally silenced by noise and obloquy; at last, however, roused by the insolence of the Jacobite party, he was once more tempted to write unwarily, and the result was that he was again (1713) apprehended, fined in £800, and committed to Newgate. After his release, De F. became sick of politics, and, fortunately for the world, sought rest in the sphere of imaginative literature. In 1719, appeared the famous *Robinson Crusoe*—the most popular of all his works. Its success was immediate. The publisher, who had accepted the book after all the others had refused it, is said to have

cleared £1000 by its publication—no small sum in those days. De F., in rapid succession, produced his other notable works of fiction. *Moll Flanders* (1721), *Journal of the Plague* (1722), *Colonel Jack* (1721), *Adventures of Roxana* (1724), and the *Memoirs of a Cavalier*, the last of which Chatham used to recommend as the best account of the Civil Wars extant, bears witness to De F.'s industry during these years. He died in April 1731. D.'s style, both in his political and imaginative works, is simple, clear, and vigorous. His fictitious narratives are characterized by an unparalleled appearance of truth. This is pre-eminently the case in the *Journal of the Plague*, which for a long time imposed upon the well-known Dr. Mead as genuine. See *Life by Lee*; and that by Minto (1882).

DEFORCEMENT, in English Law, is an ouster of the freehold (q. v.). It is the holding of any lands or tenements to which another person has right. In this sense, it includes as well an abatement, intrusion, disseisin, or discontinuance (q. v.), as any other species of wrong whatsoever, whereby he that hath right to the freehold is kept out of possession. But in its strict sense, it is only such a detainer of the freehold from him that hath the right of property, but never had any possession under that right, as falls within none of those injuries.—*Co. Litt.*, by Butler, 331 b. n. (1). The party thus wrongfully retaining possession was called the deforciant, and was said by Blackstone (2 *Comm.* 196) to have an *apparent right of possession*. There was this difference between a party retaining possession of the freehold by means of deforcement, and one who occupied by either of the other modes of ouster, that in the former case the party ousted had no right of entry (q. v.). This, previous to the reign of William IV., was a matter of some importance, inasmuch as the claimant was thereby debarred from recovering possession by means of entry or ejectment, and was driven to the more tedious process of asserting his right by a real action (q. v.). But by 3 and 4 Will. IV. c. 27, all real actions, except four, having been abolished, this distinction between deforcement and the other means of ouster has ceased to have the same practical importance.

DEFORCIANT, a title of the defendant in a suit for levying a fine on lands (q. v.).—The party wrongfully retaining possession of a freehold by Deforcement (q. v.).

DEFORMITIES. Varieties of form which mar the external appearance, may be *congenital* or *acquired*, according as they occur before or after birth. The former class was considered by the ancients to carry some important meaning in their mysterious shapes, and to show the anger of the gods; hence, they termed them *monsters*, from *monstrare*, to show; and even in later times, they were popularly believed to be the result of the most hideously unnatural combinations. Modern scientific writers have, however, made them a subject of special study, under the name Teratology (*teras*, monster, and *logos*, science), and their researches have shown that deformities generally depend on some arrest of development of the fœtus, or some accidental position it has got into, or some inflammatory disease which has caused unnatural adhesion of parts. It has been found that in 3000 births in Paris, there occurs about one monster. They generally follow some definite law. Deformities are more common among domestic than wild animals, among mammalia than birds, and very rare among fishes and the invertebrata.

It is a common belief, that the mind of the female parent has an influence over the shape of her infant; but although some singular coincidences have occurred, there is no scientific proof that such is really the case. This theory, however absurd, was eagerly adopted in the middle ages; it was, in fact, often appealed to in the interest of mercy as a loophole of escape for pregnant women, who, by the barbarous ignorance of the time, might be condemned to torture; and so universal has the popular belief in this theory become, that even at the present day no scientific demonstration to the contrary has proved sufficient to undermine it. Deformities are, however, in many cases, hereditary, as may be seen in the instances of additional fingers and toes, and of hare-lips.

It seems uncertain whether the male or female parent chiefly influences the occurrence of deformity in the offspring. One rarely seeks a case of hare-lip without being able to recognize a sort of tuck or shortening in the same feature of the mother; but the writer of this article knows a family of three with hare-lips, whose father alone is similarly deformed; and another family of three, with perfectly formed mouths, whose mother has an uncurved and extremely unsightly hare-lip.

The chief congenital deformities may be classed under the following heads:

Deformity as regards *number* of parts; as, for instance, the Sirens, who have *apparently* but a single inferior extremity, which tapers to a point; the Cyclopes with but one eye; or the head itself may be absent, or some organ, as the brain. Such deformities, from a deficiency of parts, may also result from amputation of portions of the limbs of the fœtus when still within the uterus by the pressure of the umbilical cord. Curiously enough, how-

ever, it often happens that this intra-uterine amputation of parts leads indirectly to an exactly opposite condition—namely, a multiplication of parts arising from the stumps left by these uterine amputations; the fœtus in the early stages of its growth appearing to possess something of the power of reproduction of parts observed in most of the lower orders of animals. The parts most commonly reproduced are fingers and toes, or, most commonly of all, only abortive portions of these, as little projections from the stump of the limb, with traces of nail, and sometimes a single joint with an imperfect bony development. We see a new growth of little fingers or toes according to the member lost, and this power shows itself sometimes without being preceded by such an injury, in additional fingers, toes, &c. These parts are generally close to the similar natural ones, but not always, as, for instance, an ear in the neck.

Deformity with regard to *size*. This may involve the whole body, as in dwarfs, of whom there have been some remarkable peripatetic specimens; the Corsican fairy was only 2 feet 7½ inches high; Mademoiselle Crachmi, the smallest lady who ever lived, died at 10 years of age, only 20 inches in height.

This kind of deformity is not necessarily hereditary; the father of Borowlaski, who was only 39 inches when 30 years old, had six children alternately short and tall; and dwarf women have brought forth infants as long, when extended as their mothers. One limb only may be diminutive. Of course, deformities the opposite to these exist, such as giants, or instances of premature or excessive local growth. O'Byrne, the Irish giant, measured 8 feet 4 inches when he died at the age of 22. Such individuals are generally subject to premature decay.

Deformity as regards *shape*; this results generally from retarded growth, the parts of the embryo not consolidating as growth advances, as in hare-lip; or from irregular muscular contractions, as in Club-foot (q. v.); or by two or more parts coalescing, as two fingers; or in Cyclopy, when both the eyes run into one.

Deformities of *color* are frequently co-existent with tendency to, or the presence of, some disease. There may be deficiency of coloring matter, as in albinos; or an apparent increase, as in *blue disease*, arising from the partition between the right and left sides of the heart not being completed; or from some coloring matter produced in the body, as in the mottled individuals shown in caravans.

Deformities of *continuity* occur from the lateral halves of the embryo not completely closing, as seen in clefts of the back, the palate, &c.

Acquired Deformities will be noticed under their special names.

DEGERANDO, JOS. MARIE, BARON, author and philanthropist, was born 29th February 1772, at Lyon, France. His family was originally from Italy. He studied at the College of the Oratoire of Lyon with a view to becoming a priest; but the persecutions of the revolutionists altered his plans. In 1797, he went to Paris. The *coup-d'état* of the 18th Fructidor compelled him to flee to Germany, where he entered the army of Massena as a common soldier. While at Colmar with his regiment, D. wrote a treatise, which was 'crowned' by the Academy, and which was afterwards enlarged and published under the title of *Des Signes et de l'Art de penser, considérés dans leurs Rapports Mutuels* (Par. 1800). In 1802 appeared his *De la Génération des Connaissances Humaines*, a precursor of his *Histoire comparée des Systèmes de Philosophie relativement aux Principes des Connaissances Humaines* (Par. 1803; German by Tennemann), which is reckoned the best French work on the History of Philosophy. It procured him, in the following year, admission into the Académie des Inscriptions et des Belles-lettres. About the same time, he was appointed Secretary-general to the Ministry of the Interior, and subsequently held a variety of high offices under Napoleon.

But D. is even better known, and has done more service, by his philanthropic than his philosophic writings. To the former class belong his excellent work, *Le Visiteur du Pauvre* (Par. 1820), which obtained the Montyon Prize, as did also his *Du Perfectionnement Moral*, &c. (Par. 1824), his *Cours Normal des Instituteurs Primaires* (Par. 1832), *Institutions du Droit Administratif* (Par. 1835), *Education des Sourds-muets de Naissance* (Par. 1827), *Des Progrès de l'Industrie* (1841). D. was elevated to the peerage in 1837, and died 12th November 1842, Vice-president of the Council of State.—His son, A. DEGERANDO, has written two interesting works—*Essai Historique sur l'Origine des Hongrois* (Par. 1841), and *Transylvanie et ses Habitants* (Par. 1845).

DE'GGENDORF, a town of Lower Bavaria, situated on the Danube, 29 miles north-west of Passau. It is well built, and has several churches, an hospital, an orphan-house, and a poor-house. D. has pottery and linen factories, and carries on a brisk trade in these articles, as well as in cattle, fruit, wood, &c. There is a remarkable church on the Geiersberg, possessed of a miraculous wafer, and having 'doors of grace,' which are only opened once in the year. Many pilgrims (often numbering more than 30,000

annually) flock hither, Pope Innocent VIII. having promised general absolution to all such as visited the church. Pop. (1880) 6226.

DEGLUTITION. See SWALLOWING.

DEGRA'DED, in Heraldry, means placed upon steps or degrees, as in a *Cross Calvary*.

DEGREE', in a College or University (Fr. *degré*, from Lat. *gradus*, a step), is a recognition of the student having made a certain step in advance, and having attained, as it were, to a certain resting-place in his academical career. The evidence of a degree is usually called a Diploma (q. v.). Degrees may be divided into various classes, according to the privileges which they confer. 1. They are either simple certificates of attainment granted by a competent authority; attesting either that the college or university granting them has ascertained the fact by examination—in which case they are ordinary degrees—or that the common fame of the individual is such that the learned body conferring the degree is willing to take it for granted, in which case they are honorary degrees. To this class belong our degrees in arts, and the honorary degrees of LL.D., D.C.L., and D.D., which are granted by most universities. 2. They are licenses to teach the branch of knowledge with which the holder is certified to be acquainted. To this class belonged all doctors', and probably all masters' degrees in the universities of the middle ages. See DOCTOR. 3. They are licenses to practice a certain profession or art. As the latter privilege is one in which the general community is more deeply interested than in either of the others, it is generally requisite to its full exercise that the university degree should be accompanied by a government license. These latter degrees—of which the degree of M.D. and D.C.L. (see DOCTORS-COMMONS) are the only ones known in this country—in this case resolve themselves into one or other of the former classes.

University degrees, like most institutions which have held their place in society long, arose out of public exigencies, and are not traceable to any single founder or to any single act. There is every reason to suppose that, substantially, they have existed for ages. The doctors or teachers of the law (*nomodidaskaloi*), so often mentioned in the New Testament—and probably the scribes also—were a class, taken, it would seem, very frequently from the sect of the Pharisees, but essentially distinct from them (Luke v. 17), possessing privileges very closely resembling those which were attached to the degree of a teaching doctor in after-times. In classical Greece, though far less formal than it afterwards became, education was probably more systematic than is commonly supposed. In the schools of Isocrates and Plato, Mr. Kirkpatrick, in his ingenious book on the *Historically received Conception of the University*, has traced not only substantially the function, but much even of the external organization of the university. He has shown also, very clearly, that it was the systematic training which had become necessary for success in public life that had called the Sophists into existence, and gave to them the marvelous social influence which they possessed. It was the ambition, not of the higher class of orators and statesmen alone, but of every noisy demagogue who aspired to notoriety, to come before the public with the prestige of having been the pupil of some famous Sophist, or, as we should say, of having been to a good school, and taken a good degree. All the appliances of modern teaching existed unquestionably in the Museum at Alexandria, and it is inconceivable that those who had passed through the *kuklos* or cycle of studies, should not have carried away some testimonial of proficiency very much resembling a degree. As there was a distribution both of teachers and students into what we should call the faculties of philosophy, philology, and medicine, it is probable, moreover, that there were distinct degrees corresponding to each of them. During the three centuries which intervened between Alexander and Augustus, Athens continued to be the great school of philosophy, as Rhodes was of oratory, and Alexandria of philology and medicine. The importance of an education in the Greek schools rather increased than diminished during the period of the Roman empire. So entirely, indeed, was the success of the young provincial in public life also dependent upon his literary acquirements, that, as Mr. Kirkpatrick informs us, students, before leaving the provinces for Rome, were obliged to obtain a written permission from a magistrate, and that a record of the proficiency of each student was sent in to the government, in order that the latter might be thereby guided in the selection of fit individuals for the public service. In Constantinople, moreover, down to the very last, lifeless and unproductive though the intellectual life unquestionably was, it was formally organized to an extent which reminds one of China rather than of any existing European nation. The worthless and contemptible Byzantines, male and female, like the Chinese, passed endless examinations, and took abundance of degrees.

After the incursion of the northern nations, the extreme rudeness of the general community of Western Europe caused the

learned class to stand out from it with a prominence unknown in the society of antiquity, and hence the greater importance which academical degrees assumed in the middle ages. A man who had passed through the trivium or quadrivium at Constantinople before barbarism had made learning rare, or who had received the far higher instruction which was communicated at the museum of Alexandria, by no means differed from the society which surrounded him to the same extent as did a master or a doctor at Paris or Bologna. The minutest history of academical degrees in the middle ages is involved in much obscurity. The following are passages from the above-mentioned work of Mr. Kirkpatrick, who has gone over the authorities with much care: 'Wood mentions (*Hist. and Antiq. of Oxford*, i. 50) that St. John of Beverley (680 A.D.) was commonly reported to have been the first who took the degree of Master of Arts at Oxford. The same writer informs us, that this degree had become common in the reigns of John and Richard I. According to Bulaeus (*Hist. Univ. Paris*, ii. pp. 256, 679, sqq.), academic degrees were first instituted at Bologna. The forms designative of the various orders of academic dignity in that university are stated to have been the Baccalaureatus, Licentiatatus, and Doctoratus. Of these, the last two were probably equivalent to the degrees of the master incipient and the magister socius or regent of Paris. Certain stadia, or successive courses of legal study, are said to have been in existence from the time of Justinian. The five years devoted to the acquisition of juristic knowledge were divided into the *Anni Justiniani*, *Edictales*, *Papinianistæ*, *Lytae*, and *Prolytae*. The student who had passed through all successively was described as a licentiatatus, from the circumstance that he was considered qualified to discharge the duties of an antecessor or public professor of this subject. The practice adopted in this respect by the schools of jurisprudence was afterwards transferred to theology at Paris by Peter Lombardus. The name Bachelor is supposed by Malden (*History of Universities and Academic Degrees*, p. 23) to have been borrowed from the terminology of the military hierarchy of those ages.' See BACHELOR. 'Bachelors are often styled scholars (Wood, *Hist. and Antiq. of Oxford*, i. p. 59), and the individual invested with this degree was regarded as, at the utmost, an imperfect graduate. At the same time, in accordance with the system of mutual instruction so thoroughly adopted in the schools of the middle ages, the more advanced class of scholars were both encouraged and commanded to perfect their own acquirements, and extend the educational influences of the university into the minutest ramifications of the system by teaching and catechising the junior members of their own body (Crevier, *Histoire de l'Université de Paris*, ii. p. 160).

Bachelors, though thus intrusted with certain tutorial functions, never possessed any of the legislative powers assigned to the masters'. It was to the teaching masters—and all who took the master's degree were bound to perform the duties of tuition for a time—that the term regent was applied both on the continent and in Scotland. On retiring from the office of regent, the master—at Paris, at least—ceased to take an active share either in the legislation or the government of the university (Bulaeus, par. iii. p. 420). The question as to whether the institution of teaching masters or regents ought to be revived, to the extent of permitting them to compete on equal terms with the endowed professors, was raised in Scotland some years ago. In the German universities, the Doctor, by a *Habilitation* thesis, qualifies himself to lecture in the university as *privat docent*; and from amongst the *doctores*, the professors are usually chosen. See BACHELOR, MASTER OF ARTS, DOCTOR, REGENT, UNIVERSITY.

DEGREE, in Music, is the difference of position or elevation of the notes on the lines and spaces. When notes are on the same line or space, they are on the same degree, even though one of the notes should be raised by a sharp, or lowered by a flat. When two notes follow diatonically, so that one of them is on a line, and the other on the space adjoining, the interval is of one degree. Subtracting one from an interval, gives the degrees which separate the two notes; thus, a third is separated by two degrees; a fourth, by three, &c.

DEGREE. See CIRCLE.

DEGREE OF LATITUDE is the space along the Meridian (q. v.) through which an observer must pass to alter his latitude by one degree—i. e., in order to see the same star one degree nearer to or further from the zenith. See LATITUDE. This space must be found by actual measurement; and owing to the earth being an oblate spheroid, and not a sphere, it varies with the place of observation—the degrees being generally longer towards the poles, where the earth is flatter, and shorter at the equator, where the earth is more curved. If the earth were a sphere, a degree would be exactly a 360th part of the meridian. As it is, the length of a degree of latitude depends on the latitude of the place. From a variety of observations conducted at various times and places, from as far back as the time of Eratosthenes (250 B.C.), tables have been constructed showing the length of

degrees at different latitudes. The length of 'the middle degree,' as it is called, or that of places in latitude 45° , may be taken approximately at $69\frac{1}{6}$ English miles. The ascertained differences between degrees of latitude is one of the proofs of the earth's sphericity. See GEODESY.

DEGREE OF LONGITUDE is the space between two meridians that make an angle of 1° at the poles, measured by the arc of a circle parallel to the equator passing between them. It is clear that this space is greatest at the equator, and vanishes at the poles; and it can be shown that it varies with the cosine of the angle of latitude. The annexed table shows the lengths of a de-

Degree lat	English Miles.	Degree lat.	English Miles.	Degree lat.	English Miles.
0	69.07	31	59.13	61	33.45
1	69.06	32	58.51	62	32.40
2	69.03	33	57.87	63	31.33
3	68.97	34	57.20	64	30.24
4	68.90	35	56.51	65	29.15
5	68.81	36	55.81	66	28.06
6	68.62	37	55.10	67	26.96
7	68.48	38	54.37	68	25.85
8	68.31	39	53.62	69	24.73
9	68.15	40	52.85	70	23.60
10	67.95	41	52.07	71	22.47
11	67.73	42	51.27	72	21.32
12	67.48	43	50.46	73	20.17
13	67.21	44	49.63	74	19.02
14	66.95	45	48.78	75	17.86
15	66.65	46	47.93	76	16.70
16	66.31	47	47.06	77	15.52
17	65.98	48	46.16	78	14.35
18	65.62	49	45.26	79	13.17
19	65.24	50	44.35	80	11.98
20	64.84	51	43.42	81	10.79
21	64.42	52	42.48	82	9.59
22	63.97	53	41.53	83	8.41
23	63.51	54	40.56	84	7.21
24	63.03	55	39.58	85	6.00
25	62.53	56	38.58	86	4.81
26	62.02	57	37.58	87	3.61
27	61.48	58	36.57	88	2.41
28	60.93	59	35.54	89	1.21
29	60.35	60	34.50	90	0.00
30	59.75				

gree of longitude for places at every degree of latitude from 0° to 90° . It is computed on the supposition that the earth is a sphere.

DEGREES OF LAMBETH. By 25 Henry VIII. c. 21, sundry powers formerly belonging to the pope were conferred upon the Archbishop of Canterbury, among which was the right of granting degrees. He can confer all the degrees taken in the universities of Oxford and Cambridge, but his degrees do not carry with them all the privileges which belong to degrees conferred by the universities.

DEGREES OF NOBILITY. See NOBILITY.

DEGREES OF RELATIONSHIP. See CONSANGUINITY, AFFINITY.

DEI GRA'TIA (Lat. 'by the favor of God'), is a formula taken from several apostolical expressions in the New Testament. It is believed to have been first formally used by the bishops at the council of Ephesus, 431 A.D. Afterwards, it came to be appended by archbishops, bishops, abbots, abbesses, deans, monks, and even chaplains, to their titles, in letters, and other documents, as a humble expression of dependence on the Most High. After the middle of the 13th c., when the sanction of the pope began to be considered necessary to ecclesiastical offices, the higher clergy wrote *Dei et Apostolicæ sedis gratiâ*, 'by the favor of God and the apostolic see.' At a later period, many of them preferred to write *miseratione divini, permissione divina*, and the like; but they still continued to be styled by others *Dei gratiâ*.

In the British Islands, this style was generally dropped about the time of the Reformation, but it was occasionally given to the Archbishops of Canterbury and York, even after the beginning of the 17th century. Beginning with the times of the Carolingians, many temporal princes, earls, and barons made use of the formula *Dei Gratia*; and before the 15th c., no idea of independence or of divine right seems to have attached to it. But in 1442, King Charles VII. of France forbade its use by the Comte d'Armagnac, and in 1449 obliged the Duke of Burgundy to declare that he used it without prejudice to the rights of the French crown. These instances show that it had now begun to be regarded as belonging exclusively to sovereigns who owed no allegiance to any other earthly potentate or power. In this way, what was originally a

pious expression of humility, came to be looked upon as an assertion of the doctrine of the 'divine right' of kings.

DEINOTHE'RUM. See DINOTHE'RUM.

DEISM properly means belief in a God, as opposed to atheism; but to express this sense, *Théisme* (q. v.) is the term used. On the other hand, Deism is generally understood to imply the denial of a revelation; and a Deist is one who holds the existence and providence of God, but grounds his belief on reason and evidence, rejecting the testimony of a revelation. The name is often used vaguely by way of reproach.

The term Deists, or Freethinkers, is sometimes used to designate a school or series of writers who appeared in England in the 17th and 18th centuries, and who aimed at establishing what they called Natural Religion, upon the basis of reason and free inquiry, and then bringing all positive or revealed religion to the test of this. They are looked upon as the precursors of German Rationalism in theology. The leading names in this school are Lord Herbert of Cherbury (died 1648); John Toland, whose *Christianity not Mysterious* (Lond. 1696) gave exact expression to the tendency of the Deists; Lord Shaftesbury; Anthony Collins (died 1729), the friend of Locke; Thomas Woolston; Matthew Tindal, the author of *Christianity as Old as the Creation, or the Gospel a Republication of the Religion of Nature* (Lond. 1730); Viscount Bolingbroke.

DE'KKER, THOMAS, a dramatist of some note, was born in the latter part of the 16th century. He appears to have applied himself industriously to his vocation, and is said to have written upwards of twenty plays, either wholly or in part. In company with Ben Jonson, he wrote for the Lord Admiral's theater; the two dramatists, however, afterwards quarrelled. D.'s chief plays are *Fortunatus, or the Wishing-cap*, and *The Honest Whore*. Hazlitt, who regarded the latter as a highly successful comedy, has said that it unites 'the simplicity of prose with the graces of poetry.' D. died about the year 1638. His poetic diction is choice and elegant, but he often wanders into absurdity. His life, like that of many of his contemporaries, seems to have been one of alternate revelry, want, and despair. Recently, D. has become better known by the re-issue of a work of his (not a play): called the *Gull's Hornbook*, which is full of interesting details of the manners of his time.

DEL (*Artocarpus pubescens*), a tree of the same genus with the Bread-fruit (q. v.), indigenous to the forests of Ceylon, and valuable on account of its timber, which is used both for house-carpentry and for ship-building.

DEL CRE'DERÉ COMMI'SSION, an Italian phrase, borrowed by the law-merchant to express the additional premium charged by a factor or agent, in virtue of which he warrants the solvency of the purchaser, and renders himself personally liable for the payment of the price of the goods sold. It is, in short, what is called a guaranty or warranty in England, and warrandice in Scotland. If the percentage on the price for effecting the sales be two and a half, two and a half more is usually charged as *del credere* commission.

DE LA BECHE, SIR HENRY THOMAS, a well-known geologist, was born near London in 1796. He was educated at the military school at Great Marlow, and entered the army in 1814. Three years after, he became a fellow of the Geological Society, of which he was afterwards made secretary, and eventually president in 1847. In 1820, while residing in Switzerland, he published a paper, *On the Temperature and Depth of the Lake of Geneva*. Shortly after, he returned to England; and in 1823, in conjunction with the Rev. Mr. Conybeare, he issued a paper, *On the Discovery of a New Fossil Animal, forming a Link between the Ichthyosaurus and the Crocodile*. This was the *Plesiosaurus*. In 1824, De la B. visited Jamaica, where he possessed some property, and while there he devoted himself to the geology of the country, and in two years published a paper on that subject. On his return to England, he wrote a variety of scientific papers, among which are the following: *On the Excavation of Valleys*, *On the Geographical Distribution of Organic Remains*, and his *Geological Manual* (1831), which met with a very cordial reception. He now undertook to form a geological map of England, in which the various formations should be distinctly marked. Shortly after he had begun, the government, sympathizing with his design, instituted the Geological Survey, and placed him at its head. In 1848, De la B. received the honor of knighthood; in 1851, he published the *Geological Observer*, with upwards of 300 woodcuts; and in 1853, was elected a corresponding member of the Academy of Sciences of Paris. He continued to discharge the duties of his position until within two days of his death, which took place on the 11th of April 1855.

DEACROIX, FERDINAND VICTOR EUGENE, a modern French painter, chief of the 'romantic school,' was born at Charenton-Saint-Maurice, near Paris, 26th April 1799. At the age of eighteen, he entered the *atelier* of the artist Pierre Guérin. In

1822, he exhibited his first work, 'Dante and Virgil.' It attracted much attention. The love of color, at the expense of accurate drawing, for which D. afterwards became conspicuous, is quite visible in it. It was highly praised, however, by M. Thiers among others.

In 1824, D., who was now at the head of the new school of young painters, produced the 'Massacre of Scio;' in 1826, the 'Death of Marino Faliero,' and 'Greece on the Ruins of Missolonghi;' in 1827, 'Christ in the Garden of Gethsemane,' 'Appearance of Mephistopheles to Faust,' 'The Blind Milton Dictating Paradise Lost,' and the 'Death of Sardanapalus;' and in 1828, 'Cardinal Richelieu.' The July revolution left its impress on D., and in 1831 appeared his 'Liberty directing the People on the Barricades.' About this time he made a voyage to Morocco, where he familiarized himself with novel effects of light and costumes. The Paris Exhibition of 1852 contained the results of his artistic expedition. From this period, D. continued to send forth picture after picture, which proved at least the extraordinary fecundity of his mind. The principal are: the 'Prisoner of Chillon' (1835); 'Cleopatra' (1838); 'Hamlet Contemplating the Skull of Yorick' (1838); 'Capture of Constantinople by the Crusaders' (1841); a 'Shipwreck' (1841); 'Death of Marcus Aurelius' (1845); 'Farewell of Romeo and Juliet' (1846); and 'Flowers and Fruits' (1849). D. has also decorated many public buildings and churches. In 1857, he was chosen by the Institute to fill the place of Paul Delaroche (q. v.).—The most striking quality of D.'s genius is its wonderful versatility. He has painted almost all sorts of subjects, involving a vast variety of costumes. As a colorist, he ranks high, but he is almost equally noted, as has been said, for his incorrect drawing. What renders his pictures so attractive, is a certain dramatic energy of execution, with brilliant effects of light and shadow. He has been compared to Paolo Veronese and Rubens, but is vastly inferior to both. He has also been styled the *Victor Hugo* of painting, a criticism which more nearly expresses the truth. He died Aug. 13, 1856.

DELAGOA BAY, an inlet on the south-east coast of Africa, lat. 25° 58' S., and long. 33° E. It is about 55 miles in length, and about 20 in breadth. Into D. B. many rivers fall, among which are the Delagoa River, from the west, which gives its name to the bay; the Manice, from the north; and the Machavanna, from the south. The shores of the bay being flat and marshy, are unhealthy in summer; the anchorage, however, is commodious and safe, and attracts many whalers. The Portuguese have a small fort here, whence they export ivory and gold-dust. Like most of the Portuguese possessions in Africa, D. B. lies out of the thoroughfares of the world's traffic. See LOURENÇO MARQUEZ.

DELABRE, JEAN BAPTISTE JOSEPH, a French astronomer, was born at Amiens, 19th September, 1749, and studied first under Delisle, and afterwards under Lalande, with both of whom he formed a close friendship. The discovery of the planet Uranus, in 1781, gave him the first opportunity of attracting the attention of the learned world in general. He formed tables of its motion, which obtained the annual prize of the Academy of Sciences. Soon after, he commenced the construction of new solar tables, and, at a still later period, tables of the motions of Jupiter and Saturn.

Along with Méchain, he was appointed by the French government, in 1792, to measure the arc of the meridian between Dunkirk and Barcelona, which was completed in 1799. Afterwards, he was appointed Inspector-general of Education, and in 1803, perpetual secretary of the mathematical section of the Institute. The results of his measurements appeared in his great work, *Base du Système Métrique Dérivé* (1806—1810). In 1807, he obtained the chair at the College of France, rendered vacant by the death of Lalande, his master and friend. In 1814, he was appointed a member of the Council of Public Instruction. He died at Paris, 19th August 1822. D. received a multitude of honors during his lifetime. He was a member of most of the learned bodies in Europe, an officer of the Legion of Honor, and a Chevalier of the Order of St. Michael. His writings are very numerous. The principal are: *Traité d'Astronomie* (Paris, 1814); *Histoire de l'Astronomie du Moyen Age* (Paris, 1819); *Histoire de l'Astronomie Moderne* (1821); and *Histoire de l'Astronomie au Dix-huitième Siècle* (Paris, 1823—1827), published under the care of Matthieu. Besides these, D. wrote several excellent *Mémoires*.

DELANE, JOHN THADDEUS, late editor of the *Times* newspaper, was born in London in 1815. He received the earlier part of his education in a private seminary, first in England, and afterwards in France. He then went to Oxford, where he entered himself of Magdalen Hall. His father being manager of the *Times*, he was at a very early age introduced into the editor's room, and on the death of Mr. Barnes in 1841, succeeded to the direction. Under his editorship, the *Times* has attained a prodigious circulation, and an influence unparalleled in the history of journalism. The division of labor in newspapers being more complete than in the days of his predecessors, the duty of the modern editor is not

so much to write in his own journal, as to suggest topics to others; to revise and bring into harmony conflicting contributions; to make arrangements for the prompt and punctual supply of the news of the day (in which he is assisted by the manager); and, before putting the journal to the press, to decide which of many competing articles and reports shall be inserted, and which laid aside or postponed. These are duties requiring for their due fulfilment great tact, quickness of decision, an extensive knowledge of men and things, literary taste and ability, and, in the case of a journal which claims to be the representative of the English nation, a ready discrimination of those straws on the surface, which denote the ultimate direction of public feeling—qualifications which D. obviously possessed in very large measure. He resigned the editorship in 1877, after thirty-six years of continuous editorial labor; and his death took place on 22d November 1879.

DELA ROCHE, PAUL, a historical painter, the head of the modern 'Eclectic' school of art in France, was born at Paris in 1797, became a pupil of Baron Gros, and between the years 1819 and 1823 acquired some note by painting subjects taken from Scripture, but first excited public admiration in 1824 by his 'St. Vincent de Paul, preaching in the Presence of Louis XIII.' and 'Jeanne d'Arc interrogated in Prison by Cardinal Beaufort.' These exhibit the earliest indications of that style for which he afterwards became famous—a style which endeavored to unite the picturesqueness of the romantic with the dignity of the classic school of art. In 1826, D. produced his 'Death of President Durante;' and in 1827, his 'Death of Queen Elizabeth.' These pictures greatly increased his reputation, but the last is reckoned a failure by English critics. In 1831, appeared his 'Children of Edward IV. in the Tower,' a work of very high merit, but transcended, in this respect, by his 'Cromwell contemplating the Corpse of Charles I.' (1833), which is generally regarded as one of the first historical paintings of modern times. Both are well known in Britain through the medium of engravings. In 1834, appeared his 'Execution of Lady Jane Grey;' and in 1837, his 'Charles I. in the Guard-room Insulted by the Parliamentary Soldiers,' and his 'Lord Strafford on the Way to Execution receiving the Blessing of Archbishop Laud.' From this period until 1841, he was engaged on what is probably his grandest work—the series of paintings executed on the wall of the semicircular saloon of the Ecole des Beaux Arts. This composition contains 74 figures, comprising the greatest sculptors, painters, and architects in all history, according to D.'s judgment. The style is simple, lofty, and chaste. Among his later works may be mentioned, 'Bonaparte at St. Bernard' (1850), 'Marie Antoinette before the Revolutionary Tribunal' (1851), 'Moses Exposed' (1852), 'Calvary' (1853), 'Jesus in the Garden of Gethsemane' (1854), 'The Girondins in the Concierge' (1856). He died November 4, 1856.—The characteristic excellences of D. are delicacy of treatment, picturesqueness of conception, harmony of color, and accuracy of drawing. He has been accused, however, of want of fire, imagination, and depth, and it must be admitted, that he very rarely, if ever, exhibits the highest qualities of creative genius. D. was named a member of the Institute in 1832, and Professor of Painting in the Ecole des Beaux Arts in 1833.

DELAUVIGNE, JEAN FRANÇOIS CASIMIR, a French poet and dramatic writer, was born at Havre, 4th April 1793, and educated at the Lycée Napoléon in Paris, where he first attracted notice by his poem on the birth of the 'king of Rome' in 1811. A few years after the fall of Napoleon, he published his *Messéniennes*, a series of patriotic elegies, in which he bitterly deplored the misfortunes brought upon his country by the disaster of Waterloo.

The July revolution inspired his song *La Parisienne*, which was set to music by Anber, and he wrote several other revolutionary lyrics, such as *La Varsoivienne*, *ou la Polonoise*, and *La Bruxelloise*. Many offers of employment in political affairs were made to him by Louis Philippe, but he chose to remain a *littérateur*, and worked assiduously at the composition of plays. His incessant labors at length undermined his health, and he retired to Lyon for change of air, where he died, 10th December 1843. D. is, next to Béranger and Scribe, the most popular of recent French poets. He represents that 'golden mean' of French Parnassus, the half-classic, half-romantic style of poetry. There is nothing extravagant, nothing profound about him. Easily comprehended, moderately liberal, with a slight tincture of scepticism and Voltairian wit, yet, on the whole, rather moral in his tendencies, D. was just the man to charm the more elegant and decorous circles of Parisian society. His language, too, is piquant, picturesque, and select, and skillfully conceals the lack of poetic substance. The titles of his principal dramatic pieces are *Les Vêpres Siciliennes* (1819), *Les Comédiens* (1820), *Marino Falieri* (1829), *Louis XI.* (1832), *Les Enfants d'Edouard* (1833), *Don Juan d'Autriche* (1835), and *La Fille du Cid* (1839). Several editions of his works have been published, the first in 1845, containing a biography of D. by his brother Germain, and a panegyric by Sainte-Beuve.

DELAWARE, a term of various application in the United States, indicates a river, a bay, and a state, to say nothing of counties and less important localities.—1. The river D. rises in New York, on the west slope of the Catskill Mountains, commonly reckoned a portion of the Appalachians or Alleghanies; and, in a generally southerly direction, it divides New York state and New Jersey from Pennsylvania and the state of its own name, forcing its way through the great chain above designated between almost perpendicular crags of more than 1000 feet in height, and gradually expanding into a broad estuary. With a course of fully 300 miles, it is navigable for large ships to Philadelphia, and for steam-vessels to the head of tide-water at Trenton. The D. is connected by one canal with the Chesapeake, and by two others with the Hudson; and along the right side of the stream runs a similar work for 60 miles from Easton to Bristol.—2. D. Bay—the estuary of the river—measures about 60 miles in length; the greatest width being 30 miles. It has New Jersey on the left, and D. on the right, its entrance being between Cape May in the former state, and Cape Henlopen in the latter. As numerous shoals make the navigation dangerous and the anchorage inconvenient, an artificial harbor of about 300 acres in extent, and of at least four fathoms in depth, has been formed at cape Henlopen.—3. The state of D., stretching in N. lat. from $38^{\circ} 29'$ to $39^{\circ} 47'$, and in W. long. from 75° to $75^{\circ} 45'$, is situated between Pennsylvania, Maryland, and its own bay and river.

With the single exception of Rhode Island, it is the least considerable member of the Union, being very little larger than the county of Norfolk in England. Its area is 2120 square miles, and its population, according to the census of 1880, is 146,608, having been, in 1870, 125,015. Of this population, the greater number (120,160), are white, and the remainder (26,442) colored. The senate of D. consists of 9 members, and its house of representatives of 21. The governor, who is elected for four years, is not eligible for reelection. The legislature meets biennially. Amendments to the constitution must be proposed by two-thirds of each house. The principal products are wheat, maize, oats, potatoes, flax, wool, fruit, and timber; and in addition to woollen and cotton factories, there are tanneries, paper-mills, iron-works, and ship-building establishments. Besides Dover, the political capital, and Wilmington the most populous city, the other places of any note are Milford, Newcastle, Lewes, Smyrna, and Georgetown. Originally settled, in 1627 by Swedes and Finlanders, D. was, in 1655, subjugated by the Dutch of New Amsterdam, afterwards New York. Again, in 1664, it fell, with the Dutch possessions in general, into the hands of the English, ultimately becoming a part of the grant to Penn in 1682; and though in 1703 it was detached from Pennsylvania for legislative purposes, yet it remained subject to the same government down to the Revolution. D. though a slave-state, did not secede in 1864.

DELAWARES. See **INDIANS**.

DELE'B PALM, a palm of great importance to the inhabitants of the regions around Lake Tsad, and other parts of the interior and west of Africa, being in some districts the predominant tree, although very local in its distribution, which extends, however, through the vast tracts from Kordofan to the Atlantic. It is supposed to be nearly related to the Palmyra Palm (q. v.) of India (*Borassus flabelliformis*). Its fruit, when full grown, is 6—8 inches long, and four inches thick, yellowish-brown; the pulp a very close and coarse fibrous tissue. It has a mawkish taste; yet it is very much used by the natives of Africa, who also break the stone and plant it in the ground, when in a few days a blade shoots up, and a very tender root produced, which is very pleasant, and much used as an article of food.—Barth's *Travels*.

DELECTUS PERSONÆ (Lat., choice of the person). In some legal relations, a choice of the person, for some qualification possessing value in the eyes of one of the parties to the contract, is assumed; and the individual so chosen cannot consequently transmit his rights and obligations to another without the consent of the person who is supposed to have chosen him. Thus, in Scotland, in an agricultural lease, of such duration as not to exceed the ordinary life of a man, the landlord is assumed to have chosen his tenant with a special view to his personal qualifications, and unless in virtue of a positive stipulation, the tenant cannot sublet the farm. The reverse is the case with urban tenements.

For reasons still more obvious, the same rule holds in partnership; and unless in the case of great companies, where the sale of the stock is provided for, no new partner can be admitted if a single partner object to him. Even the executors and personal representatives of a partner do not succeed to his share. For the same reason, offices of trust are neither saleable nor adjudgable for debt, though their emoluments may generally be attached for debt.

DELEGATES, COURT OF, formerly, the supreme court of appeal in ecclesiastical and maritime causes. Before the time of Henry VIII., the practice had gradually become established of taking ecclesiastical causes on appeal to the court of Rome. By

24 Hen. VIII. c. 12, this practice was abolished, and appeals were directed to be heard by the archbishops of the several provinces. By 25 Hen. VIII. c. 19, it was directed that appeals should finally be referred to the king in council, and his majesty was by the same statute empowered to issue a commission under the great seal to hear the appeals. The court thus established was called the Court of Delegates. It consisted in ordinary causes of a puisné judge from each of the common law courts, and three or more civilians. After sentence had been pronounced by the Court of Delegates, it was competent for the king to grant a commission of review; but this power was rarely exercised, except upon the ground of error in fact or in law. When application for review was made, it was usual to refer to the chancellor the memorial praying for review, and by him the expediency of granting the prayer of the petition was determined. By 2 and 3 Will. IV. c. 92, the Court of Delegates was abolished, and its jurisdiction was transferred to the King in council. And by 3 and 4 Will. IV. c. 41, and 6 and 7 Vict. c. 38, her Majesty is empowered to refer all appeals from ecclesiastical or other courts to the judicial committee of the privy council.

DELEGATION (Ital. *Delegazione*), the term formerly applied in Lombardy, Venice, and the States of the Church, both to the governing court of a province and to the province itself. Until the recent political changes in Italy, there were nine delegations in Lombardy, and eight in Venice, each of which was presided over by a delegate, vice-delegate, and various subordinates. In the States of the Church, by a decree of 1816, seventeen delegations were established, but the number was several times altered. The delegate was always a prelate, and directly appointed by the pope. If he was a cardinal, he was called a Legate, and his province a Legation.—*Delegados del fomento* is the name given in Spain to the superintendents of the entire police administration of a province.

DELFE, a heraldic charge, representing a square sod or turf, the term being derived, it is supposed, from the verb to *delle* or dig. A delf tenné is the appropriate abatement for him who revokes his challenge, or otherwise goes from his word. See **ABATEMENT**.

DELFT, one of the most ancient towns of South Holland, is situated on the Schie, 8 miles north-west of Rotterdam. It is intersected by numerous canals, the bridges over which are 69 in number. D. was once noted for its pottery (Delft-ware), but has now entirely lost its high reputation for this manufacture, and not more than 200 persons are engaged in the earthen-ware factories. D. is a dull town, but has several interesting buildings, one of which, the town-hall, is a picturesque and richly adorned edifice. The New Church contains a monument, more ornate than tasteful, to the memory of Prince William I. of Orange, who was assassinated here 10th July 1584. It also contains the tomb of Grotius, and the burial vaults of the present royal family of Holland. The Old Church, a building of some note, contains the tomb of the naturalist Leewenhoek, and of the celebrated Admiral Tromp. D. has also a state arsenal, a college where all matters connected with the management of the dykes are taught, a gymnasium, and infirmary. There are some manufactures of woollen cloths and tobacco-pipes. Pop. (1880) 25,355.

DELFTSHA'VEEN, an old town in South Holland on the Maas, two miles west of Rotterdam. It is defended from floods by three strong dykes. The chief sources of wealth are distilling spirits, beer-brewing, iron-founding, shipbuilding, sawing wood, refining sugar, &c. Pop. (1880) 11,425.

DE'LHI (more correctly *Delhi*), the name of an executive district, and also of a division in the Punjab, formerly in the North-west Provinces.—The district is situated in $28^{\circ} 24'$ — $28^{\circ} 54'$ N. lat., and $76^{\circ} 49'$ — $77^{\circ} 29'$ E. long., having an area of 1227 square miles, of which 821 are under cultivation. Of the waste lands, 189 square miles are capable, and 263 incapable of cultivation. The population in 1868 was 608,850, classified as follows: Sikhs, 582; Hindus, 447,079; Mohammedans, 133,912; and other classes, 25,034. The Christians, in the same year, numbered 2243, of whom 648 were Europeans, 233 East Indians and others, and 1362 natives. To the south, the district is rocky and barren. The soil generally is sandy or rocky, and the most fertile portions are those to the north and north-west, watered by the Jumna.—The division of D. contains 2971 villages, has an area of 5595 sq. miles, and had in 1868 a pop. of 1,916,423, of whom 1,029,757 were males. It comprises the three executive districts of Delhi, Goorgaon, and Kurnal.

DELHI (ancient name, *Indraprestha*, or *Inderput*; Mohammedan name, *Shahjehanabad*), a celebrated city of Northern India, in $28^{\circ} 39'$ N. lat., and $77^{\circ} 18'$ E. long., capital of the province and district of the same name, is situated on an offset of the river Jumna, at about a mile from the right bank of that river, and at an estimated elevation of 800 feet above the level of the sea. The modern city, which was founded by Shah Jehan in 1631, has a circumference of about seven miles. It is protected by ramparts, bastions, &c., and is entered by 11 gates.

The greater number of the streets in D. are narrow, but the Chandni Chalk is an exception, being 90 feet broad, and 1500 yards in length, and intersected by an aqueduct. The other principal street is 120 feet wide, and one mile in length. D. has many monuments of its former magnificence. The Mogul's palace was thought by Bishop Heber to surpass the Kremlin. The Jumma Musjid, or principal mosque, was commenced by Shah Jehan in the 4th year of his reign, and completed in the 10th, at a cost of £100,000. This magnificent building has been restored by the British government. The Delhi College was founded in 1792, and in 1829 the sum of 170,000 rupees was bequeathed to it by a minister of the king of Oude. The interest of this sum, together with grants from government, raises its annual revenue to 40,580 rupees. For each of the languages, English, Arabic, Persian, and Sanskrit, there is a separate department. Pop. at census of 1868, 154,417; at that of 1881, 173,393, of whom about one-half are Hindus, and the other half Mohammedans. D. has railway communication, by the East Indian Railway, with Calcutta, distant 1019 miles; with Bombay, distant 879 miles; and with intermediate places. The mean temperature of the day has been ascertained, by observations extending over three years, to be as follows: January, 56°; February, 61°; March, 72°; April, 82°; May, 91°; June, 92°; July, 86°; August, 83°; September, 83°; October, 77°; November, 65°; December, 58°. The vestiges of ancient D., on the east bank of the Jumna, consisting of ruined tombs, gardens, serais, and palaces, cover an area of about 30 miles in circumference, and present a remarkable scene of desolation. The modern city is noted for its needle-work, and here the shawls of Cashmere are embroidered in silk and gold. The D. goldsmiths are famous for the delicacy and beauty of their work. D. was the capital of the Afghan or Patan, and afterwards of the Mogul empire. It was taken by a British army under Lord Lake, September 8, 1803, and has ever since—if we except the brief period it was held by the mutineers in 1857—continued under British rule.

In our time, D. has been rendered memorable by the events of 1857. The march on the city of the mutineers from Meerut, the terrible 11th of May, the explosion of the powder-magazine by Willoughby and his heroic band, the tragic scenes that followed; the siege, the assault (September 14), when the city was won (September 20) gate by gate and quarter by quarter—a success saddened by the death of the gallant Nicholson; the subsequent daring capture of the king of D. by Hodson of Hodson's Horse, and the capture and shooting of his miscreant sons by the same officer, are memorable events. Of late the history of D. has been one of commercial prosperity. In 1877 it was the scene of the famous Dabar at which the Queen was proclaimed Empress of India. See Kaye's *History of the Sepoy War*; Keene's *Fall of the Moghul Empire*; the *Statistical Account of Delhi District*; and W. W. Hunter's *Imperial Gazetteer of India* (1881).

DELICT. The law of Scotland, following that of Rome, divides delicts into delicts proper and *quasi* delicts—the former being offences committed with a positively malicious purpose, the latter being injuries inflicted by culpable negligence of so gross a kind as to amount almost to crime. The latter class of delicts, though inferring an obligation to repair the injuries sustained by the private party, do not generally form grounds for criminal prosecution. See DAMAGES.

DE'LILAH (Heb. the languishing) is the name of a Philistine woman whom Samson loved. By her flattering blandishments, she obtained from him the secret that his God-given strength lay in his locks; and having cut these off while he lay asleep, she then treacherously betrayed the strengthless warrior into the hands of his enemies.

DELILLE, JACQUES, a French poet, was born at Aigues-Perse, in Auvergne, June 22, 1738, and received his education at the Collège de Lisieux, Paris. He first occupied the position of instructor at the colleges of Beauvais and Amiens successively, and was afterwards appointed to a professorship in Paris, at the Collège de la Marche. Here he published various poetical effusions, the most considerable of which was a translation of the *Georgics* of Virgil—a work which appeared in 1769, was distinguished by its grace and elegance of style, and met with a most enthusiastic reception. In 1774, he published *Les Jardins*, the success of which, however, was not equal to that of his *Georgics*. The Comte d'Artois presented him with the abbey of St. Severin, or rather with its revenues, for he did not insist on D. becoming a priest. His poem *L'Imagination* was written during a visit which he made to Constantinople in 1784, in the suite of Comte de Choiseul-Goubier, the French ambassador to the Ottoman court. On his return, he was elected professor of *Belles Lettres* at the university of Paris, and of Latin poetry at the College of France. At the Revolution in 1789, however, he lost all his property. He afterwards removed to Switzerland, where, in 1800, he published *L'Homme des Champs*. In 1801, he visited London, published a translation of *Paradise Lost*, and in that same year, having been solicited to return to

Paris, he re-entered the academy and the college there with which he had formerly been connected. He died 1st May 1813.

DELIQUE'SCENCE is the term applied to the property which certain substances have of absorbing moisture from the air, and becoming damp, and even running into liquid. Caustic potash, and the chlorides of calcium and magnesium, are examples of substances which undergo this change.

DELIRIUM (from Lat. *deliro*, I am furious), a state of deranged mind, in which the intellect and the judgment are perverted or lost, while the imagination and the passions are often excited, or at least left without control. The result is an incoherent or totally disordered course of action and speech, frequently attended by delusions, or unreasoning belief in supposed facts, which the sound mind at once perceives to have no existence in nature.

The nature, extent, and variety of the delusions and the degree to which the control of the reason over them is lost, may be said to indicate the type of delirium to which the patient is subject; and in some instances, the cause of the disease is pretty decidedly shown forth by the prevailing impressions on the mind and senses. Referring to the article Insanity for the description of Maniacal Delirium, or Mania, and to the article Fever for that of Typhoid Delirium, or Typhomania, we may confine ourselves in the present article to a slight sketch of the delirium arising from habitual intoxication, the *Delirium ebriosorum* or *potatorum* (of drunkards), or, as it is more commonly called, from the bodily tremors that accompany it, *Delirium tremens*. This disease is not to be confounded with the mere paroxysm of intoxication, and still less, if possible, with the insane craving for drink, or Dipsomania (q. v.). It is, on the contrary, often found in persons who have not been recently intoxicated at all, though of persistently intemperate habits, and in whom the desire for drink, as well as for food, has been entirely suppressed by the access of the disease. It is a true though usually a temporary form of insanity or of mania, brought on by the habitual poisoning of the nervous system, over a long course of weeks or months, by alcoholic liquors; and it is not going too far to say that it is rarely, if ever, induced by a single debauch, at least in its aggravated form. *Delirium tremens* is characterized by a restless, irritable state of the nervous system, rather than by furious paroxysms of excitement (though these are not rare); by constant though ill-regulated and ineffectual attempts of the patient to occupy himself; by spectral illusions, or the vision and hearing of non-existent objects; by tremors of the hands and tongue; by prostration of appetite; and by great wakefulness, the want of sleep being often protracted over many days and nights, and forming, with the constant excitement of the senses, and the prostration of the vital powers from deficient nourishment, the true source of danger in this disease. The main elements in the cure are careful nursing, and the use of all means to secure sleep, and re-establish the digestion. Opium, hyoscyamus, and antimony, are used in some cases, and tonics with laxatives in others; chloroform has also been employed. In certain cases, stimulants are required for a time; but none of these remedies ought ever to be used except under the best medical advice, for there is little doubt that delirium tremens is one of the diseases where the rash employment of strong medicines is extremely dangerous to life, and where good nursing and food, without other remedies will usually succeed. Where proper protection and vigilance cannot be otherwise secured, the patient should at once be transferred to the nearest hospital or lunatic asylum; and if the attacks have been repeated, he should be detained for some time after his recovery. See DELIRIUM TREMENS.

DELIRIUM EBRIOSUM, a term intended to denote a form of acute mania, having intoxication for its exciting cause. It is often mistaken for Delirium Tremens (q. v.), and doubtless has frequently been dealt with as such in criminal cases. It originates either from a single fit of intoxication, or a short course of intemperance—frequently of periodical occurrence—in those who are mentally excitable from hereditary peculiarity of constitution, or from some previous injury of the head, and who may have experienced some cause of depression of spirits. It is marked by an uncontrollable desire for drink, which, when gratified, only leads to further imperious demands, until the thing itself is loathed, and a fit of sickness brings about recovery. Indecorous conduct or wild and vicious passions are displayed. It is in this state that homicide and murder are so frequently perpetrated.

DELIRIUM NERVOSUM or **TRAUMATICUM**, an attack of delirium with tremors, which frequently supervenes on severe bodily injuries, such as gunshot wounds, burns, and fractures—chiefly met with in large hospitals—in the case of persons of weakly constitution, and who are irritable and nervous, and have been intemperate in their habits.

DELIRIUM TREMENS is the term given to a disease originating from the abuse of alcoholic stimulants by those of a nervous and irritable temperament, characterized by a combination of delirium with muscular tremors. The tremors are general, but

chiefly of the hands, and of the tongue when protruded; and the delirium is of a muttering, sight-seeing, bustling, abrupt, anxious, apprehensive kind. The individual affected cannot follow out a train of thought, explain an illusion or perverted sensation, or perform any act correctly; and although at one moment partially conscious and rational, is the next incoherent and excited by the most ridiculous fancies of a spectral kind, such as visitors in the shape of devils, cats, rats, and snakes, or by alarming occurrences, such as robberies, fires, and pursuits for crimes. All this is ushered in and attended by complete sleeplessness; and during the attack, in an uncomplicated form, there is no violence or ferocity of demeanor (see article *DELIRIUM EBRIOSUM*), although mischief to himself or others may be done under false impressions; and he is easily pleased by gentleness and indulgence, and fretted by restraint and opposition. The face has generally a pale dirty color, and anxious expression; eyes startled but lustreless, sometimes considerably suffused, and the pupils not contracted, unless under treatment with opium, or when inflammation of the membranes of the brain has supervened; skin warm and moist, often perspiring copiously; tongue sometimes loaded, but generally pale, moist, and remarkably clean; appetite small, but the individual will often take whatever is presented to him; thirst by no means urgent, with seldom or never any craving for spirituous liquors; alvine evacuations bilious and offensive; urine scanty, high colored, and often albuminous; the pulse usually ranges from 90 to 120, and is generally soft, but of various degrees of fulness and smallness.

The precursory symptoms are not peculiar to or pathognomonic of this disease, but common to many other febrile affections implicating the functions of the sensorium, of the circulation, of digestion; and the paroxysm—distinguished by the above phenomena—runs a remarkably uniform course, independently of age and constitution. In genuine uncomplicated cases—that is to say, when not precipitated by other illness, such as bronchitis, pneumonia, erysipelas, and fever; or some accident, such as contusions and fractures—when the illness is more of the nature of the *Delirium Traumaticum* (q. v.)—the paroxysm runs its course in from two to three days, and terminates in sleep, from which the individual generally awakens convalescent.

The above description has been taken from a paper by Dr. Peddie of Edinburgh, referred to underneath, whose views shall here be further developed. Previous to its publication, the generally received opinions regarding the essential nature of delirium tremens were, that it is a disease of exhaustion or irritation of nervous power, and that it has the habitual abuse of intoxicating liquors for its predisposing, and the abstraction or diminution of the accustomed stimuli for its exciting cause; and consequently, that the proper treatment consists in the continuation of stimulants—‘a hair of the dog that bit’—together with large opiates to act on the same principle, and force on the salutary, or what has been called the critical sleep. Since then, however, a great revolution has taken place in the views of the medical profession regarding the pathology and treatment of delirium tremens; and in consequence of this, a fatal result in a genuine case of the disease now seldom or never occurs, where these views are understood and acted on.

It has been shown that the more the history and phenomena of the affection are examined, the greater will the difficulties surrounding the second part of the proposition above stated become. It has been shown that the affection is specific and peculiar, uniform in its symptoms and progress; and that it is essentially a form of nervous poisoning—a toxicological result from the accumulation of alcohol in the system through the continued abuse of stimulants. It has been observed that the alcohol—in whatever way it may be atomically changed or chemically combined—acts on the nervous pulp of the brain through the medium of the circulation, and sets up in it an alcoholism or alcoholicerethism, manifested by a certain amount and kind of exhaustion of the cerebral and muscular functions, together with decided over-action in the meningeal vessels; and that the alcoholic principle, although acting at first slowly, begins ere long to poison the gray matter of the brain, so that every additional drop thereafter brings it more and more into a poisoned condition, until at length, unless arrested by judicious treatment, the state of irritation tends to inflammatory action and serious encephalic mischief. While, therefore, the first part of the above proposition is true—though explainable in a very different way from formerly received opinions—the second part, viz., that the diminution or abstraction of the accustomed stimulus, is the exciting cause of the disease, is altogether untenable.

Analogy will not bear out the assertion. Mercurial fumes, or the oxides of mercury, when long inhaled or absorbed into the body, as in the case of quicksilver miners, gilders, and others, in the course of time produce an attack of shaking paralysis—the *tremblement mercuriel* of the French pathologists; but will the workmen thus long exposed be more likely to become affected with tremors when removed from this poisonous atmosphere and occu-

pation, than if continuing at their work? The reverse is well known to be the fact, not only in the case of such artisans, but of those who are beginning to suffer in a somewhat similar way from lead-poisoning. In both affections, when the symptoms are precursory or recent, a cure can be effected only by removal from the injurious occupation; otherwise, the symptoms deepen with hourly increasing rapidity, until tremors are succeeded by sleeplessness, delirium, and ultimately coma. Then, too, for example, salivation from any of the preparations of mercury, and narcotism from any opiate, are not intensified by withdrawing these agents after a certain point is reached. On the contrary, a continuation beyond that stage, particularly in some kinds of constitution, more rapidly develops their peculiar physiological manifestations; and now, an infinitesimal dose will do what a large dose in an earlier stage could not. Thus is it with alcoholic stimulants in the production of delirium tremens. In those of a highly sanguine temperament, and of a nervous irritable disposition, the effect of a certain length of indulgence is to induce this condition (just as in subjects with the tendency to gout, a certain amount of high-living is apt to produce an attack of that affection), and beyond that stage, a small quantity of alcoholic stimulus will keep up and deepen the effect, which, previously, a large dose would not do, or, in another individual, could not produce, whatever quantity is imbibed. Thus is explainable the very common erroneous statement made in regard to an individual affected with delirium tremens; that although for a considerable time he has systematically indulged in considerable quantities of spirits, wine, or malt liquor, or in all of these, yet for a week or two he had drunk very sparingly, and, within the last few days, little or none; indeed, that he was now suffering from the withdrawal of his wonted stimulus, in meritorious efforts to free himself from a habit of which he had begun to be ashamed. All this seems plausible: but the statement should rather have been that, although consuming large quantities of drink at one time, he had felt latterly a smaller quantity affect him; that he then reduced still further the amount, but experienced an equal if not greater constitutional effect therefrom; and thus, from day to day, reduction was forced on him by his own sensations of gastric irritation, nervous excitement, and muscular debility—these feelings being, in fact, neither more nor less than the premonitory symptoms of an attack of delirium tremens, and just what might be looked for on the view that the alcoholic principle is in such instances a cumulative poison, and the exciting as well as the predisposing cause of the affection.

That such is the true solution of the problem, cannot be doubted; and if a suspension or diminution of habitual supplies of stimulants be at any time followed by symptoms of delirium tremens, this is not to be regarded as the result of the change in the practice of the individual, but as occurring in spite of it, and because the constitutional effect is already produced, and the premonitory stage of the disease begun. In a considerable number of instances, drink is taken freely up to the period when the disease is developed, there being no diminution of the quantity consumed, and no interval in the practice; and when there really is some diminution from the amount of previous supplies, it is on account of the system being already affected so much that a less quantity now produces a greater or equal effect. On the other hand, it may be safely averred, in contradiction to the popular error, that although stimulants are at once taken away from the habitual dram-drinker, a paroxysm of delirium tremens will not be produced if the peculiar diathesis is not yet established, and the precursory symptoms of the disease are not already begun. He may experience much mental disquietude and physical discomfort, and feel weak for a time, just as a gourmand would feel lowered and depressed by the abstraction of his accustomed good living; but this would soon pass off, without the occurrence of the usual signs of delirium tremens, more especially without those spectral illusions or phantasms, which are common to poisonings with several other agents of the narcotico-acrid class.

It seems unnecessary to add more on this part of the subject, than that experience derived from some of our large prison-establishments shows that while fully three-fourths of the criminals committed belong to the intemperate classes, and a large number, especially of the debtor class, are habitual drinkers up to the moment of admission, no bad effects are observed from the sudden withdrawal of the wonted stimuli, and the substitution of prison-fare.

In regard to the treatment of this remarkable disease, it is evident, from a common-sense consideration of its phenomena and pathology, that the non-stimulating and non-opiate plan must be the safest and best. If more spirits deepen the paroxysm, producing greater cerebral determination, then why administer even one drop additional? And if opiates combined with spirits, or given alone, act in the same manner, and tend to occasion congestion of the blood-vessels of the brain, why run the risk of inflammation, convulsions, and coma, in an endeavor to force on the salutary sleep? It must not be over-looked that this sleep is the normal termination of the paroxysm, and is not to be viewed

as a part of the affection, or in the same light as we are accustomed to regard a critical sweat or other discharge. It indicates diminished activity of the cerebral circulation and functions, and the commencement of convalescence. Hence, in a large proportion of instances, the sleep will take place spontaneously, and it will be safer to do nothing at all. The object, therefore, of treatment should rather be to remove all hindrances to sleep than to force it. In the more severe cases, this is best done by a moderate and well-regulated course of tartrate of antimony, the action of which, in this affection, appears to be remarkably sedative.

It greatly diminishes excited action, induces weariness of muscle, general nervous exhaustion, and mental languor. It thus removes all obstacles to the occurrence of the salutary sleep, and favors it; and when the individual exhausted seeks his couch, he finds repose—not as a drugged sleep, but naturally and profoundly—awaking in general with restored reason and muscular control. Digitalis has been given with the same view, also ipecacuanha and aconite; but none of these answer the various ends so well as antimony. In the milder cases, however, no medicine is required, and it seems enough to do in such, what is essentially necessary in the severer attacks—to support the strength—the organic functions of life—by suitable nourishment, such as soups, *café au lait*, and white-of-egg, and to soothe in every possible manner the excited feelings of the patient. Nothing is more hurtful in delirium tremens than restraint, particularly that of the strait-waistcoat. It increases the cerebral excitement by the never-ceasing struggles for liberty which ensue, so that fatal convulsions have very frequently been the result. All the control required is the presence of one or two judicious attendants, who will humor the patient in his whims and fancies; who will speak and act regarding them so as to assure him of safety, and to relieve him of that apprehension which is the most characteristic feature of the delirium; and who will mildly but firmly interpose, if he attempts anything which may accidentally prove injurious to himself or others. The apartment, however, in which the patient is confined should be well secured, for he may rush out at the door or leap from a window, in the fright and frenzy of imagined danger. The larger, too, the room is, the better, that he may have space to advance and retreat, according as he wishes to scrutinize or avoid a suspicious or distressing object of his fancy; to arrange and rearrange the furniture; or to carry on, after a fashion, the imaginary duties of some bustling occupation. Besides this, there should be abundance of light, so as to dissipate terrifying hallucinations. The expenditure of muscular effort without any restraint, aids greatly in producing a safe kind of mental and physical exhaustion; and the individual, languid and worn out, lies down voluntarily, and falls into the desired and restorative sleep.—*The Pathology of Delirium Tremens, and its Treatment without Stimulants or Opiates*, by A. Peddie, M.D., pp. 51, 8vo.

DE'LITZSCH (named after the Slavonic *Delezen*, once dominant there), a town of Prussian Saxony, 15 miles north from Leipzig, with which it is connected by railway, on the right bank of the Lobber, a small river. It is an old but well-built town, and has manufactures of tobacco, woollen cloth, and hosiery. It is the capital of a circle, for the most part flat, but producing much corn and fruit. Pop. (1875) 10,312.

DELIVERY. See MIDWIFERY.

DELIVERY IN SALE. See SALE OF GOODS.

DELIVERY OF A DEED. See DEED.

DE'LLA CRUSCAN SCHOOL. About the year 1785, a number of English residents at Florence endeavored to amuse their lagging hours by writing verses, which they published under the title of *The Florence Miscellany*. The insipidity, affectation, and fantasticalness of these productions transcend all belief; yet such was the poetic destitution of the period, that they soon found a crowd of admirers and imitators. Taking the name of an academy at Florence (see ACADEMY), the Della Cruscan now began to print their precious lucubrations in England, chiefly in two daily newspapers called *The World* and *The Oracle*. 'While the epidemic malady was spreading from fool to fool,' as Gifford puntingly says, one of the brotherhood, a Mr. Robert Merry, came over from Florence, and 'immediately announced himself by a sonnet to Love.' It was answered by a certain Anna Matilda, who (as was the custom) praised it immediately in language even more absurd than Merry's own. According to Gifford, 'the fever now turned to a frenzy: Laura, Maria, Carlos, Orlando, Adelaide, and a thousand other nameless names, caught the infection; and from one end of the kingdom to the other all was nonsense and Della Crusca.' Retribution, however, came (for Nemesis watches the course of poetry as sharply as that of politics). In 1794, Gifford produced his *Borad*, and in 1796, his *Mariad*. Rarely has literature witnessed such a scalping. It completely killed the school, and, indeed, it is only in these two poems that the memory of most of the unhappy Della Cruscan songsters has been preserved—an immortality which may be compared with that conferred by the *Neigate Calendar*.

DE'LLYS, a seaport town of Algeria, 49 miles east from Algiers. The French part of the town has wide streets, and a square planted with trees. The Arab part, which is greatly more populous, retains its old character: its streets are narrow and tortuous. The climate of D. is reckoned very salubrious. The vine and the olive succeed well in the neighborhood. *Bechena*, a kind of sorghum or durra, is grown. There is a trade in grain, oil, and salt. Pop. 10,484, of whom 862 are Europeans.

DELOLME, JEAN LOUIS, born at Geneva in 1740, was originally an advocate in his native town, but on account of certain political disturbances which took place there, and in which he had shared, he was forced to leave it. He went to England, where, in spite of his literary activity, he lived for several years in great poverty. He returned to his native country in 1775, and died at a village in Switzerland, July 16, 1806. D.'s principal work is *Constitution de l'Angleterre, ou Etat du Gouvernement Anglais comparé avec la Forme Républicaine et avec les autres Monarchies de l'Europe* (Amsterdam, 1771); English translation by the author himself (Lond. 1772). In 1772, he also published in English, *Parallel between the English Government and the former Government of Sweden*; ten years later, his *History of the Flagellants, or Memorials of Human Superstition*; and in 1796, an *Essay containing Strictures on the Union of Scotland with England*. His work on the British constitution, although not reckoned of great value by English critics, contains some acute observations regarding the advantages of a limited monarchy.

DELOLME, MARION, a Frenchwoman, whose name figures too prominently in the history of the 17th century. She was born about 1612, at a village near Châlons-sur-Marne, and came at an early period of her life to Paris, where her great beauty would easily have secured for her a good match, had she not been inclined to a life of licentious intrigue. Almost all the distinguished men of the age were her 'lovers.' During the first disturbances of the *Frondeurs*, her house was the rallying-point of the chiefs of that party, and in consequence, Mazarin was about to imprison her, when she suddenly died, at the age of 39. A curious tradition sprang up in France during the next century, to the effect that Marion had not died, but escaped to London; that she had returned to Paris in 1682; that she, meanwhile, had been thrice married—first, to a lord, second, to a robber-chief, and third, to a procurator of finance; and, finally, that she died in 1706, or, as others say, in 1741, when in her 129th year. Victor Hugo has made her the subject of one of his historical dramas.

DE'LOS (called also in ancient times Asteria, Ortygia, Cynthus, &c.), an island in the Grecian Archipelago, the smallest of the Cyclades, is situated between the islands Rheneia and Mykonos, in lat. about 37° 23' N., and long. 25° 17' E. According to the mythological account, it was at first a floating island, but was fixed to the bottom by Zeus, in order that it might become a safe abode to Leto, who, about to bring forth Apollo and Diana, was seeking a refuge from the wrath of Hera. Its earliest historical inhabitants were Ionians, and it appears to have been the center of a great periodical festival held in honor of Apollo, both on the mainland and in the islands. In 426 B.C., D. was purified by the Athenians, all the tombs were removed from it, and it was declared pollution for any birth or death to take place on it.

Four years after, the inhabitants of Athens expelled the Delians from the island. After 146 B.C., when Corinth fell, D. became the seat of extensive commerce. Its sacred associations, its great festival, its excellent harbor, and its situation in the direct route from Southern Europe to the coasts of Asia, all combined to render it a port highly favored by merchants. So great was the traffic of D., that it is said 10,000 slaves changed hands here in one day. After flourishing for a considerable time, it was devastated in the Mithridatic war, and from this calamity it never recovered. Pliny describes D. as being merely a rock, and only five miles in circumference. It was noted for its palm-trees, and also for its brass, and the brazen vessels which it manufactured. The town of Delos, which stood at the foot of Mount Cynthus, a granite crag of from 400 to 500 feet high, is now a mass of ruins. Still, however, the remains of the great temple of Apollo, and of the colossal statue raised in his honor, may be distinctly traced, although shiploads of the more perfect architectural fragments were conveyed, centuries ago, to Venice and Constantinople. A few shepherds and goatherds from Mykonos are now the only inhabitants of Delos.

DE'LPHI (now CASTRI), an ancient town of Phocis, Greece, celebrated chiefly for its famous oracle of Apollo, was situated about eight miles north of an indentation in the northern shore of the Gulf of Lepanto (Corinthian Gulf), at the southern base of Parnassus, in lat. 38° 27' N., and long. 22° 37' E. Its original name, and that by which Homer invariably speaks of it, was Pytho. It stood in the center of a district renowned for its classical associations. Occupying the vale of the Pleistus, it was seated in a semicircle like the area of a grand natural theater, backed towards the north by two lateral spurs of Parnassus. These lateral ranges

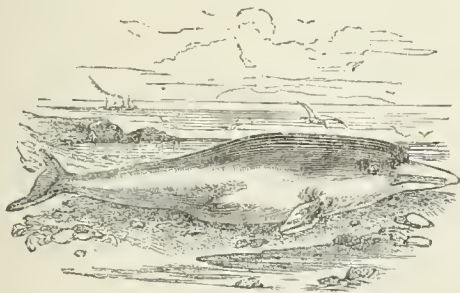
extend east and west around D., and give rise also, from the point, at which they approximate, to the famous fountain of Castalia, the holy water of the Delphian temple. The earliest inhabitants of D. are said to have come from Lycoreia, a town upon one of the slopes of Parnassus, the inhabitants of which are supposed to have been Dorians. From the Delphian nobles were at first taken the chief magistrates and the priests of the temple, while the Pythia or female who delivered the oracle, at first always a young maiden, but latterly always a woman not younger than fifty, was usually selected from some family of poor country-people. In the center of the temple was a small opening in the ground, whence arose an intoxicating vapor; and the Pythia having breathed this, sat down upon the tripod or three-legged seat, which was placed over the chasm in the ground, and thence delivered the oracle, which, if not pronounced at first in hexameters, was handed over to a poet, employed for the purpose, who converted it into that form of verse. As the celebrity of the Delphic oracle increased, D. became a town of great wealth and importance. In the 8th c. before the Christian era, it had become famous not only in Hellas, but also among the neighboring nations. Here the Pythian games were first celebrated in 586 B.C.

The first stone temple at D., built by Trophonius and Agamedes, was destroyed by fire in 548 B.C., but was rebuilt at the cost of 300 talents, or £115,000, and was fronted with Parian marble. In 480 B.C., Xerxes sent a portion of his army to plunder the temple; but as they climbed the rugged path that led to the shrine, a peal of thunder broke overhead, and two huge crags tumbling from the heights crushed many of the Persians to death, while the others, struck with terror, turned and fled. It was plundered by the Phocians during the Sacred War, and was attacked by the Gauls in 279 B.C., who, approaching by that route which the Persians had on a former occasion adopted, were repulsed by a similar supernatural agency. D. subsequently excited the rapacity of many potentates, and suffered severely by their attacks. Nero carried off from it 500 statues in bronze; Constantine also removed many of its works of art to his own capital. In the time of Pliny, the number of statues in D. was not less than 3000, and within the temple for a long time stood a golden statue of Apollo.

The modern town of Castri now occupies the site of Delphi. Its situation is beautiful, and from it the traveler may command an excellent view of the ancient valley. Castri stands in the immediate neighborhood of the source of the still flowing Castalian spring.

DELPHIN CLASSICS, an edition of the Greek and Roman classics, prepared by 39 of the best scholars of the time, under the editorship of Bossuet and Huet, tutors to the Dauphin (q. v.), son of Louis XIV. The title-pages bear the words, 'In usum Serenissimi Delphini,' and hence the name. They have never been reprinted as a whole in England, but octavo editions of particular authors, such as Virgil and Horace, have been published for the use of schools. The Delphin Classics possess little value in the eye of a scholar of the present day.

DELPHINA'PTERA, a genus of *Cetacea*, of the family *Delphinidae*, agreeing with *Beluga* (q. v.) in the want of a dorsal fin, but differing in having the snout produced into a slender beak,



Delphinaptera Peronii.

which is flattened transversely, and separated from the head by a marked furrow. *D. Peronii*, the RIGHT WHALE-PORPOISE of the South Sea whalers, is an inhabitant chiefly of the seas of high southern latitudes, but sometimes found even on the coasts of New Guinea. It is about five or six feet long, black, with brilliantly white belly and snout.

Its mouth is furnished with a great number of slender sharp teeth. *D. Commersonii*, also found in high southern latitudes, is about the size of a porpoise, silvery white; the snout, tail, and pectorals tipped with black, and is described as one of the most beautiful inhabitants of the ocean. *D. borealis* was discovered by the United States Exploring Expedition in the North Pacific Ocean.

DELPHI'NIDÆ AND DELPHI'NUS. See DOLPHIN.

DELPHI'NIUM. See LARKSPUR.

DELPHINORHY'NCHUS, a genus of cetacea of the family *Delphinidae*, having one dorsal fin like the true dolphins, but the beak not distinguished from the forehead by a furrow. *D. Bredanensis*, or *D. rostratus*, a species about eight feet long, black above and reddish below, has been thrown ashore on the French Atlantic coast. A much larger species, *D. coronatus*, attaining the length of thirty to thirty-six feet, is described as one of the whales of high northern latitudes, having been seen in numerous flocks among the ice-islands near Spitzbergen.

DELTA is the alluvial deposit formed at the mouth of a river from the deposition of the particles which it has held in suspension. The term was originally applied to the tract of land thus formed by the Nile, which, being enclosed by two main branches and the sea, has the form of the Greek letter Δ, Delta. The formation of deltas depends more upon the presence or absence of currents met with at the mouth of the river, than upon the quantity of sediment held in suspension when it reaches the sea. Deltas are consequently of almost invariable occurrence in inland lakes, in the quiet estuaries of the nearly tideless Mediterranean, and in the sheltered bays and gulfs of other seas. When, on the other hand, there are strong ebb-tides, or powerful oceanic currents, the detritus is carried off into the sea.

DE'LUGE (through the French, from Lat. *diluvium*, a washing away, a flood). There is scarcely any considerable race of men among whom there does not exist, in some form, the tradition of a great deluge, which destroyed all the human race except their own progenitors. That the Noachian deluge, recorded in Scripture, covered the whole earth, was the universal opinion until towards the close of the last century. The organic remains, on which the science of palæontology is now founded, were regarded as its wrecks, and were held to prove that it had covered every known country, and risen over the highest hills. In the progress of geology, it soon became evident that most of the stratified rocks demanded an earlier origin than a few thousand years, and the influence of the deluge was consequently restricted to the slightly altered superficial deposits; but many of these were, after a few years, found to belong to a period vastly anterior to any historical epoch, and to have been produced by long-continued and steady agencies, differing totally from a temporary deluge. The present tendency of opinion among writers like the late Hugh Miller, is to regard the flood of Noah as partial and local, although the universality seems to be implied in the biblical description.

DELU'NDUNG (*Prionodon gracilis*), a carnivorous animal inhabiting the forests of Java, referred to the family *Viverridae*,



Delundung (*Prionodon gracilis*).

but regarded as a connecting link between that family and *Felidae*. It is of slender form, with a long, cylindrical tail, and is prettily streaked and spotted.

DE LUNA'TICO INQUIRE'NDO. See INSANITY (legal).

DE'LVINO, a town of European Turkey, in the province of Albania, beautifully situated on a hill-slope covered with olive and orange groves, about 47 miles N.W. from Janina. It is fortified, is the seat of a Greek bishop, and has a considerable trade in olive-oil. The women's dress is peculiar, being a long white wrapper, enveloping them from head to foot, and giving them the appearance of animated monumental figures. Pop. estimated at 7500.

DEMAND AND SUPPLY. The nature and influence of the law or agency so designated by Political Economists have been the subject of considerable dispute. It has sometimes been maintained as a ruling principle, that the demand for anything creates the supply. This has been denied, however; and it has been held that, on the contrary the supply precedes the demand, since the article must be in existence before a purchaser goes to ask for it. Steam-engines, for instance, and india-rubber galoshes, must have been invented and made before anyone thought of purchasing them. Chambers' Cyclo. Vol. III.—4.

ing them. The most convenient way, perhaps, of viewing the term demand and supply, is to consider it as applicable to articles in the market; and here we shall find that the demand and the supply are continually vibrating with a tendency to balance. Sometimes there is more of an article than will sell at a remunerative price, sometimes less; but there is always a strong tendency to a balance. Thus, on any day in London, the supply of beef or of fish may be less than the demand—that is to say, the trade may be so brisk that had there been a few more bullocks at Smithfield, or a few more salmon and turbot at Billingsgate, they might have been sold at remunerating prices.

At the same time, there may happen to be an excess of both commodities at Windsor. It never will happen, however, that a supply suited for the London market will find its way to Windsor, or that no more will reach London than might feed Windsor—it would be as rational to expect the river Thames to reverse its course. This is the great law, then, by which the world is supplied with the necessities of life. Every day the proper supply for the enormous consumption of London is on its way from the uttermost ends of the earth, as systematically as the sap is ascending to penetrate through all the branches of the tree. How impossible it would be to effect the same thing by artificial organization, may be illustrated from the Russian campaign of Napoleon, where, despite of the most skilful and costly arrangements, one portion of the army were starving to death, while another were slaughtering their bullocks and leaving them to rot! It is necessary to keep in view the proper function of this law, which is in some measure defined under Competition (q. v.). The demand will not produce everything: no money will bring forth when wanted a Milton's *Paradise Lost*, or a Raphael's 'Transfiguration.' On the other hand, there are services beneficial to the world, or to a community, for which there is no demand in the commercial sense. There is a demand for almanacs, but none for the astronomical investigations on which they are founded. There is a demand for teachers of Latin and Greek, and for Latin and Greek school-books, but none for the profound scholarship necessary for keeping the knowledge of these languages alive; hence come scientific and scholastic endowments and establishments.

DEMAVE'ND, MOUNT, an extinct volcano of Persia. It forms the loftiest peak of the Elburtz Chain, which separates the low shores of the Caspian Sea from the high table-land of Persia. Although no longer subject to eruptions, D. bears traces of its having been an active volcano within the most recent geological epoch. Its summit is conical, covered with sulphur, and rent by heated fissures. The crater is still visible, and the surface of the mountain is in many places covered with scoræ. At its base hot springs give evidence of the continued existence of volcanic fire at no great distance beneath the surface. A great deposit of sulphur covers the summit of D., and is brought down to the plain in bags to be disposed of as an article of commerce. Although the path that leads to the peak is, for this reason, familiar to the inhabitants of the adjoining districts, the mountain was not ascended by any European till 1837. In September of that year Mr. William T. Thomson of the English Embassy at Teheran, with the view of taking important bearings from a point which commands an extensive view of the shores of the Caspian, determined to reach the summit. He set out from the base with four guides, three of whom deserted him when they experienced the effect of the rarified atmosphere on their breathing. The first night he slept below the snow limit; the second night in a sulphur cavern near the summit, so highly heated that it was impossible to place the hand near a crevice of the interior. On leaving this place of shelter, the traveler's wet clothes were instantly frozen with a bitter blast from the Caspian. The height, as recently determined by the Russian Survey, is 18,600 feet.

D. towers high above the neighboring mountains, the adjacent summits not exceeding two-thirds of its elevation. At all times it has been a conspicuous object from the great trade route between India and the West, along the edge of the Persian table-land. It is not then to be wondered at that it is connected with the earliest Persian as Enna is connected with the earliest Greek traditions. There seems indeed more than an accidental coincidence between the fables which relate to the two mountains. According to the Greeks, the giant Typhon was buried under the volcanic region of Sicily, and the earthquakes and eruptions were caused by his efforts to escape. Fire proceeded from his mouth, and he was figured with one hundred snakes growing from each shoulder. Zohak, a personification of the bad principle, was in the same way supposed by the Persians to be buried under Demavend. He was figured with one serpent growing out of each shoulder; and in other respects he had much in common with the Greek monster.

DE'MBEA, or TZANA. LAKE OF, in Abyssinia, is in lat. 12° N., long. 37° 15' E., and is 50 miles in length, with an average breadth of 25 miles. It occupies part of an extremely fertile plain, situated at an elevation of some 6000 feet above the sea, and con-

tains several beautiful islands, one of which is inhabited. Its southern portion is traversed by the Blue Nile.

DEMB'NSKI, HEINRICH, a Polish general, best known in Britain through his connection with the Hungarian revolution, was born in the palatinate of Cracow, 16th January 1791, entered the Polish army in 1809, took part in the invasion of Russia by the French in 1812, and was made captain by Napoleon himself on the battle-field of Smolensk. He subsequently distinguished himself at Leipzig. After the fall of the empire, he returned to his native country, and lived in comparative obscurity for some time. The Polish revolution of 1830 called him again to arms. He obtained the command of a brigade of cavalry, and exhibited heroic courage at the battle of Kulfew. Afterwards, he made the campaign of Lithuania, under Gielgud; and arriving in Warsaw—having traversed the entire Russian lines—was made commander-in-chief of the national army. After the surrender of Warsaw to the Russians, D. went to France, where he published his *Mémoires sur la Campagne de Lithuanie* (Strasbourg, 1832). In 1833, he proceeded to Egypt, and entered the service of Mehemet Ali, but returned to Paris in 1835.

On the outbreak of the Hungarian insurrection, he offered his services to that country, and Kossuth appointed him commander-in-chief of the Hungarian army. He drew up a plan of the campaign, but could not obtain the concurrence of Görgei, whose tardy arrival caused the loss of the battle of Kopolna (26th—28th February 1849). Forced to retreat behind the Theiss, D. resigned his command, but subsequently consented to act under Messaros. He strongly urged the necessity of uniting the cause of Hungary with that of Poland, and proposed to lead an army into Galicia; but his advice was not taken. After the resignation of Kossuth, and the capitulation signed by Görgei at Vilagos (13th August 1849), D. fled to Turkey. In 1850, he returned to France, and commenced to write his *Mémoires* on the Hungarian war. He continued to live in Paris till his death, which took place 13th June 1864.

DEMEMBRÉ, or DISMEMBERED, a heraldic term to signify that the members of an animal are cut from its body.

DEME'NTIA. See INSANITY.

DEMERARA, a district and river of British Guiana (q. v.). The river D. is upward of 200 miles in length, is 1½ mile broad at its mouth, and is navigable by ships of considerable burden for 100 miles. Its affluents are numerous though small, and at its embouchure into the Atlantic it affords a spacious harbor, obstructed, however, by a bar. It has many settlements on its banks.



Dismembered.

DEME'SNE (Lat. *Terra dominicales. Dominicum*), in the present day, may be said to be the right which the owner in possession of lands in fee simple has in his estate. But the original signification of demesne was that portion of the lands of a Manor (q. v.) which the lord of the manor reserved for his immediate use and occupation. The lands so reserved were either cultivated by the lord of the manor or his vassals (see SERFE), and were thus distinguished from lands granted or subfeued to vassals for services to be rendered. So long as the practice of sub-infundation continued, the demesne lands were a distinct and separate right; but the statute *Quia Emptores*, 18 Ed I., having abolished sub-infundations, and declared that on every transfer of land the feeoffee should hold of the lord paramount, all lands became of necessity demesne, being in the actual possession of the owner or his tenants.

DEMESNE, ANCIENT, a species of Copyhold Tenure (q. v.). Lands held in ancient demesne are said to have belonged originally to vassals of the crown. The services rendered were determinate, not variable at the will of the lord, and more honorable than those of copyhold in general. The tenants also were entitled to certain privileges and exemptions from feudal services. But in process of time, the character of the services appears to have varied; so that in the present day tenants in ancient demesne in some instances differ little from ordinary copyhold tenants.

DEME'TER. See CERES.

DEMETRIUS PHALE'REUS, so named from the Attic demos of Phalerus, a seaport of Athens, where he was born about 345 B.C., was distinguished as an orator and politician. Though descended from a family possessing neither rank nor property, yet by the resolute and persevering exercise of his abilities, he rose to the highest honors at Athens. Having been educated in the school of Theophrastus, he entered upon public life about 325 B.C., and soon made himself famous by the display of great oratorical talent. In 317 B.C., D. was placed by Cassander at the head of the administration of Athens, which office he discharged with such acceptance for nearly ten years, that the grateful Athenians, during that time, heaped all kinds of honors upon him, and erected to him no less than 360 statues. During the later period of his

administration, he seems to have given himself up to dissipation; and when Demetrius Poliorcetes, king of Macedonia, approached Athens with a besieging army, in 307 B.C., D., having lost the sympathies and co-operation of the Athenians, was obliged to flee. All his statues were demolished except one. D. retired first to Thebes, but afterwards found refuge in the court of Ptolemy Lagi, at Alexandria, where he lived for many years, devoting himself to literary pursuits. On the death of his protector, D. was expelled from the court of Egypt, and retreating to Busiris in Upper Egypt, he is said to have died there from the bite of an asp, 283 B.C. D. was the last of the Attic orators worthy of the name. His style was graceful, insinuating, and elegant; bearing, however, in its luxuriousness and tendency to effeminacy, the marks of a declining oratory. The list of his works (50 in number) given by Diogenes Laërtius shows him to have been a man of most extensive acquirements.

DEMETRIUS, the assumed name of four different persons who figure prominently in Russian history between the years 1603—1613. In 1584, Ivan the 'Terrible' died, leaving two sons, Feodor and Demetrius, the former of whom ascended the throne, but proved a weak ruler, and was completely under the control of his brother-in-law Boris Godunoff; the latter, D., was brought up at a distance from the Muscovite court, and when only nine or ten years old, either accidentally killed himself, or, which is more probable, was put to death. In 1593, Feodor died also, and Boris ascended the throne, but his tyrannical measures rendered him very unpopular. In 1603, a strange story reached Russia. It was affirmed that D. was not dead, but had appeared in Poland. The fact was, that a person calling himself D., but who, it was asserted, was in reality a monk, named Grishka Otrepiev, belonging to the convent of Tchudoff, had found means to persuade Prince Wisniewski in Lithuania, and afterwards Mniszek, Palatine of Sandomir, that he was the true son of Ivan. The latter introduced him to Sigismund III., king of Poland, who saw in him a useful instrument for introducing Polish influence into Russia, and so aided him in his designs against Boris. Towards the close of 1604, he invaded Russia, repeatedly defeated Boris (who died April 1605), and entered Moscow in June, the people receiving him with every demonstration of enthusiasm.

He ruled for some months with vigor; but his manifest predilection for the Poles soon excited the Russians against him, and the arrival of his bride, Marina Muiszek, the daughter of the Palatine of Sandomir, on the 12th of May 1606, brought the discontent to a head. Sixteen days later, an insurrection broke out in the capital, headed by Prince Wasili Shuiski. D. was slain, and a multitude of the Poles massacred. Wasili Shuiski now ascended the throne; but in the following year, an individual appeared alleging that he was D., and that another had been mistaken for him in the Moscow massacre. He found a considerable number of adherents, especially when Marina acknowledged him to be her husband. The Poles also helped him, and for some time it seemed likely that he would succeed; but at length he was put to death at Kaluga in 1610. The third false D. gave himself out to be the son of the first. After a brief career, he fell into the hands of the czar, and was strangled. The fourth made the same pretensions, but falling into the hands of the Cossacks, was carried to Moscow, where he was executed in 1613.

DE'MI, or DE'MY (half). In Heraldry, an animal is said to be demi when only the upper or fore half of it is represented. In inanimate objects, the dexter half per pale is usually intended, when it is said to be demi, though a *demi-fleur-de-lis*, for example, may be a *fleur-de-lis* divided per fess.

DE'MI-BASTION, in Fortification, is a kind of half-bastion which frequently terminates the branches of a crown-work, or horn-work, and which is also occasionally used in other places. See BASTION, CROWN-WORK, HORN-WORK.

DE'MIDOFF, a Russian family who in Russia occupy a position as capitalists similar to that held by the Rothschilds elsewhere, and who are not more celebrated for their wealth, than they are for their beneficence.—NIKITA DEMIDOFF, the founder of the family, was a serf in the time of Peter the Great, but, leaving the place of his birth in order to escape being taken as a recruit, he afterwards became famous as a manufacturer of arms, and before his death had amassed an immense fortune. In 1699, he established an iron-foundry, under the auspices of Peter the Great, in whose favor he had attained a high position, near Niviansk, on the eastern base of the Ural Mountains; this being the first iron-foundry ever established in Siberia. He subsequently erected numerous other forges among the solitudes of the Urals, and realized from them very great riches.—AKIMEI DEMIDOFF, son of the preceding, employed German workmen to explore the rich mines of gold, silver, and copper, that are found in the valley of the Irutsk, and the upper reaches of the Obi. In 1725, he built at the foot of the Magnetic Mountain, in Siberia, a foundry called Nischneitagsk, which is still the most important in all Siberia. The Russian

government, sensible of the great service done to the country by the labors of such a man, conferred upon the enterprising metallurgist the title of Counsellor of State.—His son, PROCOPE, founded in 1772 a school of commerce at Moscow, intended to furnish a complete education for the sons of Russian tradesmen.

This establishment was transferred to St. Petersburg in 1800.—PAUL DEMIDOFF, cousin of Procope, also a man of energy, traveled extensively when young, devoting himself to the cultivation of the natural sciences. He presented to the university of Moscow a valuable museum of natural history, and founded also, in 1803, the Demidoff Museum, at Yaroslavl.—NICHOLAS, COUNT DEMIDOFF, nephew of the preceding, born in 1774, distinguished himself while young as an aide-de-camp in the war against the Turks. Later, he married the Countess Stroganoff, and became a privy councillor and imperial chamberlain. His taste for the fine arts and for the natural sciences led him to travel extensively; he also caused the workmen whom he employed in his mines to travel, in order to acquaint themselves with the processes of foreign miners. In 1812, he fought at the head of a regiment which he himself raised and led against the French. His death occurred in 1828. A collection of his works, entitled *Opuscules d'Economie Politique et Privée*, was published at Paris in 1830. Of his two children, PAUL and ANATOL, the former died young, leaving the great bulk of his fortune to the latter, who was born in 1810 or 1812, and was educated in France. He was always remarkable for his enthusiasm in letters and in the sciences. His principal book, published at Paris in 1839, and of which an English translation appeared at London in 1853, is entitled *Travels in Southern Russia and the Crimea, through Hungary, Walachia, and Moldavia*. Demidoff, in 1840, married the Princess Mathilde de Montfort, daughter of Prince Jerome Bonaparte. After five years, the marriage, by which there had been no children, was by mutual consent dissolved. Demidoff, on the 19th June 1856, presented the town of Spa with a bust of Peter the Great. Russia, as well as other countries, owes the foundation of many valuable charitable institutions to the philanthropy of Demidoff. Demidoff died at Baden, 13th July, 1858.

DEMI-GORGE. See BASTION, GORGE.

DEMI-LUNE, in Fortification, is a work constructed to cover or defend the curtain or wall of a place, and the shoulders of the adjoining bastions. It is composed of two faces, forming a salient angle towards the open country outside the place. It has two demi-gorges, formed near the counterscarp, and is surrounded by a ditch. See further under LUNETTE and RAVELIN.

DEMIR-HISSAR ('iron-castle'), a town of European Turkey, in the province of Saloniki, in lat. 41° 12' N., long. 23° 28' E. It is situated on a tributary of the Karasu, at the foot of an old fort-crowned hill, is fortified, and contains several mosques and a Greek church. Pop. 8000.

DEMISE. See LEASE (ENGLISH).

DEMISE OF THE CROWN. That 'the king never dies,' is a maxim of the public law of this country, in accordance with which, immediately on the death of the reigning monarch, the sovereignty passes to his successor, by the act of the law itself. No installation, proclamation, coronation, or other ceremony is required to vest the new sovereign in the regal office, and thus there is no interval or interregnum, and the royal dignity remains perpetual.

The word demise has, in English law, the more general signification of a lease or conveyance, by which a man grants lands or tenements to another for life, for years, or at will; such estate being short of the lessor's own interest therein. It is thus, as it were, byasort of courteous and loyal analogy that it is employed to signify the death of the sovereign. 'So tender,' says Blackstone, 'is the law of supposing even a possibility of his death, that his natural dissolution is generally called his demise, an expression which signifies merely a transfer of property.'

DEMISEMIQUAVER, half a semiquaver, or the 32d part of a semibreve. See NOTATION.

DEMIURGE (from Gr. *demos*, people, and *ergon*, a work; hence a handicraftsman) was the name given in the cosmogony of the Gnostics to the creator or former of the world of sense. He was conceived as the archon or chief of the lowest order of the spirits or æons of the pleroma; mingling with chaos, he formed in it a corporeal animated world. He created man, but could impart to him only his own weak principle, the *psyche* or sensuous soul; therefore the highest, the really good God, added the divine rational soul, or *pneuma*. But the power of evil in the material body, and the hostile influence of the merely sensuous demiurge, prevented the development of that higher element. The demiurge holding himself to be the highest God, could not bring his creatures to the knowledge of the true Godhead; as the Jehovah of the Jews, he gave them the imperfect law of Moses, which promised merely a sensuous happiness, and even that not attainable; and against the spirits of the *hyle*, or world of matter, he sent

only a psychical, and therefore powerless Messiah, the man Jesus. See Gnostics.

DEMMIN, a town of Prussia, on the river Peene, on the borders of Pomerania and Mecklenburg, in lat. 53° 50' N., long. 13° 1' E. Besides the town proper D. comprises three suburbs. It has four public squares and a town-house, and manufactures of woollens, linens, hats, and leather. It has also distilleries and breweries, and some trade in tobacco, gloves, &c. Pop. (1880) 10,507. D., which is a place of some antiquity, was a walled and fortified town during the 12th century. It suffered considerably during the Thirty Years' War, previous to which it was of much more importance than it has since been.

DEMOCRACY (Gr. the rule of the people). It is interesting to trace the progress of this idea, which now plays so important a part. In Greece, whence we derive the name, it was understood to mean a commonwealth so constituted that the power was exercised by the body of the citizens (*the demos*), and not by an individual or by a dominant caste. Democracy, therefore, stood opposed both to monarchy and aristocracy. Most of the republics of Greece, more especially that of Athens, were democracies in this sense. The name by no means implied the notion of an absolutely equal right in all citizens, still less in all men, to the exercise of political power.

Neither the total absence of rights of all kinds on the part of the larger half of the population, the slaves, nor the distinctions recognized by law among citizens proper (e.g., the exclusion of the poorer citizens from office under the Solonian constitution at Athens), were considered incompatible with the nature of a democracy; though in regard to inequalities among citizens, the continually growing force of the democratic principle tended to their gradual extinction, and the transference of power to the mass of citizens without distinction. Aristotle regarded this as an encroachment of *ochlocracy* (mobocracy), the degenerate form of democracy, or democracy proper. Or more frequently, he speaks of democracy as the degenerate form of the polity (Gr. *politeia*). The polity with him was the form, where the many govern for the common benefit.—*Polit.* III. chap. 5, and IV. chap. 6.

In modern history, we meet at the very threshold a state of society which may be called democratic. Among the German nations, we find an almost perfect equality of all freemen (i.e., all that were not slaves), and real self-government exercised by these freemen in each separate tribe. For the personal distinction enjoyed by certain families gave them no privileges over the other freemen, and where royalty existed, it could hardly be said to rule, since the king could do nothing without the concurrence of the assembly of freemen, and reigned not by mere birthright, but required the confirmatory choice of the people.

This condition of general liberty and equality gave place gradually to one of a quite opposite kind. Through the growth of the Feudal System (q. v.), the majority fell into a more or less abject dependence upon a privileged minority. The mass of former freemen, now sunk into serfdom, were hardly distinguishable from those properly slaves, whose position, on the contrary, was become less dependent. The dominant class, the nobility, branded all that did not belong to themselves as 'people,' 'commonalty,' 'canaille.' Thus the term 'people,' which in the ancient republics implied the rights of citizenship, came to denote the masses that were without rights. The distinction between the dominant class and the mass of the people rested chiefly on two points—exclusive occupation in war, and the free possession of land, which was granted for warlike service alone.

But within this system of graduated dependence, from the monarch down through the aristocracy and their retainers in various degrees, there sprang up slowly an opposing element, which, as originating in the mass called the people, we may designate as democratic. It was not so much a new element, as the resuscitation of the old Roman municipal life, which had never altogether become extinct. It was of course in the cities that this fresh element first manifested itself.

Here, instead of a lord with a group of dependents, there arose communities of men with equal rights and self-government. At the same time, a new material interest, that of movable property, the product of industry and commerce, began to claim recognition alongside of territorial possessions and nobility. In England, as early as the Anglo-Saxon times, a merchant who had made three voyages ranked with athane; and soon after the Norman Conquest, the cities were represented in parliament on an equal footing with the warlike aristocracy. This took place later on the continent, and never to the same extent, except in the cities of Lombardy and Flanders, where, at an early period, the citizen element entered the lists with the feudal and warlike. Even within the cities, the same contest was carried on between aristocracy and democracy. At first, it was only those carrying on commerce on a large scale, that asserted their right to take part in the municipal government of the towns; but the trades or guilds soon set up the same claims. These claims were pertinaciously prosecuted,

and often led to bloody contests, but sooner or later were everywhere victorious. Thus was the basis of democracy widened; although the guilds also did not fail to manifest an aristocratic and exclusive spirit towards the body of the people not belonging to them, and with their restrictions and monopolies acted oppressively to the country population. It was not so easy for these last to break the bonds of feudal subjection in which they were held, or to acquire any political standing. Isolated attempts to throw off the yoke, by peasant insurrections and wars, failed, and only were followed by increased oppression. The abrupt division between the feudal possessor of the soil and the serfs under him continued long everywhere except in England. There the rigor of the relation began early to give way, and the transition was effected in such a peaceable and gradual way, that the English historian cannot say exactly how or when. For the greater part of the continent, it was not till the French Revolution in 1789, and the impulse given by it to legislation in other countries, that the agricultural population acquired more or less complete freedom and equality with other classes.

Thus had one part after another of that 'people,' so oppressed and contemptuously thrown into the background by the dominant class in the middle ages, emerged from bondage, and successfully asserted a participation of rights that were at one time the privileges of a single class. The aristocratic principle of feudal society, the principle of exclusion, privilege, of the subjection of the majority to a minority, had given way to the democratic principle of the equal rights of all classes, of all callings and employments. But the development of this last principle was not yet complete. Those who had made good a position in the state alongside of the feudal aristocracy, formed in their turn an exclusive class, taking their stand on certain material grounds.

Thus, the merchants, as representing large masses of capital; the guilds, with their privileged industry; the agriculturists, as possessors of land, however little: all these interests formed, as it were, another aristocracy within the democracy. They were democratic in their origin, and as compared with the class that was at one time exclusively privileged; but in another point of view they were aristocratic, since there still remained without a numerous body, which, instead of elevating to political power with them, they rather repelled, and treated much as the nobility had treated themselves. This residuary mass, which now came to be chiefly designated by the name 'people,' comprehended all those who possessed no capital, no privileged trade or calling, no land—nothing, in short, but their personal powers and capacities for work. This class forms at the present day by far the most numerous portion of the population in nearly all the civilized states of Europe. The designation 'people,' intended to be deprecative, is taken by them in the very opposite sense, and they ground upon it their claim to rule the state, as being properly the people, the numerically strongest class of the community. The preference given to the class of possessors, they look upon as groundless and absurd, just as these had judged of the nobility; they therefore claim perfect equality with them, especially in the exercise of the highest political rights. It is from this point of view that universal suffrage and the rule of mere numbers, without regard to possessions or other conditions, has been proclaimed as a self-evident consequence of the democratic principle.

With this there is connected in many quarters a still further extension of the idea. The same principles, it is said, that have dictated political reformations, call for a remodelling of the social arrangements of mankind; that the possessors of property, the *bourgeoisie*, ought to be deprived, not only of the political privileges they have hitherto enjoyed, but also wholly or in part of the material basis of those privileges, their property, so as to produce a perfect equality, political, material, and social, of all classes. This gives rise to a division of the democrats of the present day into two parties: the purely democratic party, aiming only at securing the political consequences of the democratic principle—universal suffrage, and the absolute equality of social rights; and the 'democratic and social,' who look upon the attainment of political rights as only a means of ultimately securing the general social equality of men.

There seems, however, to be a fundamental error in thus treating the relation between the possessionless class and the possessors as analogous to that between the serfs and lords of feudalism. The contest of democracy against feudalism was not primarily so much for equal rights as for this, that among the same people mere birth should not make one man privileged, and a ruler; another destitute of all rights, and bound to obey. It was a contest for personal freedom, the right for every man to use his powers for his own behoof, and not for that of a master; the right to the free possession of land, &c. Participation in political rights was chiefly prized as a guarantee for securing this personal and social liberty. Now, there is no such absolute distinction between possessors of property and non-possessors, as between the nobleman and *roturier* of the middle ages; the two classes run imperceptibly into one another. Still less does the one class exercise any right

of controlling the personal freedom of the other in respect of labor and acquisition, as was the case in villenage and feudal servitude. Possession has endless gradations, and in the present day, he who had nothing at the outset often becomes a capitalist, and the reverse. There may be other reasons for wishing that there were less abrupt differences of possession, and greater social equality between the lower and middle classes than society actually presents (see SOCIALISM); but this by no means follows necessarily from the notion of democratic equality. All that this notion requires, seems to be the removal of all privileges that destroy the unity and homogeneity of a nation, the establishment of complete personal and social liberty, and of the equality of all in the eye of the laws; and, in regard to political rights, or direct participation in the government of the state, such a form of constitution as will exclude no fixed class of citizens as such. All this, however, seems quite compatible with making the exercise of the different political functions dependent, in the case of each individual, on certain guarantees, and not admitting the whole body of the people to share in the government of the commonwealth at once, but only in proportion as increasing culture renders a wider circle capable of such functions. If we may judge from the example of England and Belgium, this is the way in which the real and steady progress of the democratic principle is best secured.

In France, the feudal principle, instead of a timely compromise with the democratic, as in England, came to a struggle with it of life and death. The consequence was that victorious democracy, instead of seeking to satisfy the practical wants of society first, and leaving the theoretical to be attained gradually, undertook to reorganize at one stroke the whole political and social fabric. In Germany, things took lately a similar course. The case of America is peculiar. There the foundation of the state structure was to be laid on a clear site, and the first page of the history to be written.

Those who came together to form the new community were personally perfectly free and equal, and the local circumstances were such as to favor the exercise of this liberty and equality, by rendering any very great disparity in material means impossible. In such circumstances, the construction of a perfectly democratic order of society could be carried out without struggle, and without any dangerous straining of the principle. There no one looks upon the restriction of the franchise to residents—which is the law in most states of the Union—as an infringement of the democratic principle. Norway bears no little resemblance to America; in that country, the democratic element was never so completely crushed as in other parts of the continent, and that form of society is favored by the means and style of living, which are extremely simple, and are based on a nearly equal division of the soil.

In the development of democracy in modern time, circumstances have directed its attacks rather against the aristocratic, than against the monarchical principle. At one time, monarchy, in its struggle with the aristocracy, found its natural allies in the democracy. The princes, in striving to break the power of the great nobles, which limited their own, often called in the help of the democratic element, partly by conferring privileges on bodies of the people, such as city corporations, and partly by attaching individuals of the non-privileged classes to their personal service, and appointing them to influential positions in the state. The road to power and distinction was, it is true, already open to individuals of the democracy through the church, whose dignities and privileges were not confined to the noble by birth, but were accessible to personal capacity. At a later period, the universities, especially in the faculty of law, formed for the democracy stepping-stones to power, from which they sometimes overtopped the aristocracy of birth. And when the princes—at their head the Louis of France—aiming at absolute authority, sought to find a counterpoise to the feudal nobility, by creating a bureaucratic state machinery, and favoring intelligence in every form, the very widest path was opened to the democratic element for attaining influence and distinction. It is true that all this was at the cost of its most essential principle; for the equality created by a leveling absolutism, raising the low and depressing the high, was nothing more than an equality of dependence upon the one absolute master of all.

The relation between democracy and monarchy was different where the ruler came to be limited as the chief officer of the nation. Such a limitation of the power of the monarch, by means of a representative system not confined to the privileged classes, but embracing at least the citizens of towns, was in itself a victory of the democratic principle. As the circle of this popular representation widens, and its influence in the state increases, such a monarchy becomes more and more democratic in all its institutions.

In a purely democratical state, the people may exercise their power in either of two ways—directly, or through delegates: in the one case, the democracy is said to be absolute; in the other,

representative. The absolute or direct form prevailed in the republics of antiquity; political representation, in fact, seems to be a modern idea. The same is the case with the original Swiss cantons, where almost all public business is discussed in a full assembly of the people. In Switzerland generally, the representative form is now preferred. It is also carried out in the states of North America, and was adopted in the French republic of 1848. The absolute form, in fact, is only adapted for small communities with a population concentrated as to space, and differing little in mode of life or culture. According to some, the representative system is inconsistent with the principle of democracy, as the will of the people is liable to be falsified and crossed by the very organs that are to carry it into execution. It is rather an advantage, however, that the first impulse of the public will, sometimes passionate and short-sighted, should be tempered and enlightened, by passing through a series of media on its way to action; and the hold which the constituency have upon their representatives, by means of frequent re-election, and in other ways, is sufficient guard against any defeat of a steady, earnest, public conviction.

M. de Tocqueville and Mr. J. S. Mill applied themselves to setting forth the evils and dangers of democracy, which they—the latter especially—both regarded not only as a system that must inevitably extend itself, but as the ideally perfect form of government. Mr. Mill was at great pains to show that self-government by a representative democracy is what develops, in the greatest degree, the good mental qualities, both intellectual and moral, of the governed, and that it is desirable gradually to extend this participation in the acts of government till it include the entire adult population, male and female. On the other hand, there are two sources of evil to which we are liable, more or less, as democracy approaches to the term of universal suffrage, and which are to be provided against by proper constitutional arrangements. The first of these is the insufficient mental qualifications of the governing body for the highly complicated work of government. Public administration is a profession, like engineering, medicine, or the law, and demands, no less than these, a special training and devotion of mind. In monarchies and aristocracies, the management of affairs is in the hands of a few, who make it the business of their life, and acquire the requisite skill for doing the work well. In a democracy, this advantage is lost, except in so far as the details of administration are left to skilled officials; the public assembly merely retaining the power of checking and controlling those officials, and of determining general rules of policy.

The other danger is the predominance of the laboring class, by virtue of their numbers, over the class made up of employers of labor, and the rich and educated generally. When there are two or more classes in the community with conflicting interests, the desirable arrangement is, that their power should be equally balanced, so that no party could carry a point by political position alone, or without appealing to the reason, and sense of justice, of some members of the other parties. But if the suffrage were universal, the laboring-class interest would be the predominant one; and so serious would be the danger of class legislation as a result, that Mr. Mill thought it necessary to provide a remedy in the shape of granting a plurality of votes to certain persons, especially those distinguished by education, so as to restore the balance.—*Considerations on Representative Government*, chap. viii.

DEMOCRITUS, an illustrious Greek philosopher, was born at Abdera, in Thrace, about 470 or 460 B.C. Of his life, little is known. The statement that he was first inspired with a desire for philosophic knowledge by certain Magi and Chaldeans whom Xerxes had left at Abdera, on his Grecian expedition, is as untrustworthy as that which represents him as continually laughing at the follies of mankind. His extensive travels, however, through a great portion of the East, prove the reality of this desire, as does also his ceaseless industry in collecting the works of other philosophers. D. was by far the most learned thinker of his age. He had also a high reputation for moral worth. He appears to have left a strong impression of his disinterestedness, modesty, and simplicity on the mind of the community, for even Timon the scoffer, who spared no one else, praised him. The period of his death is uncertain. He lived, however, to a great age. Only a few fragments of his numerous physical, mathematical, ethical, and musical works are extant. These have been collected by Mullach (Berlin, 1843). Cicero praises his style, and Pyrrhon imitated it.

D.'s system of philosophy is known as the *atomic system*. Its essence consists in the attempt to explain the different phenomena of nature—not like the earlier Ionic philosophers, by maintaining that the original characteristics of matter were *qualitative*, but that they were *quantitative*. He assumes, therefore, as the ultimate elementary ground of nature, an infinite multitude of indivisible corporeal particles, *atoms* (see ATOM), and attributes to these a primary motion derived from no higher principle. This motion

brings the atoms into contact with each other, and from the multitudinous combinations that they form, springs that vast and varying aggregate called *nature*, which is presented to our eyes. D. did not acknowledge the presence of *design* in nature, but he admitted that of *law*. 'The word *chance*,' he says, 'is only an expression of human ignorance.' He believed strictly in secondary or physical causes, but not in a primary immaterial cause. Life, consciousness, thought, were, according to him, derived from the finest atoms; those images of the sensuous phenomena surrounding us, which we call mental representations, were, according to him, only material impressions, caused by the more delicate atoms streaming through the pores of our organs. D. boldly applied his theory to the gods themselves, whom he affirmed to be aggregates of atoms, only mightier and more powerful than men.

Strange to say, the ethical system of D.—in spite of the grossness of his metaphysics—is both pure and noble. Such fragments of his writings as we possess contain beautiful, vigorous, and true thoughts concerning veracity, justice, law, order, the duties of rulers, &c.; while, in a spirit not alien to the teaching of Christianity, he looks upon an inward peace of heart and conscience as the highest good, the end and the aim of all virtuous endeavor.

DE'MOISELLE (*Anthropoides*), a genus of birds of the family *Gruidae* (cranes), differing from the true cranes in having the head and neck quite feathered, and the *tertials* of the wings elongated and hanging over the tail, so as in some species to reach the ground. The D., or NUMIDIAN D. (*A. Virgo*), is about 3 feet in length from the point of the bill to the tip of the tail, and the top of its head is about $3\frac{1}{2}$ feet from the ground. It is remarkable, as



Demoiselle (*Anthropoides Virgo*).

are all its congeners, for elegance and symmetry of form, and grace of deportment. The general color of its plumage is gray, but the sides of the head are adorned with two elegant white tufts, formed by elongation of the ear-coverts, and a tuft of blackish feathers hangs down from the breast. The D. is an African bird, but visits Greece and other parts of the south of Europe. To the same genus belongs the beautiful Stanley Crane (*A. paradiscus*) of the East Indies, a larger and taller bird, with very long *tertials*. Notwithstanding its large size, it seems to feed chiefly on the insects of marshes, which it takes when on wing.

DEMOIVRE, ABRAHAM, a distinguished mathematician, was born at Vitry, in Champagne, 1667, and died at London in 1754. Of French extraction, he spent most of his life in England, whither he fled, with many others, for shelter in 1685, on the revocation of the Edict of Nantes. He long supported himself by private tuition and public lecturing, and, towards the end of his life, by answering questions in chances, play, and annuities, most of his responses, it is said, being given at a coffee-house in St. Martin's Lane, where he passed much of his time.

The appearance of Newton's *Principia* incited him to increased devotion to mathematical studies, to which he had always been disposed, and at last he ranked among the leading mathematicians of his time. He was a member of the Royal Societies of London, Berlin, and Paris. The *Philosophical Transactions* of London are enriched by many contributions from his pen; and he was so esteemed by the Royal Society, that they judged him a fit person to decide the famous contest between Newton and Leibnitz for the merit of the invention of fluxions. Among his published works are *Miscellanea Analytica de Seriebus et Quadratis*, &c. (1730, 4to); a work on *The Doctrine of Chances* (1718 and 1738), dedicated to Sir Isaac Newton; and another on *Life Annuities* (3d ed. 1750). D.'s name is well known from its association with a useful trigonometrical formula—viz., that whatever be the index n , $\cos n\theta + \sqrt{-1} \sin n\theta$ is a value of $(\cos \theta + \sqrt{-1} \sin \theta)^n$.

DEMOLITION, in Military Operations, is one of the destructive parts of the duty intrusted to the engineers. When works and buildings belonging to the enemy are to be destroyed, to facilitate operations on the one side, or to obstruct on the other, rules are laid down by which the demolition may be most easily and quickly effected. The quantity of gunpowder to be blasted for bringing down masonry of a particular thickness, the determination of the line of least resistance—these, and similar matters, are required to be studied by officers of the engineer corps.

DEMO'NIACS (*dæmoniacy*, *obsessi*, or, with reference to the supposed influence of the moon, *lunatici*), the name given by the Jews to persons afflicted with epilepsy, hypochondria, or insanity, diseases of frequent occurrence in the East. The name originated in the belief, that persons so afflicted had been taken possession of by Evil Spirits or Demons (q. v.). It was a prevalent opinion among the Persians, Greeks, Romans, and the ancients generally, that the extraordinary conditions and actions of men, which could not be referred to the known and apparent operations and powers of the mind, must be ascribed to the influence of one or more higher spirits. This belief is found in Homer, Herodotus, Euripides, and later writers, and also rooted itself very deeply in the Christian mind during the middle ages. As the *good*, when beyond the limits of the ordinary powers or faculties of great men, was attributed to the inspiration of the Muses, or to the direct co-operation, or even incarnation in their persons of some beneficent deity, so also that deep internal unhappiness of 'a mind diseased,' which no strength of will, and no physician's art in olden times could remove, was as unhesitatingly attributed to evil spirits, or *demons*, as the later Jews, probably with an oblique reference to paganism, called them. Spells and exorcisms, in consequence, took the place of the healing art in reference to such as were supposed to be demonized, and the Jewish exorcists (demon-banishers) alleged, according to Josephus, that they possessed the necessary magic formulas, wonder-working roots, &c., which had been handed down from antiquity.

The good spirits thus appeared—in harmony with the idea that healing was a thing natural and divine in itself, the normal action, so to speak, of nature—to fulfil their function in banishing and destroying the demons. Thus, Christ appears in the synoptic Gospels as healing many who were possessed of unclean spirits, casting out devils, &c. But apart from the fact, that a belief in demoniacal possession was more vital and universal among the later Jews than among the other nations, on account of their being more deeply penetrated by the consciousness of sin, and by a conviction of the mysterious connection between evil and Satan, it was also expected of the Messiah, the Anointed of God, that he would possess 'power' over demons. This fundamental national belief would unconsciously prepare the contemporaries of Christ for regarding his divine exercise of the physician's art from a *religious* rather than a *scientific* point of view. When they beheld the miraculous effects of his 'power' on the bodies and spirits of the so-called demoniacs, it was natural that they should speak of it in language intelligible to their age, and in harmony with its general notions. To have used other words from the standpoint of a higher scientific knowledge, would have been as confusing to the Jews and earliest Christians as it would have been to assure them that it was the *earth*, and not the *sun*, which stood still during the battle at Gibeon. Besides, when it is remembered that before even the synoptic Gospels were written, the miraculous incidents in Christ's life must have fixed themselves in the memory of the populace, under the conditions of the popular belief, it is difficult to see that there was any other course open to the evangelical historians, even if they did not share the common belief of their countrymen, than to adopt the current representations. They had no interest in the mere scientific accuracy or inaccuracy of such representations. Their object was different and higher: it was to show the power, wisdom, and goodness of the Saviour, qualities which are equally manifest whichever theory may be adopted. This view of the question, which is held to be in conformity with sound science and sound criticism, presents itself almost irresistibly to the candid and impartial student of the Bible, when he bears in mind that there is nothing in the recorded examples of demoniacal possession different from the ordinary symptoms of epilepsy, hypochondria, and insanity, which are not *now* beyond the physician's skill.

DE'MONS (Gr. *daimones*, Lat. *genii*) are, according to superstitious belief, spirits which exercise an influence on the fortunes of men. Their dignity and character have both changed greatly in the course of time. Homer calls the *gods* demons, and *dæmoniacos* is with him equivalent to *divine*. Hesiod affirms that there are in the air 30,000 demons or ministering spirits, who were the souls of men in the Golden Age; but a proper classification of these is first found in the Pythagorean and Neo-Platonic systems. Aristotle separates the immortals into gods and demons; mortals, into heroes and men.

Plato, from whom Aristotle probably received the hint of his

division, says in his *Symposium* that 'the demon is a middle intelligence between God and man, and the uniting link which completes the chain of being.' In other places, he informs us that they inhabit the air, wander through the sky, hover over the stars, and tarry on the earth. They also see the hidden issues of the future, and can alter them at their pleasure. Every mortal receives at his birth a particular demon, who accompanies him to the end of his life, and bears his soul to the place of purification and punishment. In general, it may be said, that the Greeks included the divinity or deity among the demons, in so far as he arranged and disposed the dissimilar fortunes of men. In reference to the actions ascribed to them, the demons were divided into good and bad—*agathodaimones* and *kakodaimones*. These evil demons were not, however, originally supposed to be hostile to the divinity or supreme demon. They came from him, and carried out his purpose as truly as the good demons. This was precisely the belief of the earlier Jews also, as we find, for example, from the history of Saul, into whom God repeatedly sent an 'evil spirit,' i. e., a demon, in the classical and not in the medieval sense of the term. The demonism of the Romans consisted chiefly in the worship of departed spirits. See LARES, MANES, and PENATES. The origin of the doctrine of demons is to be sought for in the East. In the teaching of the Hindus, who, besides the highest Deity, Brahma, recognize a countless number of divine agents or messengers, the demons are called *deitjas*. In Parseism, or the religion of Zoroaster, however, this doctrine is found in its most systematic and elaborate development. Indeed, the Persians and Jews alone among the nations of the Old World had the conception of evil spirits headed by a chief demon, a Satan, who was over them as a god. To the genii or demons in the kingdom of Ormuzd (Light), who are called *Izeds*, stand opposed the genii in the kingdom of Ahriman (Darkness), who are called Dews. According to the belief of the Egyptians, the circuit of the world (the sea, the earth, the air) was filled with demons, who ruled the elements, exercised mysterious influence over stones, metals, and plants, and had the souls of men in their power. Although demonism came to Greece from various countries, and by various channels, yet the principal source of it was Egypt. The Jews derived theirs—at least to a great extent—directly from the Persians, during the time of the Babylonish captivity; and although acquainted with 'angels' from an early period, angelology, beyond all question, first received elaborate treatment after the return from exile. The dualism which characterizes the system of Zoroaster now made itself conspicuous here. According to the Jewish demonology, there were seven good demons who formed the council of Jehovah, and ever stood before his throne, while the evil demons have at their head Satan or Asmodi.

After the Jews had, under the Seleucidae and Ptolemies, entered into extensive commercial relations with the Egyptians and Greeks, especially in Alexandria, Græco-Egyptian conceptions were associated with those derived from Persia. When Christ made his appearance in the world, the Jewish conception of a demon as an 'evil spirit,' not from God, had become definitely fixed and popular. This narrowing of the application of the word may have partly originated in the wish to glorify Judaism at the expense of paganism. It would gratify the national pride, which was strongest when it had least to boast of, to include the *demons*, i. e., the spirits both good and bad, of all the surrounding Greek-speaking nations, in one black category, and so make them stand as the representatives of Evil. The early Christian writers carried out this tendency to perfection; for instead of denying the existence of the heathen gods, they turned them into demons, who, acting under the inspiration of their wicked master, had cheated the souls of men, and so made them also worship Satan unawares. See DEVIL. The doctrine of the early church concerning the fall of the demons, based on Genesis vi. 2, and concerning their activity, is a mixture of Jewish and Platonic notions, Christianized, however, by the belief that all their action is controlled and directed by God. Among the Germanic races, during the middle ages, the idea of a person's being taken possession of by demons, led to the other idea of a covenant with the devil, of which the legend of Faust is a well-known example. See Ukert, *Ueber Dämonen, Heeren und Genien* (Leip. 1850); and Conway's *Demonology and Devil Lore* (1878).

DEMONSTRATION (Lat. *demonstrare*, to point out, to cause to see), in Mathematics, is a proof of any proposition which excludes doubt; such are the demonstrations of the propositions in Euclid's *Elements*. The method of demonstration in mathematics is the same with that of drawing conclusions from principles in logic, and is usually syllogistic, the premises being omitted to be stated at each turn. The principle of *reductio ad absurdum* is also employed. See REASONING, SYLLOGISM.

DEMONSTRATION, in Military Operations, is an apparent movement or manoeuvre, the chief object of which is to deceive the enemy, and induce him to divide his force, as if to meet dan-

gers from various quarters. When thus divided and weakened, he may be attacked with greater chance of success.

DEMO'NTÉ, a town in the south-west of Piedmont, Northern Italy, situated on the Stura, 15 miles south-west of Coni. Pop. 6078.

DE MORGAN, AUGUSTUS, was born in 1806, in the small Indian island of Madura, on the north-east coast of Java. His father was an officer in the British army. He was educated at Trinity College, Cambridge, and took his degree of B. A. in 1827, when he was fourth wrangler. He was appointed first Professor of Mathematics in the University College, London, after its foundation in 1828. In 1831, he resigned this office, but was re-appointed in 1836, and continued in that capacity till his death. His writings are very numerous. Besides being a mathematician of the first order, he was extensively and minutely versed in the history of the mathematical and physical sciences. He also devoted himself to the development of the Aristotelian or 'Formal' Logic, to which he has given so symbolical a shape as to make it seem like a branch of Algebra. He has written likewise on the calculation of Insurances and on the Decimal Coinage. The following are the titles of a few of his works: *Elements of Arithmetic* (1830); *Elements of Algebra, preliminary to the Differential Calculus* (1835); *Elements of Trigonometry and Trigonometrical Analysis, preliminary to the Differential Calculus* (1837); *Essay on Probabilities, and on their Application to Life Contingencies and Insurance Offices* (1838); *Formal Logic, or the Calculus of Inference necessary and probable* (1847); *Arithmetical Books, from the Invention of Printing to the Present Time, being brief notices of a large number of works drawn up from actual inspection* (1847). De M. is also the author of treatises on the Differential and Integral Calculus; and contributed largely to the *Penny Cyclopædia*. He died March 1871. See *Memoir of Augustus de M., by his Wife* (1882).

DEMO'STHENES, the greatest orator of Greece, and indeed of the ancient world, was a native of Athens. The date of his birth is doubtful. Fynes Clinton assigns it to the year 382 B.C.; Thirlwall and other good authorities, to the year 385 B.C. His father, a wealthy manufacturer died early, leaving his fortune and children to the care of three guardians, who cruelly abused their trust. As soon as D. came of age, he resolved to prosecute at law these unfaithful stewards. He gained his case, but much of the property had been already squandered, and he only recovered enough to save him from poverty. His success in this and other civil causes fixed his resolution to devote himself to public life; and he set himself to master the law and politics of his country with a labor and perseverance almost without a parallel. His first care was to conquer the physical disadvantages under which he labored. His health was naturally feeble, his voice harsh and tuneless, and his action ungraceful. To strengthen his lungs he used to climb steep hills, reciting as he went, or declaim on the shores of the sea in stormy weather. To improve his delivery, he took instructions from Satyrus the actor, and did not disdain to study effects before a mirror. His feebleness of health he never fairly overcame, but he obviated the defects of his early training by the severest study pursued for months at a time without an interruption.

D. first began to take part in public affairs in the 106th Olympiad, when he was between 27 and 30 years of age, and from that time till his death, his history is the history of Athens. The states of Greece were at this time miserably weak and divided, and had recklessly shut their eyes to the dangerous encroachments which Philip of Macedon was even now making on their common liberties. The first period of D.'s public life (extending over ten years from 356 B.C.) was spent in warning his countrymen to abate their mutual jealousies, and unite their forces against the common enemy, whose crafty and grasping policy he exposed so nobly in 352 B.C. in the oration known as the First Philippic. Three years later, Philip became master of Olynthus, the last outpost of Athenian power in the north, which, in a series of splendid harangues—the three Olynthiæ—D. had implored his countrymen to defend. Peace was now necessary for Athens; and D. was among the ambassadors sent to negotiate with the conqueror; but Macedonian gold had done its work, and D., as incorruptible as he was eloquent, saw with despair that Philip was allowed to seize Thermopylæ, the key of Greece, and become a member of the Amphictyonic League. The peace lasted for six years, during which Philip's incessant intrigues were exposed and denounced by D. in orations hardly less remarkable for their political wisdom than for their matchless eloquence. The most important of these were the Second, Third, and Fourth Philippics; and the speeches on the 'Misconducted Embassy,' and 'The Affairs of the Chersonese.' When war broke out in 340 B.C., D. introduced several important reforms in the army and navy, and showed such powers of vigorous administration, that Philip was baffled for a time. The struggle was closed in 338 B.C. by the battle of Charonea, which laid Greece prostrate at the feet of the Macedonians. Only once after that event did D. appear on the

scene of his previous triumphs. But on that occasion he delivered, in defence of his friend Ctesiphon, his oration 'For the Crown,' which the almost unanimous verdict of critics has pronounced to be the most perfect master-piece of oratory that ancient or modern times have seen. Æselines, his life-long enemy, against whom this speech was delivered, was so overwhelmed by it, that he quitted Athens, and spent the remainder of his life in exile. In 324 B.C. D. was accused of taking part in a revolt against the Macedonian domination, and thrown into prison, whence he escaped, and fled into exile. The death of Alexander the Great in the following year brought a gleam of hope and sunshine to the Athenians; and D., recalled from exile, was again at the head of affairs. Once more the power of Macedon prevailed. D. was demanded up by the conquerors. Finding escape impossible, the hunted orator sought an asylum in the temple of Neptune, in the island of Calauria. Before his pursuers overtook him, he had died, as was generally believed, of poison administered by his own hand. His death took place in 322 B.C.

The personal character of D. is one which it is scarcely possible either to praise or to admire too much. His dauntless bravery, the stainless purity of his public and private life, his splendid and disinterested patriotism, and his services as a statesman and administrator, entitle him to a place among the highest and noblest men of antiquity. On his merits as an orator, it is hardly necessary to dwell. Suffice it to say, that the intelligent of all ages subsequent to his own have, with scarcely a dissentient voice, assigned to him the highest place. Homer is not more clearly the prince of ancient poets, than is D. the prince of ancient orators. The best of the earlier editions of D. are those of Taylor and Reiske, both now superseded by the more recent edition of Bekker. His principal orations are translated into English by Leland, and the whole by Kennedy in 5 vols., for Bohn's Classical Library.

DEMOTIC ALPHABET. See HIEROGLYPHICS.

DEMOTICA, a town of European Turkey, in the province of Adrianople, 22 miles south of Adrianople. It is situated on the Maritza, here navigable for small vessels, and is defended by a citadel. It contains an old palace, is the seat of a Greek bishop, and has manufactures of silks, woollens, and pottery. Pop. 8000. Charles XII. of Sweden, who, after the battle of Pultowa, first found a refuge at Bender, afterwards removed to D., where he remained for some time.

DEMPSTER, THOMAS, a professor famous for his learning, and a miscellaneous and voluminous writer, was born at Muirkirk, in Aberdeenshire, about the year 1579. What the rank or condition of his family was, is unknown; we know, however, that he studied at Cambridge, and that when he went to France, which he did while yet young, in order to perfect his education, he represented himself as a man of family, and as the possessor of an estate. At Paris, he obtained a professorship in the college of Beauvais, where he manifested a very quarrelsome temper, engaging, it is said, almost daily in some brawl. One of these unseemly disturbances resulted in D.'s having to retreat to England. To France, however, he again returned, bringing with him a wife, whom he had married while in England, and who was very beautiful. Crossing the Alps, he obtained a second professorship at Pisa, drawing a handsome salary for his labors. Here, however, the infidelities of his wife marred his peace; and he removed to Bologna, where he became professor of *belles lettres*, and where his wife completed her shame by eloping with 'one or more' of his students. Poor D. seems to have been fond of this wanton, for he took the trouble of attempting the capture of the fugitives. He failed; and died at Butri, near Bologna, 6th September 1625.

D. is the author of numerous treatises, among which may be mentioned the *Historia Ecclesiastica Gentis Scotorum*—a work in which his desire to magnify the merits of his country often induced him to forge the names of persons and books that never existed, and to unscrupulously claim as Scotchmen, writers whose birthplace was doubtful, or who were known to be natives of England, Wales, Ireland, and even France and Germany; but nevertheless, in spite of its defects, it is justly reckoned a valuable and erudite performance. It was reprinted for the Bannatyne Club in 1829.

DEMU'LCENTS (Lat. *demulceo*, I soften), bland and lubricating liquid substances, taken by the mouth, for the purpose of soothing irritation of the mucous membranes, and promoting the dilution of the blood, and the increase of the secretions. Demulcents are chiefly composed of Starch (q. v.), or Gum (q. v.), or of substances containing these, dissolved in water; sometimes also of oily matters, or the white of eggs, and other albuminous or gelatinous substances largely diluted. The decoction of althaea, or marsh-mallow, is a favorite form of demulcent.

DEMURRAGE, in the law-merchant, is an allowance made to the master or owners of a ship, by the freighter, when she is de-

tained in port by the latter beyond the specified time of sailing, for his own convenience. A certain number of days, called running or working days, are allowed for receiving and discharging cargo, and it is usually stipulated in charter-parties that the freighter may detain the vessel, either for a specified time, or as long as he pleases, on paying so much *per diem* for overtime. All the ordinary causes of detention, such as port-regulations, the crowded state of the harbor, and the like, are at the risk of the freighter, and demurrage must be paid, though it be proved that the delay was inevitable by him (*Commentaries*, V. i. 431, Shaw's ed.). 'In short,' says Mr. Bell, 'the rule is, that during the loading or unloading of the ship, the merchant runs all the risk of interruptions from necessary or accidental causes; while the ship-owners have the risk of all interruptions from the moment the loading or unloading is completed.' But demurrage is not due where the delay arose from detention of the ship by a public enemy, or from hostile occupation of the port; and it cannot, of course, be claimed where the fault lay with the owners themselves, or the master, or crew of the vessel. The demurrage ceases as soon as the vessel is cleared for sailing, though she should be prevented from actually doing so by adverse winds. When the days of demurrage are limited by special contract, and the ship is detained beyond them, the sum due as demurrage under the contract will be taken as the measure of the loss for the further time which may be claimed in the form of damages. It will be open, however, to both parties to show, that the rate thus fixed *per diem* is either too high or too low. Where there is no stipulation beyond the ordinary agreement that the usual time shall be allowed for loading and unloading, the master will be entitled, when this period expires, either to sail or to claim damage for detention.

DEMURRER, in English Law, is an exception by one party in a suit or action to the sufficiency in point of law of the case of the opposite party. At common law, each party might demur to the sufficiency of the pleading of the opposite party. The party whose pleading was demurred to might either amend or put in a joinder in demurrer. A demurrer in equity, like a demurrer in law, admitted the facts of the case, but stated objections to the form of the bill in Equity (q. v.), or the sufficiency of the plaintiff's case to sustain the remedy craved. Since the Judicature Act of 1875, a D. is argued before a divisional court if in the Queen's Bench, Common Pleas, or Exchequer Division of the High Court; before a single judge, if in the Chancery Division, or in the Probate, Divorce, and Admiralty Division.

Demurrer to evidence is also a form of procedure which existed in both common law and equity practice. In the former it had long been almost obsolete; and in its place was substituted a motion for a new Trial (q. v.). It may arise on a trial at bar or at Nisi Prius (q. v.). It admits the facts proved, but objects that they are not sufficient to sustain the issue. In equity, a demurrer to evidence is where a witness refuses to answer a question put to him by direction of the court. The objection is then taken down in writing, and is argued before the judge by whom the interrogatories were settled.

Demurrer to a criminal indictment is also almost obsolete. After the passage of 7 Geo. IV. c. 64, this form of demurrer, which was formerly of little moment, became of consequence to a prisoner, inasmuch as by neglecting to state in the form of a demurrer his objection to an indictment, he was precluded from afterwards insisting in them. But by 14 and 15 Viet. c. 100, it is enacted that no indictment shall for any of these defects be held insufficient; and further, that every objection for any formal defect in an indictment shall be taken before the jury is sworn, and may be amended by the judge. This last provision places demurrers in criminal cases on a similar footing to that of objections to the indictment in Scotland. There is, however, this material difference, that in Scotland the defect cannot be immediately remedied, but the prisoner, if the objection be sustained, undergoes a further detention in jail on a new indictment.

DEMY', a particular size of paper. In that of printing-paper, each sheet measures 22 inches by 17½; drawing-paper, 22 by 17; and writing-paper, 22 by 15½.

DENAIN, a town of France, in the department of Nord, on the left bank of the Scheldt, about five miles west of Valenciennes. Its situation, in the center of an extensive coal-field, and in the immediate vicinity of iron mines, gives it unusual facilities for smelting iron, and its works of this kind are of considerable importance. D. is a regular and well-built town, and has a good market. It has some manufactures of beet-root sugar. Pop. (1876) 11,849. Here the allies under Lord Albemarle were defeated by the French under Maréchal de Villars, 24th July 1712.

DENARIUS (*deni*, ten each), the principal silver coin among the Romans, was equal to ten *ases*, but upon the reduction of the *as*, the denarius equalled sixteen of it. It was first coined 269 B.C. Its weight at the end of the Roman Commonwealth is estimated at

60 grains, while under the Empire the weight was 52·5 grains of



Denarius of the earliest kinds :

Having on the obverse a personification of *Rome* as a warrior with helmet ; and on the reverse, a chariot drawn by four horses.

silver. The value of the Commonwealth denarius was thus rather more than 8½d., and of the later period about 7½d.

DE'NARY SCALE. See NOTATION.

DE'NBIGH, a parliamentary and municipal borough, the county town of Denbighshire, in the north of the county, 30 miles west of Chester, and 213 miles north-west of London. It stands in the hundred of Isaled, near the middle of the vale of the Clwyd, on the sides and at the bottom of a rugged steep limestone-hill, crowned by the imposing ruins of a castle built in 1284 by Henry Lacy, Earl of Lincoln, where there had stood fortifications erected by William the Conqueror, and where there are traces of still earlier castellated remains. The newer part of D. was built at the bottom of the hill, after the destruction and desertion of a great part of the town on the top of the hill, about 1550. D. has manufactures of shoes, and leather for the English markets and export trade; but it is more a place of genteel retirement than commerce. Pop. (1871) 6323; (1881) 6491. It sends one member to parliament; Ruthin, Holt, and Wrexham being contributory boroughs. In 1645, Charles I. took refuge in the castle after the battle of Rowton Heath. The garrison surrendered to the parliamentary forces, after a siege of two months. It was shortly afterwards dismantled. The fortifications have an area of a square mile in extent. A lunatic-asylum for the five counties of North Wales was erected near the town in 1848. A noble institution for the maintenance and education of 50 female inmates, of whom 25 are orphans, was built in the town, and opened in 1860, with funds in the hands of the Drapers' Company of London, from money left to them in 1540 by one Thomas Howell, a Welshman. It has an endowment of about £1500 a year. The charter of Henry de Lacy is preserved among the corporate archives.

DE'NBIGHSHIRE, a county of North Wales on the Irish Sea, and between the Dee and the Conway. It is 41 miles long, with an average breadth of 17; contains 603 square miles, has 8 miles of coast, and is the sixth in size of the Welsh counties.

The surface is partly rugged and mountainous, with some beautiful and fertile vales, as the vale of the Clwyd, 20 miles by 7. In the north, is a horse-shoe range of hills, 65 miles long, and convex to the coast. The highest hill is Cader Fromwen, 2563 feet; and many others rise above 1500 feet. The rocks are chiefly Silurian clay and graywacke slates, with some granite and trap, and bands of Devonian, Carboniferous, and Permian strata. There occur coal, iron, slates, flags, millstones, limestone, lead and copper. The chief rivers are the Dee, Conway, Elwy, and Clwyd. The Rhaiadr waterfall is 200 feet high in two parts. Llangollen vale is famed for romantic beauty and verdure, amid hills of savage grandeur. The climate is mild in the lower parts, but cold and bleak among the hills, where small hardy sheep and ponies are reared. About two-thirds of D. are under cultivation; its corn, cheese, butter, and live-stock are greatly esteemed. It is also well timbered. Salmon are caught in the rivers. D. is divided into 6 hundreds, 3 poor-law unions, and 64 parishes, in the diocese of Bangor and St. Asaph. The chief towns are Denbigh, Wrexham, Ruthin, Holt, Llangollen, Llanrwst, Abergele, and Raabon. Pop. (1871) 105,102, showing an increase of 74 per cent. since 1801; (1881) 108,931. D. returns three members to parliament, two for the county, and one for Denbigh. D. was anciently occupied by the Ordovices, a powerful tribe, not entirely subdued by the Romans till the time of Agricola. Of British or pre-Roman remains there still exist tumuli, two cistvaens or stone cells, barrows, and forts. To the dunes of the Welsh and Saxon struggles are referable the Pillar of Eliseg, near Llangollen, and the dikes of Offa and Watt. Offa's, the king of Mercia's dike, to keep out the Welsh, was a ditch with small forts on mounds at intervals, and ran from Herefordshire to the estuary of the Dee; Watt's dike ran on the east side of Offa's dike, and parallel to it. Wrexham Church is one of the seven wonders of Wales. Chirk Castle is a fine Norman stronghold, lately restored.

DE'NDERAH (Gr. *Tentyra*, Coptic *Tentore*, probably from *Tēn-Athor*, the abode of Athor), a ruined town of Upper Egypt, situated near the left bank of the Nile, in lat. 26° 13' N., long. 32° 40' E. It is celebrated on account of its temple, dating from the period of Cleopatra and the earlier Roman emperors, and one of

the finest and best preserved structures of the kind in Egypt. The principal temple measures 220 feet in length by about 50 in breadth, and has a noble portico supported on 24 columns. The walls, columns, &c., are covered with figures and hieroglyphics. Prominent among the former is that of Athor or Aphrodite, to whom the temple was dedicated. On the ceiling of the portico are numerous mythological figures arranged in zodiacal fashion, and which were long regarded as a representation of the zodiac; but the absence of the crab has led some recent archaeological travelers to doubt whether the figures were intended to have any reference to astronomy. There are many other sacred buildings at D., including a temple of Isis. The whole, with the exception of one propylon, are surrounded by a sun-dried brick-wall, 1000 feet long on one side, and in some parts 35 feet high.

DE'NDERMONDE (Belg. *Termonde*) a town of Belgium, in the province of East Flanders, situated at the confluence of the Dender and the Scheldt, 18 miles east of Ghent. D., which is said to have originated in the 8th c., is fortified, and has a citadel dating from 1584, and possessing the means of laying the surrounding country under water in case of attack. Louis XIV. besieged it in vain in 1667, but Marlborough, aided by a long drought, succeeded in taking it in 1706. [In connection with Marlborough's siege, D. is mentioned frequently in Sterne's *Tristram Shandy*.] The principal buildings of D. are the town-house and several churches, the most noteworthy of which is the Church of Notre Dame, a very old edifice, containing two admired pictures of Vandyk. The manufactures are woollens, lace, cotton-yarn, &c., and there is a large weekly market for the disposal of the agricultural produce of the neighborhood. Pop. (1880) about 8500.

DENDRE'RPETON, a small lizard-like batrachian, found by Lyell and Dawson in the interior of the hollow trunk of an upright *sigillaria* in Nova Scotia. The tree was about two feet in diameter, and consisted of an external cylinder of coal, and an internal axis of mud and sand, cemented together with fragments of wood into a solid rocky mass. In this were discovered the shell of a *pupa*, the first air-breathing mollusc met with in the coal, and the bones of a small reptile probably 2½ feet long. It was described and figured by Owen as *D. Acadicum*. He showed it to be nearly related to *Archegosaurus*, from the plicated structure of the teeth, the sculpturing of the broad cranial plates, and the structure and proportion of certain limb-bones. It received its name, 'tree-lizard,' from its having been found in a tree; and this was supposed to show that it had arboreal habits: it is, however, probable that the remains had been washed in with the mud and sand which form the matrix in which they are preserved.

DE'NDRITE, the name given to a peculiar branching mineral crystallization on the surfaces of the fissures and joints, or in the substance of rocks, having the appearance of moss, and often mistaken for fossil plants. The hydrous oxide of manganese is the mineral that generally assumes this form, occurring frequently in great abundance in limestone, steatite, trachyte, and other substances.

DE'NDROLITES, petrified stems of trees or shrubs, which occur in all parts of the world in the formations called Secondary, especially in the Coal formation. They may be regarded as the remains of a former creation. They are of very various magnitude. In some places, gigantic stems are found, and these are often observed to have branches, fruit and even leaves—these, however, only as impressions—whilst in other places only fragments occur, which, however, belong to trees having nothing in common with those now growing in the same regions—as, for example, beautiful stems of palms at Chemnitz in Saxony, &c.

Such woods are generally changed into agate, or into pitchstone, when they occur in ancient strata altered by volcanic fire. Concerning the question of their origin, opinions are still divided. Many of them are so hard and beautifully colored, that they are cut and employed for all artistic purposes. When cut into very thin plates, they exhibit under the microscope the structure of the wood so perfectly, that it is not only possible for botanists to determine the natural order or family of plants to which it belongs, but even the genus and species. They mostly belong to the *Filices*, *Cycadææ*, and *Conifera*. Brongniart was amongst the first investigators of this department of science. He has had many followers, amongst whom, in our own day, Unger and Göppert have especially distinguished themselves. See Göppert, *Monographie der fossilen Koniferen* (Leyden, 1850).

DE'NDROPHIS (Gr. tree-snake), a genus of serpents of the family *Colubridæ*, remarkable for their extremely slender form, their beautiful colors, and the liveliness of their movements. Their eyes are very large and prominent. They are widely distributed over the warm parts of the world; none are found in Europe. They live chiefly among the branches of trees, and insects are their principal food.

DENGUE, or **BREAK-BONE FEVER**, also called **DANDY** and **BUCKET FEVER**, is a disease known in the southern states of North America and in the West Indies, where it was first described as having appeared in the years 1827 and 1828. It was very violent in its access, but not often fatal, and consisted chiefly of a severe attack of inflammatory fever, with great heat and redness of the surface, and well-marked rheumatic pains of the limbs both in the joints and muscles. It usually terminated by a copious perspiration after a few days.

DENHAM, **SIR JOHN**, an English poet of the reign of Charles I., was the son of the Chief Baron of Exchequer in Ireland, and was born at Dublin in 1615. In 1631, he entered Trinity College, Cambridge, where, after studying three years, he took his degree. Turning his attention to literature, he wrote a tragedy, entitled *Sophy*, which in 1641 was acted with great applause at Blackfriars. Two years after he produced the poem *Cooper's Hill*, which has done more to perpetuate his name than any other of his works. In 1647, he was engaged in the performance of secret services for Charles I.; but these being discovered, he was obliged to escape to France in 1648, returning thence to England in 1652. After the Restoration, he was appointed surveyor-general of his majesty's buildings, and created Knight of the Bath. Towards the close of his life, the latter part of which was darkened by an unfortunate marriage, he was visited by insanity; but recovering for a short time, he commemorated the death of Cowley in one of his happiest poetical performances. His own death occurred in 1663. His verse is characterized by considerable smoothness and ingenuity of rhythm, with here and there a passage of some force.

DENI'NA, **CARLO GIOVANNI MARIA**, an Italian author, was born 28th February 1731, at Revello, in Piedmont; studied at Turin, and in 1754 was appointed Humanity Professor at Pignerolo, but was deprived of his office on account of his having written a comedy in which there was much that excited the professional animosity of the ecclesiastical order. D. went to Milan, but was soon after recalled to Piedmont, and appointed Professor of Rhetoric in the university of Turin. In 1777, he published anonymously at Florence his *Discorso sull' Impiego Delle Persone*, in which he sought to show how monks might be transformed into useful members of society. This, of course, again cost him his chair, and he was even banished from the metropolis. In 1782, he went to Berlin, on the invitation of Frederick the Great. Here he lived for many years, and wrote a considerable number of works. In 1804, he was introduced to Napoleon at Mentz, to whom he dedicated his *Clef des Langues* (Ber. 1804), and was in consequence appointed imperial librarian at Paris, where he died 5th December 1813.—D.'s principal productions are—*Discorso sopra le Vicende della Letteratura* (2 vols., Turin, 1761), *Delle Rivoluzioni d' Italia* (3 vols., Turin, 1769–1770), an excellent work, which was copiously abused by the apologists of ecclesiastical privileges; and *Storia Politica e Letteraria della Grecia Libera* (4 vols., Turin, 1781–1782). D.'s other works were, for the most part, written in Prussia. Among them may be mentioned—*Essai sur la Vie et le Regne de Frédéric II.* (Berlin, 1788), *La Prusse Littéraire sous le Regne de Frédéric II.* (3 vols., Berlin, 1790–1791), *Tableau Historique, Statistique et Moral de la Haute Italie et des Alpes qui l'entourent* (Turin, 1805), and *Storia dell' Italia Occidentale* (6 vols., Turin, 1809–1810).

DENIS, **St.**, according to tradition, the apostle of France and first Bishop of Paris, suffered martyrdom in the 3d century. He was sent (as is said) from Rome about 250 A.D. to preach the gospel to the Gauls. After various detentions at Arles and other places, he arrived in Paris, where he made numerous proselytes. Pescennius or Sicinnius Lescennius, who was then the Roman governor of this part of Gaul, ordered D. to be brought before him, along with other two Christians, Rusticus, a priest, and Eleutherios, a deacon. As they continued firm in their faith, in spite of threats, Pescennius caused them to be cruelly tortured, and afterwards beheaded, 272 A.D., or, as others say, 290 A.D. Gregory of Tours, Fortunatus, and the Latin martyrologists, state that the bodies of the three martyrs were thrown into the Seine, but taken up by a pious woman named Catulla, and interred near where they lost their lives. At a later period, a chapel was built over their tomb. In 636, King Dagobert founded on the spot an abbey, called St. Denis, which soon grew to be one of the richest and most important in the whole kingdom, and was long the sepulchre of the French kings.

What measure of truth there may be in the above biography, it is impossible to say. The Acts of St. D., written about the end of the 7th or the beginning of the 8th c., is founded merely upon vulgar traditions, and is full of absurdities. The Greek Church makes St. D. to be the same person as Dionysius, the Areopagite, first Bishop of Athens. The Roman Catholic Church celebrates his memory on the 9th of October. For a long period his name was the war-cry of the French soldiers, who charged or rallied to the words *Montjoye St. Denis*.

DENIS, **St.**, a town of France in the department of Seine, six miles north of Paris. It is traversed by two small streams, the Croud and Rouillon, and is well built, with clean spacious streets. It is situated within the line of forts forming the outworks of the fortifications of Paris, and was itself formerly fortified, but its ramparts have been converted into promenades. St. D. has manufactures of printed calicoes and other cotton goods; also several flour-mills, dye-works, bleacheries, and chemical works. Its yearly market, at which there is an annual sale of about 180,000 sheep, is one of the oldest in France, and lasts for a fortnight. Pop. (1876) 29,500. The town is supposed by some to date from the foundation of a chapel raised above the tomb of St. Denis (q. v.). This chapel was replaced, some time after his death, by a church and abbey, built by Dagobert I., who was buried in the abbey church, which thereafter became the mausoleum of the kings of France. By a decree of the National Convention in 1793, the abbey was ordered to be destroyed, and in three days 51 tombs were sacrilegiously rifled and demolished, and the bodies cast indiscriminately into ditches prepared for them. The building, stripped of its lead to furnish bullets for the revolutionists, remained roofless, and was used as a cattle-market, until the time of the Empire, when Napoleon commenced its restoration, a work which was completed by succeeding governments, in a style surpassing even its former splendor. The crypt of the abbey church contains statues of the French kings and princes from Clovis to Louis XVI.

DENISON, **JOHN EVELYN**, for many years Speaker of the House of Commons and Privy Councillor, was born in 1800; eldest son of John Denison, Esq., of Ossington, Nottinghamshire. Educated at Christ Church, Oxford; married, 1827, Lady Charlotte, third daughter of the fourth Duke of Portland; represented Newcastle-under-Lyne from July 1823 to 1826, and Hastings from 1826 to 1830; was a Lord of the Admiralty from 1827 to 1828; sat for Notts from 1831—when he was also returned for Liverpool—till December 1832.

On the division of the country under the Reform Bill, he was returned for South Notts until 1837. He was then without a seat until 1841, when he was returned for Malton, but exchanged this borough for North Notts in 1857. In May 1857, on the elevation of Mr. Shaw Lefevre to the peerage, D. was elected Speaker of the House of Commons without opposition, and unanimously re-elected in 1859, 1866, and 1868. In 1872, he retired from the Speaker's chair, in which he was succeeded by Mr. Brand, and shortly after he was created Viscount-Ossington. He was a D.C.L. of Oxford. He died in 1873.

DENIZLI', a town of Anatolia, Asiatic Turkey, situated on a low hill rising out of a spacious plain, in lat. 37° 48' N., long. 29° 3' E. D. is chiefly occupied with bazaars and market-places, the inhabitants for the most part residing in the environs. The manufacture of leather and a kind of morocco forms the staple industry of the place. The population may now amount to 8000 or 10,000; it was formerly much more numerous, but by an earthquake in 1715, no less than 12,000 people perished.

DE'NMARK (Dan. *Danmark*), capital, Copenhagen, the smallest of the three Scandinavian kingdoms, is situated between 54° and 57° 44' 50" N. lat. and 8° 5' and 12° 45' E. long., excepting the small island of Bornholm in the Baltic, about 90 miles east of Seeland, which lies in 15° E. long. D. is bounded on the N. by the Skagerak, a gulf of the North Sea; on the E. by the Cattegat the Sound, and the Baltic; on the S. by the states of the German empire; and on the W. by the North Sea, which the Danes call the 'Western Ocean.'

The following table gives the main divisions of the kingdom of D. and its principal colonies:

	Area in Eng. sq. miles.	Population in 1880.
Denmark Proper, comprising the islands of Seeland, Fünen, Lolland, Falster, &c., and the peninsula of Jutland,	14,553	1,969,454
The Farøe Islands.....	495	11,221
Iceland	38,860	72,000
Greenland	25,000	9,531
Danish W. I. Islands—viz., Santa Cruz, St. John, and St. Thomas, }	105	37,600
	79,013	2,099,800

The population of D. proper in 1870 was 1,784,741. Copenhagen (Dan. *Kjøbenhavn*) the capital, had, in 1880, 235,234 inhabitants.

In 1880, there were five towns in D., besides the capital, in which the population exceeded 10,000.

	Pop.
Aarhus, in Jutland.....	24,831
Odense, chief town of Fünen.....	20,804
Aalborg, in Jutland.....	14,152
Randers, ".....	13,547
Horsens, ".....	12,652

The continental portion of D., which since the treaty of Vienna of October 30, 1864, has been almost wholly limited to Jutland, is, in point of fact, the north-western extremity of the German continent.

The entire coast-line of D., along the North Sea, Skagerak, Cattegat, Sound, Baltic, and Little Belt, exceeds 800 miles; but many parts of this range are entirely unavailable for purposes of maritime intercourse, in consequence of the shallowness of the water, or of the numberless sandbanks, bars, and small islands which skirt the coasts. Seeland, or *Sjælland*, the largest of the islands, and the seat of the metropolis, Copenhagen, has an area of about 2000 square miles. Its surface is in general very flat, and only a few feet above the level of the sea, and the highest of its few isolated elevations is not 500 feet above the sea. The island is generally fertile and well-wooded, more especially in the south, but in the north the soil is in many parts arid. Fünen (Dan. *Fyn*), the island next in extent, with an area of about 900 square miles, is divided from Seeland by the Great Belt, and from Jutland by the Little Belt. It is less wooded than Seeland, and is intersected by a range of hills of inconsiderable height. The smaller islands of Laaland, Langeland, Falster, and Moen, with an area of 2000 square miles, are grouped to the south of Fünen and Seeland, and exhibit the same physical and geographical characters. They evidently, at some earlier epoch of the world's history, formed, together with those two larger islands, one connected whole, with Jutland on the west, and Sweden on the east. The north-east shores of Seeland are separated from the latter country by a channel 70 miles in length, and only $1\frac{1}{2}$ mile in breadth at its narrowest point, known as the Sound, or the *Ore Sund*, Ear Sound, so denominated from its resemblance to the human ear. This channel varies from 10 to 19 fathoms in depth. The western coasts of Seeland are divided from Fünen by the Great Belt, a channel 9 miles wide at its narrowest point, and from 5 to 25 fathoms in depth—while the western shores of Fünen are separated from the peninsula of Slesvig and Jutland by the Little Belt, which is about four-fifths of a mile wide. The peninsula of Jutland, whose area is about 9600 square miles, was anciently, and even comparatively recently, covered with forests, but since their wasteful destruction, extensive tracts have become converted into sandy heaths, and in some parts it has been found necessary to sow bent-grass and plant trees, in order to prevent the mischief accruing to the cultivated lands by the clouds of dust raised by the wind. One-third of Jutland has been rendered unfruitful by these causes, but where the few forests still remain, the neighboring districts are productive and well cultivated. Efforts have been made within the last few years to plant the heaths and drain the marshes of Jutland, and the results have on the whole been successful, more especially in regard to the latter, which are of considerable importance, since they supply large quantities of turf for fuel.

The coasts of D., both on the continent and in the islands, are indented with numerous bays or *fjords*, the largest of which is Limfjord, which intersects Jutland, and since 1825 has insulated its northern extremity by breaking through the narrow isthmus which had separated it from the North Sea. It covers an area of 250 square miles. D. abounds in small lakes, the most considerable of which are Arre, Esrom, Fure, and Bavelse, all in the north and west parts of Seeland. But as no inland point is more than 30 or 40 miles from the sea, and the ranges of hills are low and interrupted, the country has no rivers properly so called. Inter-communication is, moreover, facilitated in the islands and in Jutland by various canals.

Roads, Railways, &c.—The high-roads and lesser country roads, together measuring upwards of 1000 miles in length, are in general in excellent condition. At the present time there are about 980 miles of railroad in the islands and Jutland. In 1880, the telegraphic lines extended to a length of 2195 miles; while the number of telegrams transmitted was 1,125,124.

Climate, Soil, Productions, &c.—The climate of D. is modified by vicinity to the sea, and is considerably milder, and the air more humid, than in the more southern and continental Germany. The cold is seldom very intense before Christmas, or after the middle of March. The summers are occasionally very hot; the weather generally may be characterized as very variable; rain and fogs are frequent. The mean temperature in Copenhagen, whose climate may be regarded as representing an average of that of all D., is, in winter, 32°; spring, 43°; summer, 63°; autumn, 49° Fahrenheit. The alternations from winter to summer are rapid, and scarcely broken by the intervention of spring or the

succession of autumn. Westerly winds prevail in the proportion of 48 per cent. to all others. The total absence of mountains and large rivers, and the alluvial character of the soil, by precluding all mining operations, of necessity lead the peasantry to follow agriculture, in the pursuit of which more than half the population are engaged. The drought of the spring and the short and sudden heat of the summer are often detrimental to the grass; but there is seldom an absolute failure in the supplies, and the cereal crops are generally good. During the last half-century, the cultivation of wheat has increased nearly 200 per cent., while that of rye and barley has decreased rather than augmented.

Rye is more extensively used for bread than any other of the cereals, the average returns for the last ten years showing that about 3 millions of tons were raised in the kingdom annually, valued at nearly 19 millions of rix-dollars; while, in spite of the relatively increased cultivation of wheat, the quantity and value of the latter scarcely reached the half of the above figures.

Barley and oats, for which the Danish climate seems to be specially well adapted, yield the largest annual average returns—viz., for the former, $6\frac{1}{2}$ millions of tons, valued at 29 millions of rix-dollars, and for the latter $7\frac{1}{2}$ millions of tons at 21 millions of rix-dollars. Since the potato crops were attacked by disease in 1847, the cultivation of this tuber has declined, but the average yield may be reckoned at about 400,000 tons. In 1876, there were in D. 352,262 horses, 1,348,321 horned cattle, 1,719,249 sheep, and 503,667 swine. Of these there were exported in 1880, 14,539 horses, 99,831 horned cattle, 87,328 sheep, three-fourths of which belonged to Jutland, while the 251,459 swine, the largest number ever exported, had been nearly all raised in the islands.

The Danish fisheries are not so important a branch of industry as might be expected, when we consider the extended coast-line of the country. But it was recently calculated that the Danish fisheries had an annual value of £150,000, and employed 6500 men. The principal fish in D. are porpoises, herrings, whittings, cod, flounders, mackerel, salmon, and eels. Oyster beds, which are included under the royalties of the Danish crown, are met with at Frederikshavn, Skagen, and in the Limfjord. No part of the Danish territories is rich in minerals; some coal is found in the island of Bornholm, gypsum at Segeberg, and salt at Oldesloe. Amber is collected on the western shores of Jutland. Peat is got wherever there are swamps; and from the absence of productive coal-mines, and the increasing scarcity of wood, it is of great value for fuel, and every village in the vicinity of such land has a certain portion assigned for its supply. Beech and birch are the prevalent trees, but oak, pine, and larch are also indigenous, and grow to perfection. Agriculture has been steadily improving in D. of late years, but the land is too much subdivided to admit of the expenditure of great capital; and, moreover, is seldom cultivated by the owners. The condition of the laboring classes is happy; they are more roomily and warmly lodged, and better clad, than in Great Britain, and their dwellings are always clean. The peasants still continue to manufacture much of what they require within their own homes, the women weaving linen and woollen stuffs for the use of the household, and the men making their own furniture and simplest farm-implements, and the wooden shoes which are worn by men, women, and children. Almost two-thirds of the entire area of the country is arable land. The Danes have not hitherto availed themselves of the great natural advantages which the country possesses for manufactures and trade; and notwithstanding the rich porcelain clays in Bornholm, which afford valuable materials for the manufacture of earthenware, and the abundant water-power in every part of the kingdom, the industrial operations are very inconsiderable.

There are, however, a few good porcelain and glass works, and iron-foundries, chiefly in Seeland and near Copenhagen; and of late years the manufacture of cards and ornamental paper has been brought to great excellence in Copenhagen, and at Silkeborg, in Jutland. Linen is the principal article of domestic manufacture in Seeland, but the supply does not suffice for the home-demand. Many of the restrictions which formerly cramped foreign commerce have of late years been removed, but the commercial legislation is still too protective to give free scope to individual enterprise.

Exports and Imports.—The principal articles of export are grain, butter, cheese, smoked and salted meats, brandy, liqueurs, horned cattle, horses, skins, hides, tallow, bristles, &c. Among the imports are sugar and molasses, wines and spirits, salt, drugs, spices, textile fabrics, timber, coal, coffee, tea, tobacco, rice, flax, hemp, iron and steel wares, &c.

About two-thirds of the export trade is carried on in native vessels. The total value of the imports between 1874–80 range from £10,500,000 in 1878 to £12,650,000 in 1880; and of the exports in the same period from £8,500,000 in 1879 to about £11,000,000 in 1880. The greater bulk of the foreign trade is between Germany and Great Britain; the average annual value of the trade with Germany being about £4,000,000; that with Great Britain ranging from £2,000,000 in 1878 to £2,500,000 in 1880. In 1880, the

Danish mercantile fleet consisted of 3082 vessels, including 201 steam-ships, and 2881 sailing-vessels; total tonnage, 249,466.

Revenue, &c.—The total revenue for the financial year 1880–81 was 51,745,463 kroner, or £2,874,748 sterling, and the expenditure was 47,543,367 kroner, or £2,641,298. Since the war of 1866, the Danish government has maintained a large reserve fund for the purpose of having means to provide against war or other emergency. The amount reserved in 1882 was £1,070,903. The interest of the fund thus accumulated constitutes a very considerable item in the annual revenues of the state; and the national debt decreased from 1866 till 1880, when it was £9,629,257. In 1882, however, it was £11,203,594. Till lately, the current coinage consisted of gold Fredericks d'or (16s. 4d.), silver specie-dollars (4s. 3d.), rix-dollar or *rigs-daler* (2s. 2d.), divided into 6 marks of 16 shillings each. But under a law which came into force 1st January 1875, a decimal system of currency was introduced into D., the unit being the *kroner*, divided into 100 *öre*. The *kroner* is worth about 1s. 1½d. Since 1839, the Danish pound-weight has been made equal to half the French kilogramme, and its fractions reduced to corresponding equivalents. With a similar view of facilitating international commercial relations, the old Danish ship-measure of a *last* (=150 cubic feet) was done away with in 1867, and the English tonnage system officially adopted. The present unit is the ship last, equal to 2 tons.

Army, Navy, &c.—According to law, all able-bodied adult Danes are liable to serve for eight years in the regular army, and for a similar period in the army of reserve. Exemption from this duty can, however, be obtained under definite conditions, and by payment of the appointed penalties. The kingdom is divided into five territorial brigades, subdivided into four battalions, each brigade furnishing its contingent of infantry and one regiment of cavalry. Exclusive of the reserve, the army on the peace-footing numbers 37,850 men and officers; and on the war-footing, 49,253. The budget for 1880–81 was charged 8,737,000 kroner (£393,500) for the ministry of war. The Danish navy is recruited from certain maritime districts exempt from the liability of supplying men for the army. The old Danish fleet, of which D. was deprived by England in 1807, is now represented by a small but well-appointed force of 33 steamers (of which 8 are ironclads), with a horse-power of 30,554. The navy numbered, in 1880, about 900 men and officers. The budget of 1880–81 was charged with the sum of 5,125,700 kroner (£230,600), for the year's expense of the ministry of marine.

Education.—The educational institutions of D. have reached a very high degree of perfection, and few countries, if any, can compete with her in regard to the excellence of the system, and its extensive application relatively to the amount of the population. Education is compulsory for children between the ages of 7 and 14 years, and poor parents pay only a nominal sum towards the government or parochial schools, of which there are about 3000 in Denmark. There are six training-colleges for the teachers of these public schools. Classical and other higher-class education is afforded by a large number of colleges in the capital and more important provincial towns, with the university of Copenhagen for its center, whose professional and tutorial staff of about 50 university teachers is remarkable for the high order of instruction imparted. There are three public libraries in Copenhagen, of which the Royal Library, with 500,000 volumes, is especially rich in oriental and Icelandic MSS.

Religion.—The established religion of D. is Lutheran, to which the king must belong; but complete toleration is enjoyed in every part of the kingdom. The Reformation was introduced in 1536, when Christian III. caused all the Roman bishops to be seized in one day, formally proclaimed their deposition from their sees, and incorporated the property of the church with that of the crown. D. is divided into 7 dioceses, or *stifter* (besides those in the West Indian colonies)—viz., Seeland, Laaland, Fünen, Ribe, Aarhus, Viborg, Aalborg, besides Skalholt in Iceland; 1907 parishes, with numerous affiliated churches, 62 rectors, and 1677 parish ministers. The nomination of the bishops is vested in the king; they have no political character; but in other respects exercise nearly the same privileges within their dioceses as their English brethren of the same rank.

Law.—The supreme court of justice, presided over by four assistant judges, chosen by the Landsting, in addition to the four ordinary high judges, holds its sittings at Copenhagen, and there are lower courts in the towns. All civil cases are first carried before a Court of Conciliation, composed of persons from the vicinity, selected on account of their position and character. Their decisions are registered, and have legal force where both parties have engaged to abide by the judgment; otherwise, the case is carried to the higher courts. Appeals are allowed from all the lower courts to the Supreme Court.

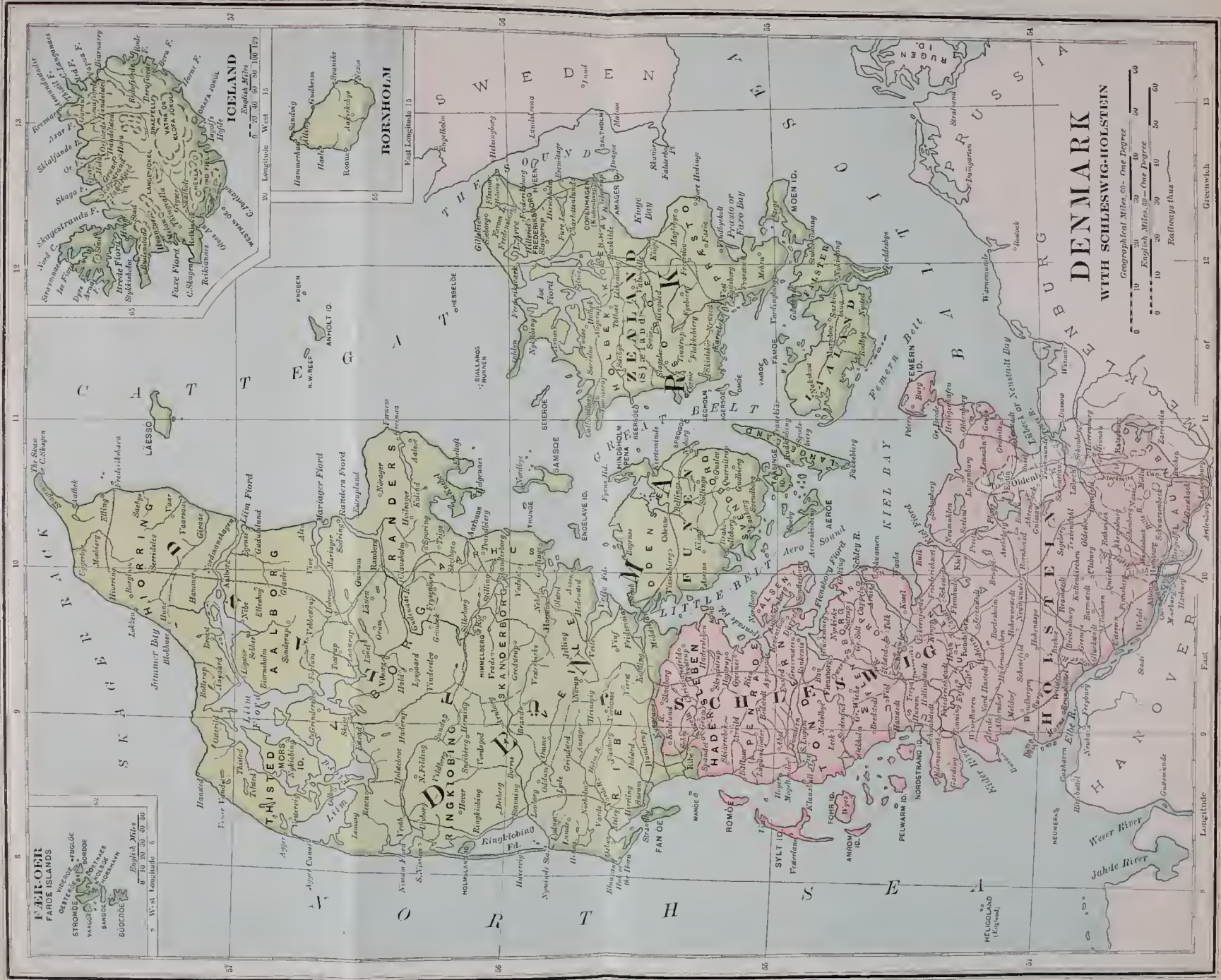
Constitution and Government.—The succession to the crown was not necessarily hereditary till 1660, when the people and the clergy, impelled by hatred towards the nobles, in whose hands the supreme power of the state rested *de facto*, constituted themselves into a

national assembly, which invested the sovereign (Frederick III.) for himself and his heirs with absolute power, and declared the succession to the throne hereditary. From that time, the crown exercised the *dominium absolutum*, unchecked by any constitutional restraint, till 1831, when Frederick VI., yielding to the pressure of the times, granted a constitution to his people, and established an assembly of notables for the islands and Jutland; the duchies being governed by their own constitutional forms. The nation was at first perfectly satisfied with the amount of power conceded by the king, but after a time the anomalous character of the authority vested in the assembly created great political agitation and discontent. This feeling continued to increase under the reign of Frederick's successor, Christian VIII.; and on the death of the latter, his son and successor, Frederick VII., saw himself obliged to depart from the conservative policy of his father, and to grant, in 1849, the constitutional form of government which D. now enjoys, and which is based upon the most liberal principles. The national assembly or Rigsdag consists of the Folkething and Landsting, and is invested with very extensive powers; it meets annually for two months, and its members receive a fixed allowance during their sittings. The Landsting is composed of 66 members, of whom 12 are chosen for life by the king, while the remainder are elected for a term of 8 years by certain municipal and rural electoral bodies, who represent the large taxpayers of the kingdom. A fixed age, good reputation, and a certain moderate independent income are the only qualifications required for election to this branch of the Rigsdag. The members of the Folkething, whose number (which is now 102) varies with the population, are elected for three years by universal suffrage, and, except that no fixed income is required in their case, they must have the same qualifications as candidates for the upper chamber. The Rigsdag must meet every year, and must, in the course of their session, consider and dispose of the annual accounts that the finance minister is bound to submit to their scrutiny.

The king's person is inviolable; the ministry is responsible, and with the king as president, constitutes the Executive Royal Privy Council. The seven members of this body, who preside over seven distinct ministerial departments, are individually and collectively responsible to the Rigsdag for their acts, and cannot under any circumstances be condemned or pardoned by the sovereign without the concurrence of that body. D. is divided for administrative purposes into 20 *Amter*, or jurisdictions—viz., 10 for the islands, and 10 for Jutland, each presided over by a chief or 'Amtmand,' who in Copenhagen alone bears the title of 'Over-president.' Primogeniture is still in force, but all other limitations to succession, and all remains of the ancient forms of land-tenure by socage or fixed terms of labor, are being entirely abrogated. The titles of nobility in D. are limited to counts ('grever') and barons.

History.—The Kymri were the earliest-known inhabitants of Scandinavia, and made themselves formidable to the Romans 160 years B.C. To them succeeded the Goths, who, under their mythical leader, Odin, established their rule over the Scandinavian lands. Odin's son, Skjold, is reputed to have been the first ruler of D.; but the little that is known of Danish history in those remote ages, seems to indicate that the country was split up into many small territories, whose inhabitants lived by piracy. The people were divided into 'Bonder,' freemen, and 'Trælle,' bondsmen. The former busied themselves with war, and 'Vikingetog,' or piracy, and the government of the land; while the latter were left the peaceful pursuits of hunting, fishing, and tilling the soil. The mission of Ansgarius, the apostle of the north, to Southern Jutland in 826, when he baptized Harald Klak, one of the Smaa Kongar, or little kings of D., was the means of first opening the Danish territories to the knowledge of the more civilized nations. The country was soon torn by civil dissensions between the adherents of the ancient and modern faith. Gorm the Old, the first authentic king of D., the bitter enemy of Christianity, died in 935, after having subjugated the several territories to his sway; and although his death gave fresh vigor to the diffusion of the new faith, paganism kept its ground for 200 years longer, and numbered among its adherents many of those half-mythical heroes whose deeds are celebrated in the Eddas and the *Kæmpeviser* of the middle ages. The success that attended the piratical incursions of the Northmen, drew them from their own homes; and while Gorm's descendants, Svend, and Knud, were reigning in England, D. was left a prey to anarchy. On the extinction of Knud's dynasty in 1042, his sister's son, Svend Estridsen, ascended the throne.

Internal dissensions and external wars weakened the country, and the introduction of a feudal system raised up a powerful nobility, and ground down the once free people to a condition of oppressed serfage. Valdemar I., by the help of his great minister Axel Hvide, known in history as Bishop Absalon, subjugated the Wends of Rügen and Pomerania, and forced them, in 1168, to renounce the faith of their god, Svantevit, and accept Christianity. During the time of Knud VI., and in the early part of the reign



DENMARK WITH SCHLESWIG-HOLSTEIN

Geographical Miles 0-100
English Miles 0-100
Railways thus

FAROE ISLANDS
STROMOY
VAAGSØY
SANDØY
GUDØY
English Miles 0-100
West Longitude 0-100

BORNHOLM
Helsingør
Rønne
Svaneke
English Miles 0-100
West Longitude 0-100

ICELAND
Reykjavik
Hafnarfjörður
Kópavogur
English Miles 0-100
West Longitude 0-100

of Valdemar II.—sons of Valdemar I.—the conquest of D. extended so far into German and Wendic lands, that the Baltic was little more than an inland Danish sea. The jealousy of the German princes and the treachery of his vassals combined to rob Valdemar II. of these brilliant family conquests. His death in 1241 was followed by a century of anarchy, and inglorious decadence of the authority of the crown, during which the kingdom was brought to the brink of annihilation under the vicious rule of his sons and grandsons. Under his great-grandson, Valdemar III., the last of the Estridsen line, D. made a quick but transient recovery of the conquests of the older Valdemars, and the national laws were collected into a well-digested comprehensive code. From his death in 1375 till 1412, his daughter, the great Margaret, first as regent for her only and early lost son, Olaf, and later as sole monarch, ruled, not only D., but in course of time also Sweden and Norway, with such consummate tact, and with so light yet firm a hand, that for once in the course of their history, the three rival Scandinavian kingdoms were content to act in harmony. Margaret's successor, Erik, the son of her niece, for whose sake she had striven to give permanence, by the act known as the Union of Calmar, to the amalgamation of the three sovereignties into one, undid her glorious work with fatal rapidity, and after an inglorious war of 25 years with his vassals the Counts-dukes of Slesvig-Holstein, he lost the allegiance and the crowns of his triple kingdom, and ended his disastrous existence in misery and obscurity. After the short reign of his nephew, Christopher of Bavaria, the Danes, on the death of the latter in 1448, again exerted their long-used ancient rights of election to the throne, and chose for their king Christian of Oldenburg, a descendant of the old royal family through his maternal ancestress, Rikissa, the great-granddaughter of Valdemar II. Christian I., the father of the Oldenburg line, which continued unbroken till the death of the last king of D., Frederick VII., in 1863, laid the foundation of the Slesvig-Holstein troubles, which after maturing for centuries, have ended in our own day in dismembering the Danish monarchy.

Christian bought the empty title of Count-duke of Slesvig and Holstein in 1460, by promising for his successors that they should for ever leave the two provinces united, a pledge he had no right to impose, and they no power to keep; and by his failure to pay his daughter's dowry to her husband, James III. of Scotland, he lost for Norway her ancient provinces of the Shetlands and Orkneys, which had been given in pawn to the Scottish king. His unprofitable reign was followed by half a century of international struggles in Scandinavia. The insane tyranny of the otherwise able and enlightened Christian II., by exasperating the Danish nobles, and lashing the national anger of the Swedes to fury, cost him his throne, and gave him a life-long cruel imprisonment among his subjects in D., who chose his uncle Frederick I. to be their king, while Sweden was for ever separated from D., and raised under the Vasas (see GUSTAVUS I.) to be a powerful state. Christian III., in whose reign the Reformation was established, united the Slesvig-Holstein duchies in perpetuity to the crown in 1533. His partition of the greater part of these provinces among his brothers became a source of much mischief to D., which did not end till 1773, when the alienated territory was recovered by the cession of Oldenburg and Delmenhorst to the Grand Duke of Russia, the representative of the Holstein-Gottorp family. Frederick II., who increased the embarrassments connected with the crown-appanages, by making additional partitions in favor of his brother (the founder of the Holstein-Sonderburg family), was succeeded by Christian IV., 1588, who was the ablest of all the Danish rulers. His liberal and wise policy was however, cramped in every direction by the arrogant nobles, to whose treasonable supineness D. owes the reverses by which she lost all the possessions she had hitherto retained in Sweden. The national disgraces and abasement which followed, led, in 1660, under Christian's son, Frederick III., to the rising of the people against the nobles, and their surrender into the hands of the king of the supreme power. For the next hundred years, the peasantry were kept in serfage, and the middle classes depressed; while the power of the crown rested in the hands of a Germanized nobility, who despised the language and usages of their country, and exerted the most baneful influence on the true national life. Many improvements were, however, effected in the mode of administering the laws, and the Danish kings, although autocrats, exercised a mild rule. The abolition of serfage was begun by Christian VII. in 1767, but not finally completed till twenty years later; it was extended to the duchies in 1804. The miseries of the reign of Christian's son, Frederick VI., due to the relations maintained by D. with Napoleon, brought the country to the verge of ruin. At war with Sweden, England, Russia, and Prussia, and with the finances in a depressed condition, the kingdom was threatened with bankruptcy; and although it had speedily rallied from the injuries and losses inflicted by the battle of Copenhagen, under Nelson, in 1801, the fresh rupture with the allies, which ended in the compulsory surrender to the English of the entire fleet, after

the destructive bombardment of Copenhagen, September 1807, completely paralyzed the nation.

By the congress of Vienna, D. was compelled to cede Norway to Sweden. The discontent that had long been brooding in the duchies, degenerated after the stirring year of 1830 into mutual animosity between the Danish and German population which was not allayed by the schemes devised by the court to meet the difficulties of the case. The anticipated failure of heirs to the throne complicated the questions at issue; and the Holstein party, being encouraged by the diet at Frankfort, and perhaps still more by Prussia, came to an open rupture with D. in 1848, hastened, no doubt, by the reaction produced all over the continent by the French Revolution, and thus, on the accession of Frederick VII., half his subjects were in open rebellion against him. After alternate hostilities and armistices, the Slesvig-Holstein war was virtually concluded in 1849, by the victory of the Danes over the Slesvig-Holsteiners at Idsted, followed by the conclusion of peace between D. and Prussia. The liberal constitution granted by the king fully satisfied his subjects in D. Proper, but disaffection still smouldered in the duchies.

On the death in 1863 of Frederick VII., the present king, Prince Christian of Slesvig-Holstein-Glücksborg, ascended the throne under the title of Christian IX., in conformity with the act known as the treaty of London in 1852, by which the succession to the Danish crown had been settled on him, and his descendants by his wife, Princess Louise of Hesse-Cassel, niece of King Christian VIII. of D. With Frederick VII., the direct Oldenburg line had expired, and at his death, the question of the succession to the duchies acquired an importance which it had never before possessed. A pretender, backed by German influence and help, at once started up in the person of the eldest son of the Duke of Angustenberg, whose defeat in 1848, and solemn renunciation of all claims on the titles or possessions of the Danish royal house, in consideration of his receiving a free pardon, and accepting a large sum of money from the crown, had been regarded in D. as the final settlement of his pretensions.

The cause of the Angustenberg prince, who assumed the title of Duke Frederick VIII. of Slesvig-Holstein, was speedily merged and lost sight of by Prussia and Austria in their direct aim of incorporating the duchies with the German Confederation. D., unaided by the neighbors and allies on whose support she had relied, was forced to go single-handed into the unequal contest. After a brave but utterly futile attempt at resistance, the Danes found themselves forced to submit to the terms conceded to them by their powerful foes, and resign not only Lauenborg and Holstein, but the ancient crown-appanage of Slesvig into the hands of the German confederate powers. By the peace of Vienna, 1864, the Danish king bound himself to abide by the decision which Prussia and Austria should adopt in regard to the destiny of the severed Danish provinces. The dissensions between these two great powers, which led to the Austro-Prussian war of 1866, and resulted in the triumph of Prussia, have left the fate of the Slesvigers entirely in the hands of the latter state, which has hitherto refused to relinquish its hold upon the province.

Since the war, D., although reduced to the narrow limits of the islands and Jutland, has recovered from its fall, and the degree of political and social freedom enjoyed by the nation now perhaps as high as is to be found in any country in Europe.

DENNERY, or D'ENNERY, ADOLPHE PHILIPPE, a French dramatic writer of Jewish extraction, was born at Paris on June 17, 1811. His first employment was that of a clerk to a notary; he gave that up to become a painter; and afterwards, while still very young, he became a contributor to the newspapers. The first dramatic work in which he had a hand was brought out in 1831; this was *Emile, ou le Fils d'un Pair de France*, and it was produced by him in concert with M. Charles Desnoyer, a well-known *littérateur* and theatrical critic. It had some success, and D. followed it up with two or three others, which had so much popularity that his services as a play-writer came into considerable demand. He was a ready writer, and always able to come up to a fair standard of merit; and, encouraged by the theatrical managers of France, he has been one of the most prolific of dramatic authors. He has produced, by himself or in concert with others, about 200 pieces in one style or another; and a few years ago, five of his pieces were to be seen upon the Parisian stage at one time. Latterly, D. has been a man of business as well as an author. He was appointed director of the Théâtre Historique in 1850, but resigned this appointment almost immediately. An attempt which he made in 1855 to establish a new theater, which he first proposed to call the Théâtre du Peuple, and afterwards the Théâtre du Prince Impérial, did not succeed; but since that, he has had a large share in establishing and in managing a public company, in which many persons connected with the press and with the theaters were concerned—the Société Thermale de Cabourg-Dives. Of this company, whose speculation consisted in developing the attractions of a new watering-place (in the dep. of Calvados), he has been suc-

cessively secretary and managing director. D. was decorated with the Legion of Honor on the 10th December 1849, and was promoted to the rank of officer on the 16th of August 1859.

DE'NNEWITZ, a small village in the province of Brandenburg, Prussia, 42 miles south-south-west of Berlin. Here was fought, on the 6th of September 1813, a battle between 70,000 French, Saxons, and Poles, commanded by Marshal Ney, and 45,000 Prussians, under General Tauentzien.

The fighting was obstinate to the last degree. Both armies more than once drove each other from their positions, but the patriotic enthusiasm of the Prussians finally prevailed, and Ney gave the order to retreat. At this moment Bernadotte, crown-prince of Sweden, appeared at the head of 70 battalions of Russians and Swedes, supported by 10,000 horse, and preceded by 150 pieces of cannon. These fresh troops turned the retreat into a complete rout, until the whole of the French army presented nothing but a vast mass of fugitives. The French lost 15,000 killed, wounded, and prisoners (the Germans say 20,000), and 43 pieces of cannon. The allies lost 6000 killed and wounded, of whom 5600 were Prussians. The most important feature of this victory to the Prussians was that most of their troops were *landwehr* (militia), for whom Napoleon had expressed the utmost contempt, designating them a 'rabble.'

DENNIS, JOHN, the son of a London saddler, was born in London in 1657. He was put to school at Harrow; and afterwards, in 1675, he went to Caius College, Cambridge. Four years afterwards, he removed to Trinity Hall in the same university, and in 1683, took there his degree of M.A. After leaving Cambridge, he traveled on the continent, passing through France and Italy. Returning home, and in the possession of a small fortune, he joined the Whigs, and brought a sufficiently rancorous pen to the assistance of his party. He formed the acquaintance of Dryden and Wycherley, and other distinguished wits of the time, and instigated by companionship, as well as by native bent, he made various attempts as a theatrical writer. D. was expensive in his habits; and having dissipated his fortune, he had to depend for subsistence during the remainder of his life on private patronage and his pen. For several years, he enjoyed a small annuity, procured for him by Lord Halifax, but that he outlived. He became blind before he died; and in his distress, some of those he had flattered, and some of those he had abused, got up a play for his benefit. He died in 1734. D. had an ungovernable temper, and made many enemies; and his name, which his own writings could not preserve, will live for ever in their contempt and hate. He is one of the best abused men in English literature. Swift lampooned him, Pope assailed him in the *Essay on Criticism*, and finally 'damned him to everlasting fame' in the *Dunciad*.

DENON, DOMINIQUE VIVANT, BARON, was born at Châlons-sur-Saône, January 4, 1747. At an early period, he went to Paris, to study law, but quickly betook himself to the fine arts, and acquired a high reputation as an amateur and art critic. During a residence in Southern Italy, he spent much of his time in studying etching and mezzotint engraving, and along with the Abbé St. Non, wrote a *Voyage Pittoresque de Naples et de Sicile* (Par. 1788). Afterwards, he lived at Venice, and other Italian cities, but returned to France during the Revolution. Having, at the house of Madame Beauharnais, formed the acquaintance of Bonaparte, he was chosen by him to accompany the expedition to Egypt in the capacity of a *savant*.

He was indefatigable in drawing the relics of ancient Egyptian art. In 1802, he published his *Voyage dans la Basse et la Haute Egypte*, the engravings attached to which admirable work, are very correct, and prove D. to have been a skilful artist. As a member of the Egyptian Institute, he had also the most important part in the *Description de l'Egypte* drawn up by that learned body. Bonaparte now made him Inspector-general of Museums, in which capacity he exhibited great ability. He accompanied Bonaparte in various subsequent expeditions, and suggested to him what art-treasures of the conquered cities would be most suitable for the Louvre. After 1815, he was dismissed from his office. The remaining years of his life were occupied in preparing for publication a History of Art, to be illustrated by the best artists, but he did not live to finish it, having died 27th April 1825. D.'s work was completed by Amaury Duval, and published in 1829, under the title *Monuments des Arts du Dessin chez les Peuples tant Anciens que Modernes*. D. himself executed as many as 300 etchings, chiefly imitations of the style of Rembrandt.

DÉNOUEMENT (Fr. from *dénouer*, to untie, which again is from *nœud*, a knot.) In Fiction, this term is generally applied to the termination or catastrophe of a play or romance; but, more strictly speaking, it designates the train of circumstances solving the plot, and hastening the catastrophe. A good dénouement in a novel or play should be natural, as a result of the preceding plot, and yet should not be so obvious as to be easily anticipated. Forced and arbitrary solutions of plot, offending against nature

and common sense, are frequently perpetrated for theatrical effect (*coups de théâtre*).

DENS, PETER, a well known Roman Catholic theologian, was born in 1690, at Boom, a small Belgian town, situated on the river Rupel, about 10 miles south of Antwerp. Apparently, nothing is known—at least by Protestant writers—regarding the incidents of his life, as his name appears in no encyclopædia or biographical work that we are acquainted with. The scanty information we possess is derived from the epitaph inscribed on his tomb in the chapel of the archiepiscopal college of Malines by the present (1857) rector. From this epitaph it appears that he was reader in theology at Malines (something equivalent to our professor of divinity) for twelve years, *plebanus* or parish priest of St. Rumold's or Rumbold's Church in the same city, and president of the College of Malines for 40 years. He also held various honorary church offices. He was canon and penitentiary, synodical examiner and scholastic archpriest of St. Rumold's—the metropolitan church of Belgium. He died 15th February 1775, in the 85th year of his age.

The work which has rendered D.'s name familiar, even to the Protestant public, is his *Theologia Moralis et Dogmatica*. It is a systematic exposition and defence—in the form of a catechism—of every point of ethics and doctrine maintained by Roman Catholics, and is extensively, if not generally adopted as the text-book of theology in their colleges. It appears to owe its popularity more to its being a handy and useful compilation than to any great talent exhibited by its author. The casuistical parts of the work have been severely criticised by Protestant moralists. The edition we have consulted is the Dublin one of 1832.

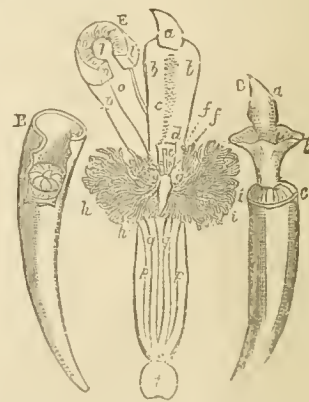
DEN'SITY. When of two bodies of equal bulk or volume, the one contains more matter than the other, it is said to have greater density than that other. The quantity of matter is measured by the weight, and thus density and specific gravity come to be proportioned to one another. Platina, which is about 21 times the weight of water, long passed for the densest body; but Breithaup of Freiburg, in 1833, made out *iridium* to be twice as dense. Rare is opposed to dense, and the rarest body known is *hydrogen*, which is about 14½ times rarer than atmospheric air. The density of bodies is diminished by heat and increased by cold. See HEAT, MATTER.

DE'NTA, or GYE'NTA, a market-town of Hungary, situated on the Berzava, about 30 miles south of Tamesvar. It has several large annual pig fairs. Pop. (1869) 2919.

DENTA'RIA, a genus of plants of the natural order *Crucifera*, having a lanceolate compressed silique. One species only, *D. bulbifera*, is found in Britain, and is a rare plant, with a simple stem, the lower leaves pinnate, the upper leaves simple, and rose-colored flowers, the axils of the leaves producing bulbs, and the creeping rhizome having tooth-like knobs, whence the name *D.*, and the English name Coral-root. The root, when dried, is said to have greater pungency than pellitory of Spain, and was formerly used in the same way for toothache. *D. diphylla*, a North American species, is called Pepper-root from the same property.

DENTAL SYSTEM. See TEETH.

DENTALIUM (Lat. *dens*, a tooth), a genus of marine gasterop-

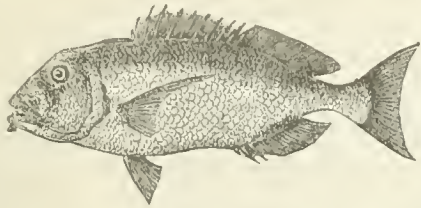


Dentalium:

B, the shell of *Dentalium entalis*, broken longitudinally, showing the animal in a contracted state. C, the shell, showing the animal advancing out; a and b, the head, the lobes of which are developed in the form of a corolla; c, a part of the collar of the mantle. E, the animal, magnified, extricated from the shell, with the mantle slit along the dorsal and medial line, detached in part from its posterior insertion, and turned aside so as to show the parts enclosed; a, the extremity of the foot, which closes the aperture j. of the collar *lm*, of the mantle *nop*; bb, lobes of the foot; c, the foot itself, presenting a depression or channel, running its whole length; d, the head; e, the cerebral ganglion; f, f, the two sides of the mouth; g, g, the membranes which support the branchiae; hh, ii, the branchiae; pp, qq, the retractor muscles; s, the muscle of insertion; t, the expanded posterior extremity, in which is situated the vent.

odous molluscs, of the order *Tubulibranchiata*, having two symmetrical *branchiæ* (gills), which are enclosed, along with all the other soft parts of the body, in an elongated shelly tube. The tube is conical, somewhat curved, and has a considerable resemblance to an elephant's tusk in miniature. Until recently, from a mistake originating in the similarity of its branchiæ to those of some of the *Annelides*, the *D.* was ranked in that order. Fossil species abound in the Tertiary formations.

DENTEX, a genus of acanthopterous fishes of the family of *Sparidae* (Sea-breams, &c.), having a deep compressed body, and generally perch-like form; a single dorsal fin, the anterior rays of which are spinous; scaly cheeks; and many small conical teeth, among which are in each jaw at least four large canine teeth, elongated, and curved inwards. One species (*D. vulgaris*), the



Dentex.

Dentex of the ancient Romans, abounds in the Mediterranean, and has occasionally been taken on the southern shores of Britain. It is sometimes called the Four-toothed Sparus.

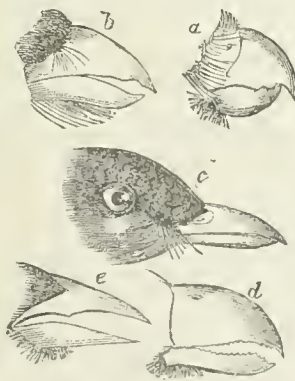
It attains a large size, sometimes three feet in length, and 20 to 30 pounds weight. It is an excessively voracious fish, as its large canine teeth might be held to indicate, devouring other fishes; but is itself in much request as an article of human food, and great numbers are taken in the mouths of rivers in Dalmatia and the Levant. It is there also a considerable article of commerce, being cut in pieces, and packed in barrels with vinegar and spices, in which state it will keep good for twelve months. It was preserved in the very same manner by the ancients.

DENTIFRICES are substances, generally powders, which are employed as aids in cleaning the teeth. Charcoal and cuttle-fish bone-powder are useful as detergents; chalk, as a soft powder; and pumice, as a hard gritty substance for occasional use, when the teeth are more than ordinarily colored. Catechu, cinchona, and rhatany are employed to give astringency to the tooth-powder; myrrh, to impart odor; and bole armoniac, to communicate a red color. Common salt, cream of tartar, phosphate of soda, and sulphate of potash, are occasionally used; and where the breath has an unpleasant odor, the addition of 4 parts of bleaching-powder (chloride of lime) to the 100 of the tooth-powder, removes the foetid character of the breath, and also tends to whiten the teeth.

DENTILS (Lat. *dens*, a tooth), in the Ionic, Corinthian, and Composite orders of architecture, are ornaments resembling teeth. See **ENTABLATURE**.

DENTINE is the thin layer of cement or enamel which more or less coats the teeth of the mammalia, and from the compactness of its structure and fine texture, it is generally called the ivory of the tooth. It is very hard and durable, and consists mainly of phosphate of lime accompanied by gelatine.

DENTIROSTRES, a tribe or sub-order of birds, of the order



Examples of Notched Bills:

The notches or serratures are evidently adapted to the better securing of the prey; and this conformation appears not only in the *Dentirostres*, but in birds of other groups and orders. Examples may be seen in the double-toothed Falcons, as in the genus *Harpagus*, *a*; in the *Nogons*, *b*; in the sub-genus *Andropadus*, *c*; and in the *Chizzerhis Variegata*, *d*, where the teeth are small, sharp, regular, and of equal size. The *Lanio* of Vieillot, *e* has a central or raptorial tooth to its bill.

Insessores, characterized by a bill with a marginal notch towards

the extremity of the upper mandible. It is composed chiefly of insectivorous birds, although the *Shrikes* (*Laniada*), which belong to it, prey also on small birds, quadrupeds, and reptiles. Among the other families of *D.* are *Merulida* (Thrushes, &c.), *Sylviada* (Warblers, &c.), *Ampelida* (Chatterers), and *Muscicapida* (Fly-catchers, &c.).

DENTISTRY, the art of the dentist, or that of treating disease in the teeth (*Dental Surgery*), and of replacing these organs when lost (*Mechanical Dentistry*).

1. *Dental Surgery*.—The disorders to which the teeth are liable are those arising from defective development, such as imperfections in form or structure, irregularity of position, &c.; those, again, constituting diseases more properly so called, such as caries or dental decay, necrosis or death of a tooth, inflammation or neuralgia of the soft tissues connected with them, such as the gum, the central pulp or *nerve*, &c.; lastly, those arising from accidents of various kinds, such as blows, falls, and the like.

The treatment of all these different affections is generally of a local kind; or, in other words, confined to the spot in which the disease manifests itself. But dental diseases themselves are not always of a purely local nature; and it may be generally stated that wherever a tooth becomes diseased without any well-marked or ostensible cause, such a tooth has been originally defective or weak. It has been, in fact, imperfectly developed, and this imperfection is due to constitutional causes, or such as affect the general health of the individual. In this way, a very slight cause is sufficient to excite disease in, and lead to the destruction of, such a tooth. Disease impairs what little vitality it already possesses; it becomes less and less able to resist the action even of such influences as it is naturally exposed to in the mouth—chemical decomposition sets in, and the substance of the tooth is broken down and decays—literally, rots away. This, in most cases, constitutes the pathology of dental caries; but there seems no doubt that in other instances caries, like any other morbid action in the bodily tissues, may commence in teeth previously quite healthy.

The object of the dentist, in these circumstances, is twofold: he either attempts to arrest the decay, and repair its ravages; or he removes the diseased tooth altogether. These operations, along with supplying artificial teeth when the natural ones are lost, constitute, with those for the treatment of various minor affections, the main offices of dentistry.

Premising that all operations in dentistry require to be modified according to the different cases, we shall shortly describe the various manipulations required in their performance.

Sealing.—This is a little operation, by which the accumulation of a substance termed 'tartar' is removed from the teeth. Tartar is a deposit from the saliva, and lodges in greatest quantity most commonly behind the lower front-teeth. Where it accumulates it is generally accompanied by absorption of the gums, whereby the necks of the teeth are exposed, and they become loosened, and fall out. Its removal is effected by little hoe-shaped steel instruments, bent in a manner to reach more easily those situations in which the tartar is found. Their mode of use is by inserting the point of any one of them under the free edge of the mass of tartar, at the gum, and lifting it away from the backs of the teeth to which it is adhered. The teeth are then freed from any particles still sticking about them, and their surface smoothed by being rubbed with pumice-powder or chalk.

Regulating.—The teeth of the second, or permanent or adult set, are very liable to be crowded and misplaced, one overlapping the other, or those of the upper jaw falling behind those of the lower when the mouth is closed, thus producing the prominent condition of the under-jaw denominated 'under-hung.' To remedy these defects, a variety of means have been adopted by dentists; the principle upon which all of them act, however, being that of pressing the displaced tooth or teeth into the natural position. This, of course, requires that room or space should exist for them to be thus adjusted; and where this is not the case, the usual procedure is to remove one or more of the back-teeth, or any others which it is less desirable to preserve. Some considerable time is necessary to complete the regulation of misplaced teeth; and even after they have assumed their proper position, they require to be carefully maintained there, otherwise a tendency to resume their former irregularity soon manifests itself.

Stopping or Filling.—This is one of the most important and delicate operations the dentist has to perform. The first step to be taken in filling or 'stuffing' a tooth, as it is sometimes called, is to clear away all decay and decaying substance. For this purpose, a number of slender digging and excavating steel instruments, termed 'excavators,' are required. With these, the hollow of the tooth is scooped out and thoroughly cleaned. If pain be occasioned by this process, the operation of 'destroying the nerve,' as it is called, had better at once be resorted to. This is performed in several ways. Where the tooth is singled-fanged, as in front-teeth, the nerve, or more correctly the pulp, may be removed by passing a slender broach, or square and

pointed steel wire, up into the central cavity of the tooth, with a slight rotary motion. Where this cannot be done at once the best plan is to destroy the nerve by some caustic application, such as arsenious acid, chloride of zinc, carbolic acid, &c., carefully applied. The method of doing this is to clean the tooth thoroughly out, and then to apply a little of the caustic on a pellet of cotton wool about the size of a barley-pickle or a grain of rice—pressing it well into the decayed hollow, and then filling it over with soft bees-wax. This should be allowed to remain there for six, eight, or twelve hours; it may at the end of that time be taken out, and the stopping proceeded with.

The cavity being properly shaped and cleaned out until its walls are of sound and hard tooth-bone, it is to be well dried, and the plug of stopping-material inserted. Various substances are employed for this purpose, and the mode of using each is somewhat different. For temporary stoppings, pure gutta-percha is a serviceable material. A quantity sufficient to fill the cavity, and somewhat more, is to be gently warmed over a spirit-lamp—not in hot water—and when quite plastic, is to be firmly pressed with a blunt-pointed stopping-instrument or 'plugger,' into all the interstices of the hollow in the tooth—more and more being pressed in, until the surface of the plug so formed is on a level with the surface of the tooth, when all the superfluous portion should be removed, and the solid plug smoothly finished.

A set of stoppings known as osteo-plastic fillings have recently been introduced, and are inserted into the tooth in a soft condition, where they harden in the course of a few minutes.

Another variety of stopping-material consists of amalgams of different kinds. Many absurd statements have been made regarding the evil effects of amalgam stoppings, but the only real disadvantage attending their use is shrinkage, and that many of them get black in the mouth, and discolor the tooth, while some that do not get black are friable, and crumble away in a short space of time. They are to be readily obtained, made up, and under various names. None of them seem very much superior to what is known as the platinum and gold alloy amalgam. The amalgam, then, whatever one it may be, is to be rubbed up with mercury to a firm, plastic consistence, and carefully introduced into the dried cavity in the same way as described regarding the gutta-percha, and is to be finished off precisely in a similar manner.

Gold-stopping is an operation of a much more complicated and difficult description. The materials used here are either gold-foil—that is, thick gold-leaf—or the peculiar substance, or rather the peculiar form in which gold exists, known as sponge-gold, or 'pellets' of gold made up in a soft spongy condition of various sizes ready for use. In stopping a tooth with gold, even more care is necessary in preparing the cavity than what has been already inculcated. Its *shape* must now be particularly taken into account, and the nearer it approaches to a cylindrical form the better. The gold-foil, when it is employed, should be cut into strips, their breadth varying according to circumstances. Various modes of packing the gold are adopted according to two conditions in which gold exists—namely *adhesive*, where each portion can be welded together; or *non-adhesive*, where they are securely fixed merely by tightly wedging them together. Non-adhesive gold can be made adhesive by heating it to redness. In stopping with sponge, or other forms of gold, the preparatory steps are the same as for foil-stopping; it is, however, necessary to be more careful that no moisture interfere with the operation.

The surface of a gold plug, formed in either of these ways, should be well consolidated by hard pressure with a blunt plugger, or lightly hammered with a suitable mallet, and the superfluous portion being removed, it ought to be burnished until it assume a brilliant metallic lustre.

Extraction.—This is the principal surgical operation falling to the dentist. It is most commonly demanded in consequence of what is termed toothache—a disorder which, however, is not always one and the same in its nature. This want of uniformity in the nature of those diseased states to which teeth are subject, and which are comprehensively denominated toothache, leads to the conflicting results obtained from those applications recommended for its cure. These remedies are numerous, and of various characters. To explain their mode of action, and the particular symptoms indicating the selection of each one in preference to another, would here be out of place. Their intention in general, is either to destroy the nervous fibres existing in a tooth, or to narcotize and render them insensible. Among those acting in the former manner are such as creasote, arsenious acid, carbolic acid, pepsine, chloride of zinc, nitrate of silver, alum, tannin, &c.; among those acting in the latter mode are chloroform, laudanum, ether, spirit of camphor, &c. There is no necessity for describing the method of their application, further than to remark, that in all cases the decayed cavity should previously be well cleaned out, otherwise the remedy employed may be altogether prevented from reaching the spot where it is intended to act.

Where extraction comes to be demanded, it is performed by means of instruments adapted to the special peculiarities of the

tooth requiring removal, or to the circumstances in which it exists. The great matter is, that each tooth should be extracted in accordance with its anatomical configuration; and to accomplish this, of course, requires an intimate knowledge of the natural form proper to each of these organs individually; without this, it is impossible to extract any tooth upon a correct principle. The tooth is grasped, as far as the instrument can be made to do so, by that portion of the root or fang which just emerges from, or perhaps which is just within, the socket; it is then loosened, not exactly by pulling, but rather by moving it in a lateral or in a rotatory manner, in strict accordance with the respective character of fang possessed; and finally, on its being thus detached from its connection with the jaw, it is, with very little force, easily lifted from its socket.

Anæsthetics are employed in the extraction of teeth in the same manner as for other surgical operations, where it is desirable to abolish pain. Ether and chloroform are the only agents of this nature which have as yet been found generally fit for practical application in any operation of a prolonged character. Chloroform tends to depress the circulation when far pushed, and in this way should be watched with care during its administration. Ether, again, has little of this tendency, but requires larger time to induce insensibility, is more exciting and persistent in its effect, while the odor of this preparation remains about the patient for hours. Both of these agents are liable to occasion sickness, and as a variety of accidental and collateral difficulties may arise during their exhibition, they ought not to be given by inexperienced hands.

An anæsthetic proposed at the end of the last century—namely, nitrous oxide or laughing-gas, has been revived, and its application in dental surgery has been of much service, answering all the purposes of chloroform or ether in short operations. Like these it requires careful employment, and in some cases it would better be avoided if possible—such as in elderly patients of a full habit, or those who may have suffered from any lesion of the nerve centers, from hæmoptysis, &c. Other modes of inducing insensibility, local or general, have been proposed from time to time, but one after another has been abandoned as unserviceable. All over the world quack nostrums are found for rendering this operation painless; these, however, do not demand consideration here, as had any one of them afforded the least chance of success, it would long ago have been gladly welcomed and generally adopted by dentists.

2. Mechanical Dentistry.—The manufacture of artificial teeth, and other matters comprehended in mechanical dentistry, involve many subjects of which no adequate or satisfactory idea can be conveyed by mere description. Nothing beyond a mere outline of the materials employed, and the leading process involved in this branch of art, can be given without practical illustration. The various conditions of the mouth requiring the adaptation of artificial teeth, range from cases where only one tooth may be wanting, to those where not a single tooth remains in the jaw, above or below. Accordingly, artificial teeth are spoken of as partial or complete sets—a partial set being one for either upper or lower jaw, where some of the natural teeth still remain; a complete set being one for either jaw, where none are left, or for both jaws, when both are in such circumstances.

The simplest form of partial sets is what is termed a pivoted tooth. This is an artificial tooth fixed in the mouth upon the fang or root of one whose crown has been lost by decay or otherwise. The mode of procedure is as follows: An artificial tooth, as near as possible to the color and form of that to be replaced is selected. This artificial tooth may be either the crown of a natural human tooth corresponding to that lost, or one made in imitation of this in a species of pottery-ware, and by a process much too long for detail in this place. Such *mineral teeth*, as these last are termed, are manufactured on an extensive scale, and sold ready for use to dentists. A tooth of either kind, then, being selected, is accurately fitted to the root remaining in the mouth, and, by means of a gold pin, adjusted to, and inserted into the open central canal existing in the root—the other extremity of this gold pin being attached to the substitute tooth—the whole is fixed in its natural position, in a manner that renders detection almost impossible.

Where more than one tooth is required, and occasionally even where only one is necessary, a somewhat different contrivance is had recourse to. What is called a 'plate' requires to be fitted to the gum and remaining teeth in so precise and perfect a manner as to lie quite firmly and steadily in its place, and to which the artificial teeth required are subsequently fixed.

This 'plate' is frequently made of gold, silver, or platinum plate, of the thickness of card-board, in which case, the name of 'plate' is used in its liberal signification. But such plates may be made of other substances beside those of gold, silver, &c., such as vulcanized Caoutchouc (q. v.) or vulcanite, or a material not long introduced, and termed celluloid base—a compound of camphor and gun-cotton. The first step in any of these processes is to obtain an exact model of the gum and other parts upon which the plate is to rest. This is obtained by introducing bees-wax, or

gutta-percha, or other modelling compound, softened by previous heating, into the patient's mouth, and pressing it forcibly upon those parts of which an impression is desired. On removing the wax or other substance from the mouth, Paris plaster is poured into the mould thus procured, and on its hardening, or 'setting,' this plaster-cast presents an exact counterpart of the gum. It is upon this plaster-model that all the subsequent operations are performed in fitting the artificial set. The following is a very brief sketch of the principal steps in working each of the most ordinary methods employed for these purposes:

Metallic-plate Sets.—Where the framework lying upon the gum is to be of gold or silver plate, or the like, it is necessary to procure, besides the plaster-model, a metal one. This metal-model is generally cast in zinc, gun-metal, or some such material; and a counter-model of a softer metal, generally lead, is taken from this again, so that a complete pair of dies is in this way procured. The gold or other plate, cut of a convenient size, is then stamped between the two metallic dies, and so made to assume the precise form desired. It is then trimmed, and any more delicate adjustments made upon it, such as soldering bands or clasps round those parts where it is to embrace any teeth remaining in the mouth, and finally completed by having the individual artificial teeth added to it, and adapted to the comfort and convenience of the wearer. The mode of fastening the teeth to the plate is in one of two ways. One kind of teeth have a tube extending along their whole length, and these are fastened by means of a pin fixed to the plate, upon which the tooth is secured by this pin passing up the tube alluded to. The other kind are provided with short platinum pins, fixed in the material of the tooth during its manufacture, to which pins a piece of gold or other plate is soldered, or a mass of gold fused upon them, and this, again, soldered to the framework of the set itself, wherever they are required.

Vulcanite Sets.—The first step in the manufacture of a vulcanite set of teeth is to make a pattern set in wax, with the mineral teeth constructed for the purpose, and which are to be used in the piece when it is finished, fixed in the wax; the whole constituting, in short, an exact fac-simile of what the completed set is intended to be. This pattern set is, of course, made upon and fitted to the plaster model, and is adjusted to the wearer's mouth precisely as if it were the set to be worn there. When everything is thus prepared, a duplicate of the wax-set is made in vulcanite—the vulcanite—replacing the wax, and the mineral teeth being retained as they were.

The process by which the vulcanite is made to take the place of the wax consists in imbedding the pattern set in Paris plaster, so that the mould of it, thus secured, may be separable into at least two parts. On these being taken asunder, the wax of the pattern set is melted out with boiling water, leaving the teeth *in situ*. The wax is then replaced by raw vulcanite, which, on the mould being reclosed, is subjected to the usual process of vulcanizing.

For a more detailed account of dentistry, we must refer to the numerous and beautifully illustrated works specially devoted to the subject, such as: Tomes's *Dental Surgery*; Smith's *Hand-book of Dental Surgery*; Taft's *Operative Dentistry*; Richardson's *Mechanical Dentistry*; Hunter's *Dental Mechanics*; and Oakely Cole's *Dentistry*.

Law as to Dentists.—By the Act 'to amend the law relating to dental practitioners,' passed in 1878, it is provided under a penalty that no one shall hereafter call himself dentist or the like unless he is registered under this act, power being given to the medical authorities who grant surgical degrees to examine and grant certificates of fitness to practise dentistry to persons twenty-one years of age.

DENTITION, PERIOD OF (Lat. *dentitio*, the process of teething, from *dens*, a tooth). In man and most mammals, there are two distinct sets of teeth: one set which appears shortly after birth, and which are termed the *milk* or *deciduous* teeth; and a second set, which, after a few years, replaces these, and which are termed *permanent* teeth.

In the human subject, the milk-teeth are twenty in number, each jaw containing (from before backwards) four incisors, two canines, and four molars; while the permanent teeth are thirty-two in number, each jaw containing four incisors, two canines, four premolars or bicuspid, and six molars. Anatomists are in the habit of briefly expressing the number of the different kinds of teeth in any mammal by what they term a *dental formula*. The permanent teeth in man are represented by the formula, $i \frac{2-2}{2-2}, c \frac{1-1}{1-1}, p \frac{2-2}{2-2}, m \frac{3-3}{3-3} = 32$, where the letters *i*, *c*, *p*, *m*, stand for incisors, canines, premolars, and molars, and where the two terms in each numerator and in each denominator represent the number of each particular kind of tooth in each half of the upper and lower jaw respectively. As these formulæ are of common use in most works on zoology and comparative anatomy, we add another example—that of the permanent teeth of

the hog, whose formula is, $i \frac{3-3}{3-3}, c \frac{1-1}{1-1}, p \frac{4-4}{4-4}, m \frac{3-2}{3-2} = 44$; which signifies that there are on each side of both upper and lower jaws three incisors, one canine, four premolars, and three molars, making in all 44 teeth.

For a general description of the form and uses of these different kinds of teeth, we refer the reader to the article DIGESTION, ORGANS AND PROCESS OF, where their special uses are noticed in reference to the digestive function; while the history of their structure, &c., is given in the article TEETH.

The following is the usual order and period of appearance of the milk-teeth: The four central incisors usually appear through the gums about the 7th month after birth, those of the lower jaw showing themselves first. The lateral incisors next appear between the 7th and 10th months; the anterior molars show themselves about the 13th month, and are soon followed by the canines, which usually appear between the 14th and 21st months. The posterior molars are the last and most uncertain in their time of protrusion, which may range from the 18th month to the end of the third year. Except in the case of the incisors, there is no definite law as to whether the upper or lower teeth first appear.

About the middle or end of the 7th year, the jaw-bones have become sufficiently elongated to permit the appearance of the first true molar; and about the same time, the central incisors are replaced by the corresponding permanent teeth. The advance of the permanent teeth towards the surface of the gum causes the absorption of the roots of the temporary teeth, and thus facilitates their shedding; the crown falling off, and leaving room for the permanent tooth behind it to come forward and supply its place.

In the replacement of the first by the second set of teeth, the following order is observed: The middle incisors are first shed and renewed (usually when the child is about eight years of age), and then the lateral incisors (perhaps a year later). The anterior molars of the first set are then replaced by the anterior premolars (this usually happens about the 11th year); and about a year afterwards the posterior deciduous molars are replaced by the second premolars. The persistent canines take the place of the deciduous ones in the 12th year; these being the last of the milk-teeth to be exchanged. The second molars appear between the ages of twelve and a half and fourteen years; and the third molars, or *dentes sapientie* (wisdom teeth), seldom appear till three or four years subsequently, and often much later.

The factory laws in England render it very important that we should be able to determine the ages of *nine* and *thirteen* in children, because before a child is nine years old, it is illegal to employ it in factory-work; and until it is thirteen, it may only be employed for a limited number of hours a day. Mr. Saunders, a well-known dentist, has shown in his pamphlet, *The Teeth a Test of Age, considered with Reference to Factory Children*, that the teeth afford a far better test of age at this period of life, than the standard of height which has been adopted by the legislature for this purpose.

Dangers attending Teething.—The teeth are formed in closed sacs, and in rising to the surface in the progress of their growth they slowly penetrate the gum from below; a process familiarly called 'cutting the teeth.' The minute physiology of this process will be described in a separate article (see TEETH); in the present, it will be sufficient to indicate shortly the dangers to which children are exposed, particularly during the period of the first dentition, or from five months old to two years or more.

Infants are occasionally said to die of 'teething,' but this, like many other vague terms, may be said to be only a cloak for ignorance; for the mere cutting of the teeth is never, by itself, mortal, or even a serious source of suffering. It only becomes a cause of disease by its reflected influence on the delicate nervous system of the child. The period of dentition, in fact, is one during which the whole organization of the infant is undergoing a revolution; in passing from an exclusively milk-diet to one of a more complex character, the entire digestive system undergoes a corresponding development. The diseases of this period of life correspond in importance with the great physiological changes taking place in it, and with the dangers of derangement in the just order or symmetry of their development. If these diseases often appear to be due directly to the cutting of a tooth, it is because complex causes of disorder have prepared the way for a morbid change, which is ready to be developed into activity by a comparatively slight irritation. The principal diseases of dentition are Diarrhœa (q. v.), Convulsions (q. v.), vomiting, and hydrocephalus, or tubercular inflammation of the membranes of the brain, which are all apt to originate at this period of infantile life, and to coincide more or less closely with the development of the first set of teeth. It is very doubtful how far the operation of cutting the gum with a lancet, so commonly supposed a specific for the diseases of dentition, ought to be encouraged. Sometimes there is evident irritation, or even inflammation of the gum, and then the operation will probably at least do no harm; but the indiscriminating use

of the gum-lancet, at the request of anxious but foolish mothers and nurses, is characteristic of a weak and erroneous routine practice, and must be denounced as an unwarrantable interference with the truly beautiful process by which the tooth is gradually evolved from its socket, in most cases, without any suffering. The special treatment of the diseases of dentition is discussed under the separate articles devoted to some of these diseases.

D'ENTRECASTEAUX, a term of various application in Australasia, affords one of the few traces of French discovery in that part of the world. It indicates an archipelago, a cape, and a channel.—1. The archipelago lies between New Guinea and New Ireland, about lat. 10° S. and long. 151° E.—2. The cape, a headland in West Australia, forms nearly the south-west point of the continent, being in lat. $34^{\circ} 52'$ S., and long. 116° E. 3. The channel, an arm of the Pacific, separates Bruné Island from the south-east coast of Tasmania or Van Diemen's Land. It is about lat. $43^{\circ} 25'$ S., and long. $147^{\circ} 15'$ E., is 35 miles long, and varies in width from 3 to 9 miles. On the side of the mainland, it is connected with the interior by means of the Derwent and the Huon, communicating through the former with Hobart-Town, the capital.

DENUDATION is the removal of solid matter by water in motion, whether of rivers or of the waves and currents of the sea, and the consequent laying bare of some inferior rock. The rate of abrasion depends upon the velocity of the current, and the nature of the solid materials through which it flows; these two causes equally affect the deposition of the abraded matter, for the carrying power of the water varies with its velocity and with the weight of the particles. The heavier débris, large stones and gravel—are carried short distances, and deposited generally in masses; the finer particles are conveyed even by a slow current to great distances, and scattered in thin layers over extensive districts. All deposition, except in the case of showers of volcanic ashes, is the sign of a superficial waste going on contemporaneously, and to an equal extent, elsewhere, the gain at one point being equal to the loss at another. No new material has been used in the formation of the sedimentary rocks. The degradation and abrasion of igneous rocks provided the materials of the earliest strata; these in their turn were frequently abraded and re-deposited, under new conditions, and with the remains of a newer fauna and flora. Thus the crust of the globe has not actually increased in thickness, for whenever it acquires density in one place, it becomes thinner in another. The changes that have been effected by denudation, and the amount of matter thus transported, are difficult to imagine. In districts where faults occur, the surface has been smoothed, and the uptilted ends have been washed away. These faults sometimes extend over several hundred square miles, and the dislocations had they remained unaltered, would have produced high mountains with precipitous escarpments. In regions with horizontal stratification, denudation has produced inequalities, hollowing out valleys of denudation, and often carrying away the whole of the superficial strata, leaving mountains here and there.

DENVER, the capital of Colorado Territory, U.S., 15 miles from the east base of the Rocky Mountains, and 5267 feet above the level of the sea. It is now the commercial center of the territory and of a still vaster region, rich in mines. Several lines of railway meet here. Pop. (1870) 4759; (1880) 35,630.

DEOBSTRUENTS, medicines which have the property of removing obstructions, especially in the lymphatic system (see **LYMPHATICS**). The glands of the thorax and abdomen, as well as the lymphatic and lacteal glands, are subject to enlargements, which were formerly ascribed to obstructions of their outlets, or of the vessels in connection with them; against all of these states, deobstruents were employed with varying success. The favorite deobstruent remedies are mercury, iodine, and bromine; blisters and friction, with stimulating liniments, may be said to have a like action in some cases.

DEOBUND, a town of India, in the British district of Saharnpore, North-west Provinces, 20 miles S.E. from Saharnpore, on the railway route from Saharnpore to Mozniffurnuggur. It is situated between the rivers Hindun and Kali Nuddee, the one a branch of the Jumna, the other of the Ganges, in an open cultivated country. Pop. (1872) 19,168.

DEODAND. A personal chattel which was the immediate and accidental occasion of the death of a reasonable creature, was, by the law of England, forfeited to the crown, in order that it might be applied to pious uses, or given to God, as the term implies. The rule did not apply where the instrument had been intentionally used for the purpose of causing death, as in cases of murder and homicide. Blackstone traces the origin of the custom to the popish prayers for the souls of the dead, and asserts that deodands were 'designed in the blind days of popery, as an expiation for the souls of such as were snatched away by sudden death; in the same manner as the apparel of a stranger, who was found dead, was applied to purchase masses for the good of his soul.' The more probable view is, that it originated in the nat-

ural horror which is felt for whatever has been the instrument of so dreadful an occurrence; just like the Jewish law, that if 'an ox gore a man that he die, the ox shall be stoned, and his flesh shall not be eaten;' or the old English law, that a well in which a person was drowned should be filled up under the inspection of the coroner. Similar regulations are to be found in the legal systems of most nations. The law of deodand was abolished by statute 9 and 10 Vict. c. 62.

DEODA'R. See **CEDAR**.

DEODAR, remarkable as being one of the pettiest states in the world, is a district in the north-west of Guzerat. Containing only 80 square miles, and 2000 inhabitants, it is yet subdivided into as many independent communities as there are villages—the whole being, for external purposes, under the gratuitous protection of the British government. The principal village, bearing the name of Deodar, is in lat. $24^{\circ} 9'$ N., and long. $71^{\circ} 49'$ E. The district was forced on the East India Company in 1819, as having become a refuge of marauders.

DEODORISERS are chemical substances employed for the purpose of absorbing or destroying the odoriferous principles evolved especially from decomposing animal and vegetable matter. They strictly belong to the classes of substances known as **ANTI-SEPTICS** (q. v.) and **DISINFECTANTS** (q. v.).

DEORI, sometimes distinguished as **BURA DEORI** or **GREAT DEORI**, a town of Hindustan, stands in lat. $23^{\circ} 22'$ N., and long. $79^{\circ} 4'$ E., and is 1705 feet above the level of the sea. Though it has been but little noticed by travelers or writers, yet it appears to be not unworthy of its second name, as mentioned above, for, on its being burned down by a freebooter before English authority was established here, 30,000 people are said to have perished in the flames. Pop. (1872) 5500. It is situated in the Nagpore division of the Central Provinces, on the table-land, whence flow the Sone to the Ganges, and the Nerbudda to the Arabian Sea; so that the territory of Sangor and Nerbudda, within which it is contained, is common to the two principal basins of Northern India. The place is about half-way between the better-known cities of Sangor and Gurrah, being 44 miles to the south-east of the former, and 41 to the north-west of the latter.

DEOXIDATION is the term applied to the process of withdrawing the oxygen from a compound, as in the reduction of the native peroxide of iron in the smelting furnaces to the condition of metallic iron. On the small scale, in experimental inquiries, the process of deoxidation may be carried on before the **BLOW-PIPE** (q. v.), where the inner or reducing flame is essentially a deoxidizing one.

DEPARTMENT (Fr. *Département*), a term used to denote a territorial division in France. Previous to the Revolution, France was divided into provinces; but in 1790 Mirabeau rose in the Constituent Assembly, and declared that, after having abolished aristocracy, it was neither convenient nor safe to preserve these provincial divisions. He alleged that they were too large, that they tended to concentrate the administrative power in the hands of a few, and that such power soon becomes aristocratic of necessity. He suggested, therefore, a minutest territorial division, as a carrying out of the principles of the Revolution. This expression of opinion was followed by a decree of the Assembly, dated Feb. 16, 1790, ordering the abolition of the old provincial divisions (34 in number), and the redistribution of the land into 83 Departments. During the year 8 of the Revolution, these were increased to 98; in 1808 the Empire consisted of 127; at the fall of Napoleon, of 130; and at present it consists of 87, including the sadly diminished Department of Haut Rhin (from 1871 till 1879, 'the territory of Belfort'). Originally, it was intended that the Departments should be governed by persons elected by the citizens; but this plan did not suit the views of the First Consul, who placed over each Department a prefect, and a *conseil de préfecture*. The Departments were again subdivided into *arrondissements*, over each of which was placed a sub-prefect (*sous-préfet*). The right of naming these functionaries was reserved to the chief of the state. This system of departmental administration is still in force in France.

DEPARTURE, a term in Navigation, explained under **SAILINGS**. See also **DEAD RECKONING**.

DEPENDING ACTION. An action is said, in Scotland, to be in dependence, from the moment of citation, until it be finally decided by the House of Lords, should it be appealed to that ultimate tribunal. As a security for the implement of the decree by the defender, in the event of his being found liable, the pursuer is entitled to use either Inhibition (q. v.) or Arrestment (q. v.) on the dependence, or depending issue.

DEPHAL (*Artocarpus Lakoocha*), a tree of the same genus with the Bread-fruit (q. v.) and Jack (q. v.), a native of the south of India, and frequently cultivated in the northern parts of that country. The fruit is eaten, but is inferior to the Jack. The juice, like that of the Bread-fruit is tenacious, and is used for

bird-lime. The root is used for dyeing yellow. The D. is a large tree, and its timber is valued for a variety of purposes.

DEPHLOGISTICATED AIR. See PHLOGISTON.

DEPILATORIES, or EPILATORIES (Lat. *depilo*, to pull out the hair), are chemical agents employed for removing superfluous hair from the skin. They were extensively used by the ancients, but are now restricted in their employment to the face, and to the removal of the hair from the scalp in the treatment of certain diseases. The caustic alkalis and alkaline earths are generally used, and a good recipe is to mix five parts of caustic or slaked lime, ten parts of carbonate of soda, and forty parts of lard. The tersulphuret of arsenic (commonly known as orpiment) is occasionally used, but its employment is dangerous, as any abrasion of the skin will enable the arsenical compound to begin to act. A mixture of caustic lime and orpiment constitutes some of the depilatories to be purchased; and it is believed that the Turkish *Rasna* is composed of these ingredients. A very active and comparatively safe compound is a strong solution of sulphuret of barium made into a paste with starch which is immediately applied to the part from which the hair is to be removed, and is allowed to remain for five or ten minutes.

DEPLOY', as a military movement, is a spreading-out of a body of troops in such a way that it shall display a wider front and a smaller depth than it did before the deploying.

DEPO'NENT, a term in Latin Grammar applied to verbs having a passive form but an active signification. They are so called because they, as it were, lay down (Lat. *depono*) or dispense with the signification proper to their form. Such verbs had all originally a reflexive meaning, like the middle voice in Greek verbs; thus, *aversor*, 'I detest,' means radically 'I turn myself away from.'

DEPO'SIT' was a real contract of the civil or Roman law. It was the simplest of all contracts, and consisted merely in the delivery of an article by one person to another, to be kept without remuneration, and to be restored *in specie* as soon as the depositor should require.—*Inst.* iii. 15, s. 3. Return when required was the sole condition of the contract; and no obligation was incurred by the depositary but to exercise ordinary care in preservation of the article. The civil law recognized a distinction, as to the value which might be recovered by the depositor in case of loss, between the case of articles voluntarily deposited, and those which came into the hands of the depositary by the misfortune of the owner, as by fire or shipwreck. In the latter case, double the value of the article might be recovered. There was also a special provision by the edict *Nautæ, cauponæ, stabularii*, whereby shipmasters, innkeepers, and stablemen were compelled to exercise more than ordinary vigilance over the goods of their customers and passengers.

The principles of the civil law as to deposit have been universally adopted by modern nations. In Scotland, the name of the contract is preserved. Lord Stair, i. 13, 2, lays down that the depositary is 'not liable for light faults, or for the perishing or deterioration of the thing deposited by casualty or accident.' The article must be restored when demanded, and failure to do this will involve the depositary in liability for the consequences. See also Erskine, iii. 1, 26.

Deposit, in English Law, is a branch of bailments, which includes also loans, pledges, and letting and hiring. From each of these, deposit is distinct. It is defined by Judge Story to be 'a bailment of goods, to be kept by the bailee without reward, and delivered according to the object and purpose of the trust.'—Story on Bailments, c. ii.

The chief questions which have arisen in modern times relate to the amount of care which the depositary is bound to exercise. Judge Story lays down the principle to be, not the care which a man takes of his own affairs, but that which a reasonable being would use, and cites in support of his view the case *Doorman v. Jenkins*, ii. Ad., and *Ellis 256*, where a person intrusted with money placed it in his own cash-box, and the box having been stolen, the depositary was yet held liable for negligence. So also with jewels and other valuables—the nature of the article implies extra care. Where, however, a sealed packet or locked box is deposited, the question arises as to the liability of the depositary. Erskine lays it down broadly, that where such a deposit is made without showing the contents, the depositary incurs no extra liability. But Story takes a distinction, and states that if the depositary had reasonable ground to believe the contents were valuable, he incurs liability accordingly. The immense value of the timber-trade of America raises in that country questions as to the liability of a landowner for timber left by the river on his ground. On this point, Story indicates that the smallest amount of liability is incurred. Whether or not the depositary may make use of goods left in his charge, is said by the same author to depend on the particular circumstances. If the article would benefit by use, then such use is allowable; but if injury were likely to accrue, it is not. If use is a matter indifferent, then the deposi-

tary is not entitled to the use. The admirable work of Story on Bailments is the best authority on this subject.

DEPOSIT, a term much used in Geology, to characterize those rocks which have been formed from matter that has settled from suspension in water. The materials constituting such rocks have been obtained by denudation, and their extent in one place equals the denudation in some other. Deposits are characterized according to the conditions under which they were formed, as marine, lacustrine, fluvial, and so forth.

DEPOSITION, the testimony of a witness set down in writing. Depositions are taken either by a judge or by a commissioner specially appointed by him for that purpose. The questions to which the depositions are answers are usually put by the legal representatives of the parties to the suit, under the control of the court or commissioner, and the answers are taken down by the clerk of court, or by a clerk specially appointed for the purpose. If the competency of the questions or the admissibility of the witnesses be objected to, the objection must be stated to the court or commissioner. The latter may either dispose of the objection at the time, or reserve it for the opinion of the court by which he was appointed. It is a rule in the laws of evidence of all countries that the deposition cannot be read where the witness might be himself produced, because his oral testimony is the best evidence, and secondary evidence is never admissible. Where he is dead, however, or insane, or beyond the jurisdiction of the court, his deposition then becomes the best evidence, and may be read in court.

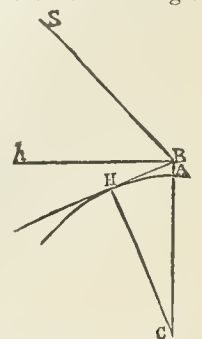
DEPOSITION OF A CLERGYMAN. In Scotland, the minister of a parish who has been guilty either of immoral and scandalous conduct, or of preaching or otherwise publishing doctrines contrary to the standards of the church to which he has declared his adherence, or of contumaciously setting aside the authority of the Presbyterian church-courts, may be deposed from his holy office by the church-courts. By this means he is deprived not only of his ecclesiastical dignity, but of the temporalities of his benefice (stat. 1592, c. 115), and the benefice becomes vacant, just as if he were dead. He may, however, be restored to the exercise of the ministry, and to his position as a minister of the church by the General Assembly, but he cannot, of course, be restored to his benefice; and it is considered irregular that he should be so even by a new presentation by the patron, because the stigma attached to his character by his deposition is likely to affect his usefulness. Where sentence of deposition is pronounced by an inferior church-court, the judgment of which is reversed on appeal to the General Assembly, it is held that it had never been pronounced; but if the sentence be affirmed, it takes effect from the date when it was pronounced by the inferior court, and from that date the minister's right to the profits of his benefice ceases. Sentence of deposition cannot be pronounced by a presbytery in the absence of the minister, except by the authority of the General Assembly. See DEPRIVATION OF A CLERGYMAN.

DÉPÔT, in Military matters, is a name sometimes given to a place where army-stores are deposited during war. In the regimental system, however, a dépôt used to be the town or barrack where certain stores belonging to the regiment were kept, as well as the regimental books and some of the men, when the regiment was ordered on foreign service. It was rarely that a whole regiment was engaged in active service at once; either one or two companies were generally kept at home, under the command of one of the officers, and were called *dépôt companies*. They formed a nucleus where recruits were received and drilled, and where the corporate existence of the regiment might be kept up. By the Military Forces Localization Act of 1872, under which the United Kingdom is divided into 70 sub-districts, every battalion, whether at home or abroad, has a dépôt of two companies. The dépôts of two battalions constitute the dépôt-center, or sub-district brigade, to which the volunteers and militia of the sub-district are affiliated. In time of war, the dépôt would expand into a third battalion.

DEPRESSION or DIP OF THE HORIZON is the angle through which the sea-horizon appears depressed in consequence of the elevation of a spectator.

Let A be a point on the surface of the earth, B a point situated in a vertical line from A. Let BH be a tangent to the earth's surface drawn from B, Bb a line in the same vertical plane perpendicular to AB. The angle $\angle bBH$ is the true dip of the horizon to the spectator at B.

The true dip measured in minutes is equal to the distance in nautical miles of the visible horizon. Let C be the center of curvature of the surface; then since CHB is a right angle, the angle $\angle bBH = \angle HCA$; and the minutes in this angle are the nautical miles in the arc AH. To find this angle in minutes or nautical miles, the rule is: Multiply the square root of the height in feet by 1.063.



The true dip of the horizon, however, is not exactly the same as its apparent depression. The apparent sea-horizon is raised above its true place by *refraction* through an angle, which varies according to the state of the atmosphere and the relative temperatures of the air and water, the variation ranging from one-third to one-twenty-third of the amount of the true dip. The rule commonly employed is to diminish the true dip by about one-fourteenth of its amount, to find the apparent dip.

If S be a star or the sun in the same vertical plane with ABH, and an observation of the altitude above the sea-horizon be made by means of a sextant from the point B (as from the deck of a vessel), the apparent dip of the horizon must be subtracted from the observed angle, in order to find the altitude of the sun. Owing to the uncertainty of the amount of refraction, the nearest minute to the dip given in the tables is usually taken. The following table gives a sample of the amount of the apparent dip under ordinary state of the atmosphere and equal temperature of air and water. See Raper's *Practice of Navigation*.

Height. Feet.	Dip. m. s.	Height. Feet.	Dip. m. s.
0.....	0 0	8.....	2 50
1.....	1 0	9.....	3 0
2.....	1 20	10.....	3 10
3.....	1 40	20.....	4 20
4.....	2 0	30.....	5 20
5.....	2 10	40.....	6 10
6.....	2 20	50.....	7 0
7.....	2 40	100.....	9 50

DEPRIVATION OF A CLERGYMAN. In England, this may be either (1.) by a sentence declaratory in the proper court, on the ground of attainder or conviction of treason, felony, or any other infamous crime, or of conviction for heresy, infidelity, or gross immorality, or for farming or trading contrary to law, 1 and 2 Vict. c. 106 s. 31; or (2.) in pursuance of divers penal statutes, which declare the benefice void for some nonfeasance or neglect, or else some malfeasance or crime, as simony; for maintaining any doctrine in derogation of the king's supremacy, or of the Thirty-nine Articles, or the Book of Common Prayer; for neglecting to read the liturgy and articles in the church, and to declare assent to the same, within two months after induction; for using any other form of prayer than the liturgy of the Church of England; for continued neglect, after order from the bishop, followed by sequestration, to reside on the benefice. In these latter cases, the benefice is void, without any formal sentence of deprivation (Stephen's *Com.* iii. 37). A bishop may be deprived of his bishopric, but cannot be deposed, as may be done in the case of a Presbyterian clergyman, the character of a bishop, like that of a priest, being indelible. The tribunal by which the Bishop of Clogher was deprived in 1822 consisted of the archbishop and the other bishops of the province; and this precedent having been established, would probably be adhered to on any future occasion, notwithstanding that the archbishop alone might have full authority to deprive.—*Cripps's Laws of the Church*, p. 100.

DE PROFUNDIS ('out of the depths'), the first words of the 130th psalm, which forms a portion of the liturgy of the Roman Catholic Church, and is sung when the bodies of the dead are committed to the grave. A tender melancholy pervades the psalm, which, however, brightens up at the close under the conviction that with God there is 'plenteous redemption.'

DEPTFORD, a town on the south bank of the Thames, about 4 miles below London Bridge, divided from Greenwich by the river Ravensbourne, a creek of deep water (*depe ford*) formerly fordable at the spot where D. Bridge now stands. It contains two parishes, St. Nicholas' and St. Paul's, the latter formed by act of parliament in 1727. St. Nicholas' Deptford lies wholly in Kent, but St. Paul's extends into Surrey—the Surrey portion being known as the Manor of Hatcham. Pop. (1881) 84,653, engaged to a large extent in the Royal Deptford Victualing Yard, and in extensive private ship-building and engineering establishments. The market-gardens of Deptford are famous. The upper portion of the town is well-built, and is a favorite place of residence for persons engaged in business in London. D. forms, with Greenwich, Woolwich, Charlton, and a portion of Plumstead, the parliamentary borough of Greenwich, which returns two members.

The ancient Incorporation of the Master and Brethren of the Trinity House of 'Deptford Strond,' founded by Henry VIII., has its hall at D., and also two sets of almshouses. Queen Elizabeth, in 1581, visited Drake at D., in the ship in which he 'compassed the world.' In 1698, Peter the Great acquired the art of ship-building in the dock-yard here, residing at the manor-house of Sayes Court, which John Evelyn had previously occupied.

DEPTFORD DOCK-YARD, as one of the royal naval establishments, was not so remarkable for ship-building as for other operations connected with the fitting-out of fleets. Being ill

adapted for the large war-ships of the present day, the dock-yard proper was abandoned in 1865, and the naval establishment limited to the victualling-yard, an important place, employing several hundred persons as officers, clerks, workmen, and hoymen. This is the chief dépôt for victualling the home and foreign stations, and the marines; also for shops and many of the necessaries for seamen. It is convenient for these purposes in being near the metropolitan markets. The officers receive, examine, store, pack, re-issue, and register the various stores, and transmit all their accounts to the Admiralty. For simplicity it used to be called collectively a royal dock-yard; but the ship-building, the store-keeping, and that very miscellaneous process called the provisioning, were the work of different establishments.

DEPU'CH ISLAND, a member of the Dampier Archipelago, lies off the north-west coast of Australia, in lat. 20° 38' S., and long. 117° 44' E. Though only eight miles in circuit, yet it is, on more than one ground, worthy of notice. On it have been found some curious specimens of native sculpture; and, rising with its greenstone rocks to a height of 514 feet above the sea, it presents a remarkable contrast to the low-lying shore of the adjacent mainland.

DEPUTY, one who exercises power which properly belongs to another who has placed him in his stead. The appointment of a deputy does not free the principal from responsibility, for the deputy is not an assignee. It is a general rule, that no judge can appoint a deputy unless he be authorized to do so in the commission by which he himself is appointed. In the rare cases in which a deputy is empowered to appoint a deputy, the latter is usually called a substitute. See **SHERIFF**.

DE QUINCEY, THOMAS, a distinguished English writer, was born in Manchester, August 15, 1786. His father was a wealthy Manchester merchant, who, dying while his children were yet young, left his widow a fortune of £1600 a year. De Q. received his first education at home, and was afterwards sent to the grammar school of Bath. He proceeded to the university of Oxford in 1803, and remained there till 1808. At the university, he made the acquaintance of opium, which was ever afterwards his dread familiar.

On leaving college, he went to reside at the Lakes, and formed one of the cluster of literary lights which made that region at the time so illustrious, and afterwards so memorable. He left Cumberland in 1819, and in 1843 he came to reside in Scotland, settling with his family at the village of Lasswade, near Edinburgh. He died at Edinburgh on the 8th December 1859.

With the exception of a strange episode of his youth, described in the *Confessions of an Opium-eater*, the heroine of which was, singularly enough, one of the 'waifs of womanhood,' De Q.'s career was almost entirely eventless. He led a lonely and a speculative life, and his writings are at once history and autobiography. He was perhaps, with the exception of his friend Professor Wilson, the most brilliant magazine-writer in this century of magazines. Everything he wrote, putting aside the *Confessions*, the *Logic of Political Economy*, and a novel which no one seems to have read, or if read, to have remembered, is in the form of articles. Even the *Confessions* themselves were originally published as a series of articles in the *London Magazine*. De Q. has written on a great variety of subjects, and in a great variety of styles. He has written articles pervaded by humor of the most curious and novel kind, philosophical and critical articles distinguished by originality and daring of speculation, and articles of the nature of prose poems, which are unquestionably of their kind the most wonderful things in English literature. In point of imaginative grandeur, and music and sweep of sentence, the *Suspensio de Profundis*, and the opium visions that close the *Confessions*, are miracles of impassioned prose. De Q.'s works were first collected and republished in America. The edition of De Q.'s works, in 16 vols., includes nearly all his writings. See Page's *Life and Writings of De Q.* (1877); and Mason's *Sketch* (1881).

DERAJAT, the fluvial portion of Daman (q. v.), itself a comparatively narrow strip in the Punjab, between the Suliman Mountains and the Indus, and which, when duly irrigated, is singularly fertile. D. is so called from *dera*, a camp, a common element in the names of its towns—Dera Deen Panah, Dera Futti Khan, Dera Ghazee Khan, and Dera Ismail Khan. It is divided into three districts, and has an area of 12,565 sq. miles, and a population of 991,251. Dera Deen Panah, apparently the least considerable of the above towns, has suffered much from physical causes, having, in 1819, been nearly destroyed by an earthquake and by a simultaneous flood from the Suliman Mountains.—Dera Futti Khan is the center of a district which produces cotton, grain of various kinds, indigo, sugar, and opium. Pop. 5000.—Dera Ghazee Khan occupies, for commercial purposes, a very favorable position—the intersection of the two great routes of the country between north and south, and between east and west. Hence it has been recommended as the best site for an annual fair, so as to suit at once Sindh, the Punjab, Afghanistan, Beloochistan, and Khorassan. It

manufactures cotton, silk, and steel, and has an extensive bazaar. Pop. 17,164.—Dera Ismail Khan is of recent origin. another town of the same name having been swept away by an inundation of the Indus.

It stands on the thoroughfare already mentioned between north and south, commanding also two ferries across the river. To this position it is indebted for a thriving trade, and in spring particularly it is crowded by the Lohani Afghans, an enterprising tribe of pastoral peddlers. Pop. 24,906.—Besides the towns already described, D. has Isa Khel, a town with (1872) 17,746 inhabitants; and the important commercial town of Leia (q. v.).

DERA'YEH, or DEREY'EEYAH, a town of Arabia, formerly the capital of the Wahabees. It is situated near the center of Nedjed, 430 miles north-east from Mecca. It was a town of some consequence before the time of the Wahabees, but attained its highest importance under their dominion. See WAHABIS. It was taken by Ibrahim Pasha in 1819, after a siege of seven months, and nearly destroyed. It stands in a valley about half a mile in breadth, filling the whole breadth of the valley.

DERBE'ND, or DERBE'NT, a town of Russia, capital of the government of Daghestan, is situated on the western shore of the Caspian Sea, on the declivity of a branch of the Caucasus, which here approaches very close to the water's edge, and forms a defile anciently known as the *Albanie Pyle*, now called the Pass of Derbend. Lat. 42° N., long. 48° 15' E. D. is built in the form of a parallelogram, being about three miles in length, and from a quarter to half a mile in breadth. It is surrounded by strong walls of very ancient date, which are further strengthened at intervals by towers. From two massive iron gates, through which the road to the interior passes, the town derives its name, which signifies 'the shut-up gates.' The harbor of D. is quite inaccessible to all but small boats. The manufactures of the place consist chiefly of coarse silk and woollen stuffs, and saffron is cultivated. Pop. (1880) 16,552. D. is a very ancient place, having, as it is said, been fortified by Darius I. to prevent the incursions of the Scythians; and it was long considered the key of Persia on the N.W. side. It came finally into the possession of Russia in 1795.

DE'RBY, the titular name of a distinguished family of the British aristocracy, descended from a common family with the Barons Audley or Audleigh, county Stafford. William de Audleigh, on exchanging with his cousin, Sir Adam de Audleigh, the manor of Talk, county Stafford, for that of Stanleigh (Stony Lea), county Derby, adopted the latter name, and continued it to all his descendants. This event occurred in the 12th century. The first who assumed the arms now used by the family—viz., 'three stags' heads on a bend'—was Sir William de Stanley, son of William de Stanley, who flourished in the reign of Henry III. The first Lord Stanley was created in 1456; his eldest son Thomas was created first Earl of Derby in 1485.

DERBY, EDWARD GEOFFREY SMITH-STANLEY, 14th EARL OF, was born, 1799, at Knowsley Park, Lancashire. He was educated at Eton and Christ-church, where, in 1819, he gained the Latin Verse prize (subject, *Syracuse*). He was elected member of parliament for Stockbridge in 1820; in 1825, he married the second daughter of the first Lord Skelmersdale; and in 1826, he represented Preston, but lost his seat in 1830, on becoming Chief Secretary for Ireland under the administration of Earl Grey. A seat was then found for him at Windsor. He took a distinguished part in the debates in favor of the Reform Bill, and signalized his Irish administration by two bold measures—one for National Education in Ireland, and another relative to the Irish Church Temporalities, which resulted in ten Irish bishoprics being abolished. The grievance of church-rates and first-fruits was also removed, and a graduated tax upon benefices and bishoprics substituted. In 1833, he became Secretary of State for the Colonies, and in the same year carried the bill for emancipating slaves in the West Indies, and providing a compensation of twenty millions to the planters. In 1834, being alarmed by the success of Mr. Ward's motion for appropriating the surplus of the Irish Church temporalities to secular purposes, Lord Stanley seceded from the Grey ministry, carrying with him Sir James Graham, the Duke of Richmond, and the Earl of Ripon. He ever afterwards adhered to the Conservative party, although, in 1834, upon the dismissal of the Melbourne ministry by William IV., he declined to join the administration of Sir Robert Peel. After acting in concert with the opposition for seven years, he accepted the colonial seals in the Peel administration of 1841, and held them for four years. In September 1844, he resigned his seat for North Lancashire, for which he had sat since 1832, and was called to the Upper House in his father's barony of Stanley of Bickerstaffe. In December 1845, when Sir Robert Peel determined to repeal the corn laws, he retired from the cabinet. In 1846, he put himself at the head of the Protectionist opposition, which, headed in the Commons by Lord George Bentinck and Mr. Disraeli, waged a stout but ineffectual opposition to the free-trade measures of Sir Robert Peel. He was now regarded as the leader

of the great Conservative party. In 1851, on the death of his father, he succeeded to the earldom. In February 1852, on the resignation of Lord John Russell, he was sent for by the Queen, and intrusted with the formation of an administration, which was, however, displaced in December following by a hostile vote of the House of Commons condemnatory of the budget of his Chancellor of the Exchequer, Mr. Disraeli. On the death of the Duke of Wellington in 1852, he was elected to the post of Chancellor of the University of Oxford.

In February 1858, when the Palmerston government resigned on the rejection of the Conspiracy Bill, he again became First Lord of the Treasury. At the meeting of parliament in the following year, his government brought forward a measure of Parliamentary Reform. A hostile amendment having been moved by Lord John Russell, and carried, he dissolved parliament, and appealed to the country. When the new House of Commons re-assembled in June 1859, a vote of want of confidence was carried against his government, and he resigned. He returned to power in 1866, and, in conjunction with Mr. Disraeli, passed the Reform measure of 1867. See REFORM. In 1868, he resigned the premiership in favor of Mr. Disraeli. His last speech in parliament was made (1869) in opposition to the disestablishment of the Irish Church. He died October 23, 1869, and was succeeded in the earldom by his son, Edward Henry Smith-Stanley (see STANLEY). As a debater, the late earl stood in the very first rank. His power of invective was almost unequalled, and his vehement contentions with O'Connell on the Repeal of the Union and the Irish Church did much to diminish the influence of the Irish agitator. He was tall, of commanding gesture, and his voice, in elevated passages of declamation, rang with power and effect. D. devoted the leisure of his latter years to translating Homer's *Iliad*, which was published in two volumes in 1864, in blank verse.

DE'RBY, a parliamentary and municipal borough and manufacturing town, the capital of Derbyshire, in the south part of the county, in the wide and fertile valley of the Derwent—thence navigable to the Trent—at the junction of the main branches of the Midland Railway, 132 miles north-north-west of London, and 35 miles north-north-east of Birmingham. The houses are mostly of brick, and the public buildings of stone. The Free Grammar School is one of the oldest English foundations, reaching to 1162. Here Blackwell, author of the *Sacred Classics*, was a master, and Flamsteed a pupil. Dr. Darwin, in 1783, founded the Philosophical Society of D., and wrote most of his works here. D. is well situated for manufacture and trade, being at the south end of a coal-field, and being connected by canals and railways with a great part of England. It has manufactures of silk, cotton, lace, hosiery, lead, iron, paints, porcelain, jewelry, black marble vases, columns, chimney-pieces, and ornaments of floor-spar, petrifications, marble, &c. The staple manufacture is throwing silk, introduced by Mr. Crochet from Italy early in the 18th c.; the silk-mill, with machinery still in use, erected in 1718 by John Lombe, being the first of the kind in England. D. has about 25 silk-mills. Pop. (1871) mun. bor. 49,793, (1881) 80,410; par. bor. (1871) 61,381, (1881) 77,636. D. returns two members to parliament. In 1867 a new cattle-market was opened, and also a new corn-exchange. The grammar-school was removed in 1862 from St. Peter's Churchyard to St. Helen's House, the site of the original foundation, and class-rooms have been added to it; and a handsome market hall was built in 1866.

Mr. Bass presented the town with a recreation-ground, swimming-baths, a free library, art gallery, and museum buildings. D. was the Roman station *Derevntio*, which stood on the east bank of the river, opposite the town. Roman brass, silver and gold coins have been found, a Roman pavement, and the foundations of a Roman bridge. D.—called *Northcorthige* by the Saxons, and *Deoraby* by the Danes—was given by the Conqueror to William Peveril.

DERBY DAY is the second day, the Wednesday, of the Grand Spring Meeting, which takes place at Epsom in Surrey, in May, in the week succeeding Trinity Sunday. Upon this day, the most important on the list, and that on which the best horses run, the famous Derby stakes, instituted by the Earl of Derby in 1780, and which consist of 50 sovereigns each, are contended for. When the first Derby was run for, there were only 36 subscribers at 50 guineas each (with £25 forfeit in case of non-starters); but the number of subscribers is now so large, that the value of the stakes sometimes amounts to more than £6000. The Derby Day is the great English holiday. To be present at Epsom on that occasion, London empties itself, and proceeds to the Downs by modes of locomotion the most heterogeneous. For hours, a continuous stream of carriages, gigs, dog-carts, vans, and vehicles of every description, moves tumultuously along the road to Epsom. Shopkeepers on that day shut up their shops, the benches of parliament are deserted, one-half of the aristocracy appear on the ground, people of every condition arrive in countless numbers from all districts; and huge trains arrive every few minutes at the

station, bringing their thousands, until the entire Downs are covered with a vast moving mass. So great is the demand for conveyances on this day, that scarcely a horse can be had either in London or within 40 miles of it. At the Derby in 1861, the course, which is a mile and a half in length, was gone over in 2 minutes 43 seconds—the swiftest running, by 2 seconds, ever yet known on that course.

DE'RBVITES. See PLYMOUTH BRETHREN.

DE'RBVSHIRE, an inland county of England, lying between Yorkshire on the north and Leicestershire on the south. Its shape is triangular; the greatest length from north to south being 56 miles; greatest breadth, 34; area, 1030 square miles. The north-west is occupied by the south end of the Pennine chain, called the High Peak or Derbyshire Highlands. This tract forms the watershed between the Trent and Mersey, and is not surpassed for rugged and romantic scenery by anything in England; abounding in precipices, faults, rocking-stones, caverns—one of which is 2700 feet long—and streams that often lose themselves for a time among the fissures of the limestone hills. The Peak is 1880 feet high; Kinder Scout 1981 feet. From the Peak tract, a range runs south; another runs 60 miles south-south-east. Other ranges intersect parts of the county. To the south, D. sinks into a flat or gently undulating tract of new red sandstone, with some spots of magnesian limestone and coal, and beds of red marl and gypsum.

The chief rivers are the Trent—dividing D. from Staffordshire for 10 miles, and then crossing the south of the county and passing into Nottingham—and its tributaries, the Derwent and the Dove, both of which rise in the region of the Peak, and flow in a south-easterly direction. Warm mineral springs exist at Buxton and Matlock, and intermitting springs at Barmoor and Tideswell. D. is celebrated for metals and minerals—iron, lead, zinc, manganese, copper, coal, fuller's-earth, mineral caoutchouc and mineral oil, gypsum, pipe-clay and chert for potteries, marble, fluor-spar, and alabaster for ornaments, &c. D. has six canals, and is intersected by many branches of the Midland Railway. In the north, the climate is cool and moist, with fogs, and often frosts in summer. D. is more a manufacturing and mining than an agricultural county. The best soils in the south are red, marly, fertile loams. There are many woods and coppices. The chief crops are wheat, barley, and oats. The total acreage under crops of all kinds, bare fallow, and grass, was 512,334 in 1881. D. has much permanent pasture, large dairies, and sheep pasturage in the Peak district. There are manufactures of cotton, silk, worsted, metallic goods, porcelain, and marble and spar ornaments. D. is divided into 6 hundreds, 9 poor-law unions, and 140 parishes in the diocese of Lichfield. The chief towns are Derby, Ashbourne, Bakewell, Buxton, Chapel-le-Frith, Chesterfield, Belper, and Wirksworth. Population (1871) 380,538; (1881) 461,141. D. returns eight members to parliament—six for the county, and two for Derby. There are in the county remains of so-called Druid circles, barrows, cromlechs, British and Roman roads, Roman baths, and a Roman altar at Haddon Hall. There are also ecclesiastical and monastic remains. Repton Church crypt is older than 874. Hardwick Hall contains some furniture of Elizabeth's time, and some embroidery said to have been done by Mary Queen of Scots. Near Bakewell is Chatsworth, the magnificent seat of the Duke of Devonshire. Arkwright built his first mill at Cromford, in 1771. Brindley was born at Turnstead; and Strutt, the inventor of ribbed stockings, at Normanton.

DERBYSHIRE SPAR is a name given to the fluoride of calcium, or Fluor-Spar (q. v.).

DERE'CSKÉ, a town of Hungary, 12 miles south of Drebrezin. It is situated in the vicinity of several small lakes, from which, in the summer-time, a considerable quantity of soda is obtained by evaporation. In one of the lakes, small but very beautiful pearls are found. Pop. (1880) 7630.

DE'REHAM, EAST, a town in the middle of the county of Norfolk, 16 miles west-north-west of Norwich. Its streets are wide, well lighted, and well paved. The church, which is cruciform, with a tower, contains the remains and monument of Cowper the poet. D. has manufactures of agricultural machines, and in the highly cultivated country around there are many gardens and orchards. Pop. (1881) 5640. Here Withburga, daughter of King Anna, founded a nunnery in the 7th c., which was burned by the Danes, and afterwards refounded. Withburga was buried in her nunnery in 654, but her remains were stolen thence by the monks of Ely in 974.

DE'RELICT, a term in English Law, signifying anything forsaken or left, or wilfully cast away. Derelict lands, if suddenly left by the sea, belong to the crown; but if the sea has receded gradually and imperceptibly, the gain will go to the owner of the adjacent lands.

In order to constitute a ship which has been wrecked derelict, it is necessary that the master and crew shall have abandoned

her, without hope of recovery. The mere quitting of a ship for the purpose of procuring assistance from the shore, or other temporary cause, with the intention of returning to her again, is not an abandonment. See Lord Stowell's judgment in the case of the *Aquila* (1 Rob. 37), and *Abbot on Shipping*, p. 489. When such abandonment or dereliction has occurred, the first-comers are entitled to take temporary possession of the ship, and to claim salvage, either from the owners, the lord of the manor, or other person having right to wrecks unclaimed by the owners, or in the event of no claim from the crown. The general superintendence of all matters relating to wreck is placed in the Board of Trade by the 439th section of 17 and 18 Vict. c. 104, commonly called 'the Merchant Shipping Act;' and the board may, with consent of the Commissioners of her Majesty's Treasury, appoint any officer of customs, or of the coast-guard, or other person, to be a receiver of wreck in any district, and to perform the duties imposed on him by the act. These duties consist in taking the command of the persons present, and availing himself of their services to the best of his ability to save the ship and her crew and cargo. If any one refuses to obey him, he shall incur a penalty of £50; and if any master of a ship or boat shall refuse him his aid, or any proprietor of a wagon, cart, or horses shall refuse him the use of them, he shall incur a penalty of £100. All articles washed on shore or lost are to be delivered to the receiver, and he has power to suppress plunder and disorder by force. Within 48 hours after taking possession of any wreck, the receiver shall cause to be posted up in the nearest custom-house a description of the same, and of any marks by which it is distinguished; and if the value of such wreck exceeds £20, he shall transmit a similar description to the secretary of the committee of Lloyd's (s. 452). See LLOYD'S. Goods deemed perishable he may sell immediately (s. 453). The owner of all wreck is entitled, within one year, to claim it from the receiver, who will deliver it up to him on receiving payment of such expenses, fees, and salvage as may have been incurred in terms of the act (s. 470). In the event of no owner establishing his claim before the expiration of a year from the date at which the wreck has come into the possession of the receiver, it shall be delivered up to the lord of the manor or other person having title to it. If a dispute arise as to the property of wreck, or the amount of salvage or other charge due, it may be decided by two justices, whose proceedings may be reviewed by any court of law or equity, if carried there by appeal within three months. If no claim shall be established to wreck either by an owner or lord of the manor, or admiral, mayor, or other person having title to wrecks cast on shore at particular parts of the coast, the wreck becomes the property of the crown, and shall be sold by the receiver, and the proceeds, after deducting fees and expenses, paid into her Majesty's exchequer (s. 475).

The principle upon which Salvage (q. v.) is given on wrecks and derelict is, that a person who by his labor preserves goods which the owner or those intrusted with the care of them have either abandoned in distress at sea, or are unable to protect and secure, is entitled to retain the possession of the goods until proper compensation is made to him for his trouble. Where the parties cannot agree on this sum, and are unwilling to adopt the decision of the justices, as above stated, the amount is generally ascertained by a jury. Till the question is decided, the goods remain in the custody of the salvor, or of the receiver for his behoof. No claim for salvage is due where the owner, or those in his employment, are at hand on the coast, and in a condition to save and protect his property. If any one set of persons have taken possession of a derelict, and are endeavoring to bring it into port and save it, another set have no right to interfere with them and become participators in the salvage; unless it appears that the first in possession would not have been able to effect the rescue of the property without the aid of the others (Abbot p. 490). This rule applies to king's officers, even where the property saved is government stores. The original salvors cannot be dispossessed without reasonable cause. As to the proportion which the salvage allowed bears to the value of the property saved in various circumstances, see SALVAGE.

DERG, LOUGH (signifying the *red lake*), the name of the two Irish lakes. One, the largest lake expansion of the river Shannon, between Tipperary on the south-east, and Galway and Clare on the north-west, is 24 miles long from north-east to south-west, 2 to 6 broad, 10 to 20 feet deep at the upper, and 50 to 80 at the lower end. Its surface is about 100 feet above the sea. It contains several islands.—The other Lough Derg is in the south of Donegal county, on the borders of Tyrone. It is 3 miles by 2½, has many small isles and rocks, and wild dreary shores, and is surrounded by mica-slate hills 700 to 1200 feet high. Saint's Isle contains the remains of a priory, founded about 600, and is the original seat of St. Patrick's Purgatory. But the place of penance has for some centuries been on Station Isle—under an acre in extent, and with two chapels—which is now the most celebrated place of pilgrimage in Ireland, 10,000 to 15,000 persons

flocking to it annually, from 1st June to 15th August, for prayer, fasting, and vigils.

DERIVATION. See **ETYMOLOGY**.

DERIVATION, in Medicine, a method of curing disease, by which it was formerly supposed that the *materies morbi*, or matter of the disease, was drained away through some channel established for it by artificial means, as when a blister is applied over an inflamed lung, or a discharge from the bowels established in a case of dropsy. Without too closely scrutinizing the theory, it may be admitted that many of the practices founded on it have also a pretty firm basis of experience, and are well established in modern medicine.

DERMATO'LOGY (Gr. *dermatos*, of the skin, *logos*, a discourse), the science of the management of the skin and of its diseases. See **SKIN**.

DERMATOPHYTES (Gr. *derma*, the skin, and *phyton*, a growth or plant), vegetable growths, chiefly of the lowest of Cryptogamia (q. v.), inhabiting the cuticle or epidermis, and giving rise to some forms of skin-disease, as Favus (q. v.), Pityriasis (q. v.), Ringworm (q. v.), &c.

DERME'STES, a genus of coleopterous insects of the section *Pentamera*, and of the family *Clavicornes* (q. v.); having antennæ shorter than the thorax, their three terminal joints forming an ovate compressed club. Their larvæ feed mostly on dry and decaying animal matter, and are very voracious, committing great ravages among furs, collections of natural history, &c. *D. lardarius* is the well-known **BACON BEETLE**, the larva of which is so often destructive to bacon and other dried meats, and often also to cheese. The perfect insect is about a quarter of an inch in length, and of a dull black color, the base of each wing-cover ash-colored with three black spots. The larva is of a long shape, tapering towards the tail, dark-brown above, white beneath, with long hairs, and furnished with two horny hooks on the last segment. The larva of *D. murinus* is common in the dried carcases of vermin nailed up on doors by gamekeepers; that of *D. vulpinus* abounds among cargoes of hides brought from warm climates; that of *D. paniceus* in long-kept stores of ship-biscuits.

Use is sometimes made of the larvæ of species of *D.* for procuring well-cleaned skeletons of birds and other small animals: the animal is first soaked in water, to get all the blood out; then dried, to suit it to the taste of the larvæ, which are placed with it in a box; and in a short time their work is very neatly and completely done, much better than by ants.

DERMIS. See **SKIN**.

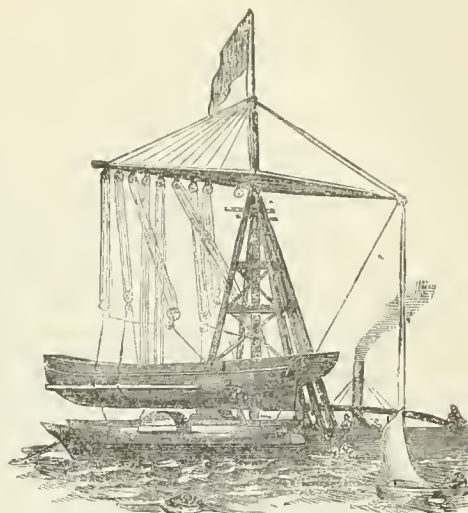
DERMO'PTEROUS (Gr. skin-finned) **FISHES**, an order of fishes in Owen's classification, so named from the cutaneous vertical fins, in which the rays are extremely soft and delicate, or altogether imperceptible, and further characterized by the want of pectoral and ventral fins. Lampreys, the lancelet, &c., are dermopterous fishes.

DE'RNA, or **DE'RNAH**, a town of Tripoli, Northern Africa, situated at the mouth of a ravine a mile from the Mediterranean, in about lat. 33° 30' N., long. 22° 30' E. Built on both sides of the ravine, it has regular streets, which are far from cleanly, although a copious stream of pure water flows through several of them. The houses are low and have a mean appearance, but they are surrounded by fine gardens and orange-groves. The harbor of D. is insecure, and its prosperity, which was formerly considerable, has now greatly declined. Pop. 6000.

DERREY'EH, EL, or **DERAY'EH**, a town of Nedjed, Central Arabia, in lat. 25° 15' N., long. 46° 30' E. It is fortified, and has a population usually stated at about 15,000. It was formerly the capital of the country of the Wahabees, but was captured and almost destroyed by Ibrahim Pasha in 1819.

DE'RRICK, a mechanical contrivance used for the same purposes as the crane, but recently so improved in size, strength, and mechanism, as to be able not only to raise a body of 1000 tons in weight, but to transport it from one place to another. The following description of the *Great Floating Derrick*, built in 1859, will convey an idea of the powers of this machine, and of the principles upon which it works. This derrick was built by the Thames Iron Ship-building Company, at Blackwall. It consists of a flat-bottomed vessel, 270 feet long, and 90 feet across the beam, and is divided throughout into a number of water-tight compartments, which can be filled, so as to counterbalance any weight on an opposite side. From the deck of this floating steam-crane rises an iron tripod 80 feet high, on the top of which revolves a gigantic boom, 120 feet long, and above the boom the 'king-post,' a continuation of the tripod, rises to the height of 50 feet. One arm of the boom is furnished with ten fourfold blocks; the chains attached to these blocks are passed across the king-

post, brought over the other arm of the boom, and so descend to the other side of the vessel, where they are connected with two powerful steam-engines, by means of which the weights are raised. This derrick is capable of being propelled by means of a series of bucket-paddle floats at the rate of four miles an hour.



It is the invention of Mr. Bishop, an American. Derrieks have been long in use in America, and have proved much more expeditious and economical than any other species of lifting-power. They are chiefly used for lifting machinery or other great weights, and for raising wrecks. A *Derrick-crane* has a jib fitted with a joint at the foot, and a chain instead of a tension-bar at the top.

DE'RVISH is a Persian word signifying *poor*, corresponding to the Arabic *Fakir* (q. v.). It designates, in Mohammedan countries, a class of persons resembling in many respects the monks of Christendom. The dervishes are divided into many different brotherhoods and orders. They live mostly in well-endowed convents, called Tekkije or Changah, and are under a chief with the title of a Shiek, i. e., 'elder.' Some of the monks are married,



Dervishes.

and allowed to live out of the monastery, but must sleep there some nights weekly. Their devotional exercises consist in meetings for worship, prayers, religious dances, and mortifications. As the convent does not provide them with clothing, they are obliged to work more or less.

It is difficult to say when these religious orders took their rise. From the earliest times, pious persons in the East have held it to be meritorious to renounce earthly joys, to free themselves from the trammels of domestic and social life, and to devote their thoughts in poverty and retirement to the contemplation of God. In this sense, poverty is recommended by Mohammed in the Koran. Tradition refers to the origin of these orders to the earliest times of Islam, making the califs Abubekr and Ali found such brotherhoods; but it is more probable that they arose later. Many Mohammedan princes and Turkish sultans have held dervishes in high respect, and bestowed rich endowments on their establishments; and they are still in high veneration with the people. The orders are generally named after their founders, and the best known are the *Bestamis*, established 874 A.D.; *Kadris*, 1165; *Rufaisi*, 1182; *Mevelevis*, 1273; *Nakshibendis*, 1319; *Bektashis*, 1357; *Rushenis*, 1533; *Shemsis*, 1601; and *Jemalis*, 1750. The kadris are commonly known in the west as 'the howling dervishes,' from the excited chaunt of their religious services; the 'dancing dervishes' are the Mevelevis.

DER'WENT, one of the principal rivers of Tasmania, issues from Lake St. Clare, in the center of the island; flows tortuously to the south-east; and enters Storm Bay, in D'Entrecasteaux Channel, by an estuary four miles wide. Up to Hobart-Town, the D. is navigable for ships of any burden.

DER'WENTWATER, or KE'SWICK LAKE, an oval sheet of water in the south of Cumberland, and one of the most beautiful of the lakes of that county. It stretches south from Keswick, is 3 miles long by $1\frac{1}{2}$ broad, 72 feet deep, and 222 feet above the sea. Its banks are rocky and abrupt, and behind them rise rocky mountains, one of which, the Cat Bells, is 1448 feet high, and another, Lowdore, has a fall of 100 feet. This lake is an enlargement of the Derwent river, which runs through the lake in its course towards the Irish Sea, into which it flows at Workington. It has several wooded isles, besides a remarkable floating isle—a mass of earthy matter six feet thick, and varying in size in different years from an acre to a few perches, covered with vegetation, and full of air-bubbles, which buoy it on the surface of the water. D. abounds in trout, pike, perch, and eels.

DERWENTWATER, JAMES, EARL OF, one of the leaders in the rebellion of 1715, and the last Earl of D., was the descendant of an ancient Northumberland family named Radcliffe. He was born in 1688, educated in France, and on the death of his father in 1705, D., then in his 17th year, returned to the seat of his ancestors at Dilston, in Northumberland, and assumed the paternal titles and estates.

On the eve of the insurrection, at the close of 1714, warrants were issued on suspicion against several gentlemen in the north of England, and one, among others, against the Earl of D.; but having been previously warned, he fled from Dilston, and found refuge in the cottage of one of his dependents. He soon afterwards collected a few retainers, and placed himself at their head, under the impression that the entire body of the Jacobites either had risen, or were about to rise. From this period the history of the Earl of D. becomes the history of the Rebellion of 1715, which ended in the disastrous encounter at Preston, on which occasion D. conducted himself with the utmost heroism, but, with the most of the rebel leaders, was taken prisoner, and conveyed to the Tower of London. Having been impeached of high treason at the opening of parliament, he was carried before the House of Lords, February 9, 1716, and, requesting time to prepare an answer to his accusation, was remitted till the 19th, when, being taken for trial to Westminster Hall, he pleaded guilty, and threw himself upon the mercy of the king. His appeal was unavailing, and he was condemned to suffer. Every possible effort was made by the relations and friends of D. to obtain a pardon, but their exertions were fruitless, and he was beheaded on Tower Hill, 24th February 1716. His youth, his invariable amiability of temper, his rank, and his bravery, combined to excite great sympathy for the unhappy sufferer.

DERZA'WIN, GABRIEL ROMANOWICZ, a celebrated Russian lyric poet, was born at Kasan, 3d July 1743, studied at the gymnasium of his native city, and in 1762 entered the army as a private soldier. His talents and superior education soon procured him promotion. The Empress Catharine highly esteemed him; and in 1791, appointed him Secretary of State; in 1800, Imperial Treasurer; and in 1802, Minister of Justice. This last office, however, he held only for one year, when he retired on a pension, and devoted the remainder of his life wholly to the muses. He died 6th July 1816. D. is a thoroughly original poet. He excels in loftiness of idea, purity of sentiment, and rich vigor of language; in fact, the latter quality at times manifests itself in an Oriental extravagance of imagery which the colder fancy of the West fails to appreciate. D.'s noblest, as well as his most popular ode, is his *Address to the Deity*. It has been translated into English, German, and other European languages. His collected works were first published at St. Petersburg in 5 vols. (1810—1815), and have been often reprinted since.

DESAGUADERO, the name of various waters in Spanish America, of which the chief are a lake and two rivers.—1. The lake, situated in Araucania (q. v.), measures 35 miles in length, with an average breadth of five, and sends forth the Osorno to the Pacific.—2. A river of the Argentine Confederation, separates the departments of San Luis and Mendoza. It is, however, merely a winter torrent, being quite dried up in summer.—3. A river of Bolivia—the only stream of any magnitude that is wholly within its borders—issues from Lake Titicaca, and, after a south course of 190 miles, loses itself in the land-locked lake of Aullagas, near the town of Oruro.

It is, without exception, the loftiest stream of any length on either continent, for the elevation of its source, not greatly exceeding that of its mouth, is 12,846 feet, or nearly $2\frac{1}{2}$ miles.

DESAIX DE VEYGOUX, LOUIS CHARLES ANTOINE, a general of the first French republic, was born at St. Hilaire-d'Ayat, in

Auvergne, August 17, 1768. After studying at the military school of Effiat, he was appointed in 1792 aide-de-camp to Prince Victor de Broglie, then at the head of the army of the Rhine. Here D. distinguished himself by his bravery, which was at the same time cool and fearless. In 1796, Moreau having obtained the command of the army of the Rhine, made D. his lieutenant, and employed him in the most difficult and dangerous missions. In Moreau's (q. v.) famous retreat through the Black Forest during this year, D., who commanded the left wing of the army of the Rhine, increased his already great reputation. The French by this retreat had now retired within the Rhine, retaining on the right bank only the fort of Kehl, which D. was commissioned to defend. The fort was in ruins, and could not be well repaired before the approach of the Austrians; nevertheless, behind this imperfect defence D. resisted the Austrian army for more than two months, only capitulating in January 1797, when his ammunition was spent. His greatest achievement, however, was the conquest of Upper Egypt, which he accomplished in 1799, after an eight months' campaign. He was incredibly fertile in resources, and possessed the power of winning and restraining the people whom he had conquered, to a wonderful degree; his own soldiers used to compare him to Bayard, while the inhabitants named him *The Just Sultan*. D. returned from Egypt just in time to take part in the battle of Marengo, on the 14th June 1800, in which he was killed by a musket-bullet. His body was placed—after being embalmed—in the convent of Mount St. Bernard. A statue has been raised in his honor in the Place Dauphine, in Paris.

DE'SCANT, or DI'SCANT (Sp. *discante*), a term which, in ancient times, was given to a musical composition; also to the counterpoint or melody which the singer (taking the upper part), sung extempore to the tenor or bass. In modern music, the term is applied to the part written for the voices of females or boys, and is the same as treble or soprano.

DESCARTES, RENE (Latinized into RENATUS CARTESIUS), the name of one of the reformers of philosophy, was born March 31, 1596, at La Haye in Touraine. He was sent at the age of eight years to the Jesuit College at La Flèche, where he soon became distinguished for his keenness of intellect, and made great and rapid progress in languages, mathematics, and astronomy. It was not long, however, before he became dissatisfied with the doctrines and method of scholasticism, and felt it impossible to acquiesce in what had hitherto been regarded as *knowledge*.

The first thing that he did after leaving college, as we are informed in his treatise on Method, was to abandon books, and endeavor to efface from his mind all that he had hitherto been taught, that it might be free to receive the impressions of truth, whencesoever they should come. In pursuance of his plan, he resolved to travel, and soon entered the army as a volunteer, serving successively in Holland and Bavaria. As, however, the life of a soldier contributed little to his main object, he quitted the army in 1621; and after making journeys in different directions, he at last retired to Holland, where he prepared most of his works, attracted many disciples, and at the same time became involved in several learned controversies, especially with the theologians. Although he loved independence, yet, in 1649, he accepted an invitation to go to Sweden, addressed to him by Queen Christina, who desired his learned intercourse and instruction. His willingness to leave Holland was partly occasioned by his anxiety to escape from the hostility of his enemies. Only a few months after his arrival at the court of Queen Christina, he died on February 11, 1650. Sixteen years later, his body was brought to Paris, and buried in the church of St. Genevieve-du-Mont.

The grand object towards which D. directed his endeavors, was the attainment of a firm philosophical conviction. The way whereby he sought to attain this end, is explained in the Discourse on Method (*Discours de la Méthode*, published in 1637), to which we have already referred. This small, but extremely interesting and important treatise, contains a history of the inner life of the author, tracing the progress of his mental development from its commencement in early years, to the point where it resulted in his resolution to hold nothing for true until he had ascertained the grounds of certitude. The author also, in the same treatise, explains the practical rules whereby he resolved to be guided while in this state of *suspended belief*, and by the observance of which he hoped to arrive at *absolute certainty*, if, indeed, it were at all attainable. The results of his inquiries, so conducted, he exhibited more particularly in his *Meditations de Primâ Philosophiâ* (Amst. 1641), and the *Principia Philosophiæ* (Amst. 1644). In the former of these treatises, the independence of his thinking is strikingly brought out by his commencing his Meditations with the expression of doubt with regard to all that had hitherto borne the name of knowledge. After examining thoroughly, as he thought, the grounds of certitude in the various departments of knowledge, he found one, and only one proposition that seemed to him to stand the test, and of which the truth could not possibly be doubted: that proposition was, that he ex-

isted, which he inferred from the fact of his possessing consciousness.

He could not doubt that he felt and thought, and therefore he could not doubt that *he*, the feeler, the thinker, existed. This relation between consciousness and existence he expressed by the memorable words: *Cogito, ergo sum*. Instead, however, of making the above proposition the foundation of his philosophy, by which he would have been led into a direction similar to that of Kant or Fichte, he employed it only so far as to ascertain from it the criterion of certitude—viz., that whatever is *clearly and distinctly thought, must be true*. Amongst these clear and distinct thoughts, he soon recognized the idea of God as the absolutely Perfect Being. This idea, he reasoned, could not be formed in our minds by ourselves, for the imperfect can never originate the perfect; it must be *connate*, i. e., part of the original structure of our understanding, and implanted their by the Perfect Being himself. Hence, from the existence of the idea of perfection, D. inferred the existence of God as the originator of it; he inferred it also from the mere *nature of the idea*, because the idea of perfection involves existence. But if God exist, then we have a guarantee of the previously determined ground of certitude, for God the Perfect Being cannot deceive, and therefore whatever our consciousness clearly testifies, may be implicitly believed.

The most general fundamental principle of the philosophical system of D., is the essential difference of spirit and matter—the thinking and the extended substances—a difference so great, according to D., that they can exert no influence upon each other. Hence, in order to account for the correspondence betwixt the material and spiritual phenomena, he was obliged to have recourse to a constant co-operation (*concursus*) on the part of God; a doctrine which gave rise subsequently to the system called Occasionalism (q. v.), the principle of which was, that body and mind do not really affect each other, God being always the true cause of the apparent or occasional influence of one on the other. This doctrine received its complete development in the pre-established harmony of Leibnitz. See LEIBNITZ.

D. did not confine his attention to mental philosophy, but devoted himself systematically to the explanation of the properties of the bodies composing the material universe. In this department, his reforms amounted to a revolution, though many of his explanations of physical phenomena are purely *a priori*, and certainly sufficiently absurd. His corpuscular philosophy—in which he endeavored to explain all the appearances of the material world simply by the motion of the ultimate particles of bodies—was a great advance on the system held up to that time, according to which special qualities and powers were assumed to account for every phenomenon. It was in mathematics, however, that D. achieved the greatest and most lasting results; and, indeed, his mathematical discoveries procured among his contemporaries, for him, in many cases, wild philosophical views, a greater importance than they in themselves are entitled to.

It was D. who first recognized the true meaning of the negative roots of equations; and we owe to him the theorem, which is called by his name, that an equation may have as many positive roots as there are changes of sign in passing from term to term, and as many negative roots as there are continuations of sign, and not more of either kind. He gave a new and ingenious solution of equations of the fourth degree; and first introduced *exponents*, and thereby laid the foundation for calculating with *powers*. He showed, moreover, how to draw *tangents* and *normals* at every point of a geometrical curve, with the exception of mechanical or transcendental curves; and, what perhaps was his highest merit, he showed how to express the nature and the properties of every curve, by an equation between two variable co-ordinates; thus, in fact, originating *Analytical Geometry*, which has led to the brightest discoveries. D. was less happy in his cosmological exertations, in which he attempted to explain the movements of the heavenly bodies by *vortices* (*tourbillons*), consisting in the currents of the ether which he supposed to fill the universe; a theory which not only then, but even after the discoveries of Newton, made a great noise, and found many adherents, but which has long ago been consigned to oblivion. The philosophical and mathematical works of D., which are composed in Latin, were published at Amsterdam (9 vols. 4to, 1692–1701, also in 1713), and at Paris (1724–1726, in 13 vols. 12mo). More recently, an edition of his whole works has been published by M. Cousin (11 vols., Paris, 1824–1826).

DESCENDANTS. See HEIR, CONSANGUINITY, &c.; SUCCESSION.

DESCENT, LINE OF SWIFTEST, is that by which a body falling under the action of gravity, passes most quickly from one point to another. It is proved that when the one point is not directly over the other, the line of swiftest descent is an arc of a Cycloid (q. v.).

DESCENT OF MAN. Before attempting to prosecute the inquiry as to the origin, or descent of man, a considerable amount

of preparatory study is needed. The reader must bring to the task (1) some knowledge of the general progress of the sciences; (2) some acquaintance with the history and progress of biology, and of the main facts of morphology, physiology, and distribution; (3) a knowledge of the necessity for some theory of the origin of these biological phenomena, and considerable familiarity with the evidence for and against each of the two rival theories of origin—of special creation and evolution; (4) he must be in possession of the facts respecting the antiquity of man. (For information and references on these heads, see DARWINIAN THEORY; and MAN, ANTIQUITY OF.)

By those wholly destitute of this preparation, support or rejection of the evolutionary or the creationist theory must be based upon the particular prejudices with which they may happen to be imbued, and the particular authorities with which they may happen to have been in contact.

Long before the publication of the *Origin of Species*, the evolutionary hypothesis had been maintained by Lamarck and others. Since that time it has been strongly upheld by numerous naturalists, but by none so fully and carefully as by Darwin, from whose *Descent of Man* (second edition, Lond. 1875), the following abstract is derived, and to which the reader is referred for further information and references. Huxley's *Anthropogenie* (*Evolution of Man*, translated 1879), and Huxley's *Man's Place in Nature* (Lond. 1864), should also be consulted.

The objects of Darwin's work are, 'to consider, firstly, whether man, like every other species, is descended from some pre-existing form; secondly, the manner of his development; and thirdly, the value of the differences between the so-called races of man.'

1. Man is constructed on the same type as other mammals; his bones, muscles, nerves, blood-vessels, and viscera can be compared with theirs; even in his brain every fold and fissure can be compared with that of the orang; and it has been anatomically demonstrated that in the structure of the brain, and of all other parts of the body, man differs less from the higher apes, than these do from the lower Primates. The physiological resemblance is, if possible, even more complete; man is liable to receive the diseases of animals, and communicate his to them; and this proves their close similarity in blood and tissues. Monkeys suffer from the same diseases, exhibit the same peculiarities of taste, and are infested by closely allied parasites. The process of reproduction, too, closely corresponds in all its details; the difference between the sexes is completely analogous; even the age of maturity is by no means so widely different as might appear, for the orang is not adult until ten or fifteen years old.

The development of man agrees thoroughly with that of other mammals, and exhibits the most complete resemblance with that of the higher apes (see DEVELOPMENT OF THE EMBRYO).

Rudimentary organs are peculiarly numerous in the human body. Many muscles characteristic of the lower animals are occasionally, or constantly, present in the human body in this state; the muscles for twitching the skin furnish good instances of this. The superficial muscles of the scalp, and the numerous muscles of the ear, belong to the same system, and in rare instances are functional. The blunt point projecting from the inwardly folded margin of the ear, is probably homologous with the tip of the erect and pointed ear of lower animals. Other examples are the nictitating membrane, the scanty development of hair, the vermiform appendix of the cæcum, and even the wisdom teeth.

A certain foramen occasionally present in the humerus of man, and much more frequently in the humerus of animals, existed much more commonly in prehistoric times; so, too, in skulls and other characters the ancient races stand nearer the brute. The coccyx of man and the higher apes is a true tail, which during development projects beyond the legs, and occasionally persists during adult life. In all cases it is furnished with an extensor and other muscles, and contains a continuation of the spinal cord.

2. *Manner of Development*.—The variability of man, familiar to us in features only, is no less great in every other respect; dimension, proportion, form, and structure, both internal and external, all alike vary to the most unexpected degree. Thus, 558 muscular variations have been observed in 36 bodies, of which one possessed 25 distinct abnormalities, and none was completely normal.

The variability of mental faculties notorious in man, is represented in animals—as each dog or monkey shows—and the inheritance of mental peculiarities is as evident as that of physical ones, for man and beast alike.

Variability depends to some extent upon external conditions, largely, also, upon use and disuse of parts, and other circumstances (see DARWINIAN THEORY, *Laws of Variation*). Arrested development may occur, leading to the reduction or suppression of certain parts, or long lost characters may frequently appear through reversion, as in the case of a human subject which abnormally resembled certain apes in no less than seven of his muscles. Correlated variations also take place, and others which must provisionally be termed spontaneous.

Man, like other animals, tends to increase with extreme rapidity; his rate of increase is, however, checked by the difficulty of gaining subsistence, by disease, war, infanticide, and the like.

Seeing, then, that man varies like the lower animals, and tends to increase beyond the means of subsistence; seeing, too, that in course of his incessant migrations he must have been exposed to the most diversified conditions, he and his early progenitors must have been exposed to a struggle for existence, and consequently to the rigid law of natural selection, which would tend to preserve advantageous variations of intellectual and social faculties, as well as of bodily structure. Commencing with the latter, we find the hands of the *Quadrupana* of similar type to our own, but far less perfectly adapted for diversified uses, though admirably so for climbing. As some ancient Primate became less arboreal, it would needs become more strictly quadrupedal, like a baboon, or more bipedal. For many actions it is evident that the anterior members should be spared from rougher uses and left free, and this would necessitate firmer standing on the feet, which accordingly have become flat, and lost most of their power of prehension. Hence, we can see how it would have been advantageous to the progenitors of man to have become more and more erect, and the higher apes in fact show various intermediate stages between the quadrupedal and the bipedal type.

This change of posture would render necessary endless changes of structure, besides those of the four limbs: the pelvis having to be broadened, the spine doubly curved, and the head fixed in an altered position. As stones and clubs became substituted for the teeth in fighting, the jaws and canines, with the jaw muscles and their bony attachments, would become reduced, and the adult skull would resemble more and more that of existing man. As the mental faculties developed, the brain would become larger, and this increase in weight would affect the size and shape of the spinal column and skull. The coating of hair, too, would diminish, probably chiefly through sexual selection, though other reasons are not wanting. The rudimentary character of the tail in man and the higher apes may be largely ascribed to disuse; the friction, too, of the sitting posture would not be without effect, as is evidenced by the extremely short and callous tail of *Macacus brunneus*, and its total abortion in the allied species *M. ecaudatus*.

Besides the acquirement of new characters by sexual selection, changes might also be those unknown agencies which occasionally induce strongly marked variations, not necessarily of physiological importance, on our domestic animals.

Judging from the habits of savages, and of the majority of the quadrupana, primeval man and his progenitors probably lived in society; and favorable variations would thus act and react upon the individuals and the society. Social life would be immensely favored by the comparative weakness and defencelessness of man and his progenitors; and his social and intellectual qualities, even in their lowest state, would more than compensate for these disadvantages. Even the lowest races thus maintain themselves against climate or wild beasts, while in some warm continents or islands, like Australia or Borneo, no special danger exists.

Comparison of the Mental Powers of Man and the Lower Animals.—The immense difference between the mental powers of the highest ape and the lowest savage has now to be accounted for. Between the highest men of the highest races and the lowest savages, there exist the finest gradations, and no one denies that they might pass and be developed into each other. Similarly, between one of the lowest fishes, as a lamprey or a lancelet, and one of the highest apes, there is a much wider interval in mental power than that between an ape and a man; yet this is filled up by numberless gradations. Nor is there any fundamental difference in mental faculty between man and the lower animals; consequently, numberless gradations are readily conceivable.

As man possesses the same senses as the lower animals, his fundamental intuitions must be the same. Some instincts (see INSTINCT), too, he has in common, as well as all the emotions. Terror, suspicion, courage, and timidity, rage, and revenge, love and jealousy, love of approbation and pride, shame, humor, and magnanimity, are all possessed by the higher animals. Nor are the more intellectual emotions and faculties absent: excitement and ennui, wonder and curiosity are readily to be observed in animals, while imitation, attention, memory, imagination, and even some distinct power of reasoning as certainly exist; as innumerable anecdotes bear witness. Some traces of the highest intellectual powers are present; a dog has some powers of abstraction, of forming general conceptions; it certainly retains its mental individuality, and may probably possess self-consciousness in some incipient form. And it must be remembered, 'how little can the hard-worked wife of a degraded Australian savage, who uses very few abstract words, and cannot count above four, exert her self-consciousness, or reflect on the nature of her own existence.'

The faculty of language is justly considered one of the chief distinctions between man and the lower animals. Yet even here there are gradations, discussed elsewhere (see PHILOLOGY); and the Evolution of Language by Natural Selection is now well

known. That the sense of beauty, in all its elementary forms, is present in animals, is evidenced by their sexual selection and habits.

There is ample evidence to show that numerous races of man are as wholly destitute of all idea of religion as of words to express it; while, on the other hand, the dog regards his master with a reverent submissive, yet hopeful love, which is not easily distinguishable in kind from the religious emotions of humanity. The belief in spiritual agencies naturally follows from other mental powers.

It is the moral sense or conscience which probably affords the best and highest distinction between man and the lower animals; and its origin is accounted for by Darwin on the view, elaborately expounded and supported in chap. iv., 'that any animal whatever, endowed with well-marked social instincts, the parental and filial affections being here included, would inevitably acquire a moral sense or conscience, as soon as its intellectual powers had become as well, or nearly as well developed as in man.'

Development of the Intellectual and Moral Faculties during Primeval and Civilized Times.—Under this head are discussed, the advancement of the intellectual powers through Natural Selection, and their increase and modification by imitation, reason, and experience; the evolution of the social and moral faculties, at first strictly limited to the same tribe, and chiefly stimulated by such external agencies as natural selection, or praise and blame, but increasing in extent and in complexity, and reaching an internal sanction.

The action of natural selection in preserving and advancing favorable variations among savage tribes, and its action upon civilized nations, which have all certainly arisen from barbarism, are also examined in detail.

On the Affinities and Genealogy of Man.—Man holds no more than sub-ordinal rank among the *Primates*, in the Natural System of Classification, which is a genealogical one (see ZOOLOGY, DARWINIAN THEORY), and is most closely related to the anthropomorphous apes, themselves a highly specialized sub-group of the *Catarrhini*, or Old World monkeys. To this stock, therefore, our early progenitors must have belonged. But we must not suppose either that the anthropomorphous progenitor of man was any existing ape, nor that the more remote ancestor of the whole Simian stock, including man, was identical with, or even closely resembled any existing ape or monkey. The great break in the organic chain between man and his nearest allies, which cannot be bridged over by any known extinct or living species, although apparently a very serious objection, is not really of much weight to those who, for general reasons (see DARWINIAN THEORY), believe in the general principle of evolution. For such breaks, and far more striking ones, exist between the orang and its allies, between the elephant, the horse, or the ornithorhynchus, and other mammals; and depend merely upon the number of related forms which have become extinct; while the absence of their fossil remains is explained by the imperfection of the geological record. The lower stages of the genealogy of man must be left for the student of vertebrate morphology in general.

On the Races of Man.—Accepting the ordinary anthropological data (see ETHNOLOGY), Darwin discusses the value or the differences between races from the classificatory point of view, and how they have originated. The question whether mankind consists of one or several species is debated, and shown to be a matter of comparative indifference, since the distinctness of racial type is demonstrated on the one hand, and their unity of origin on the other. On the whole, the term sub-species is preferred. The extinction of old races, and the formation of new, are fully considered.

Sexual Selection in animals is very fully discussed; receiving no less than eleven chapters.

The secondary sexual characters of man are then described. The greater size, strength, courage, and pugnacity and energy of man, as compared with women, seem to have been acquired chiefly through the contests of the males for the possession of the females; while his greater intellectual vigor would be due rather to natural selection. Men acquired beards as a sexual ornament, and women, for the same reason, became comparatively denuded of hair, and so with other characters. In the last chapter the whole argument is recapitulated and summarized; and the monumental work concludes with a brief indication of the applications of the principle of sexual selection to the welfare and progress of society, and with the reflection, that as man has already risen to the very summit of the organic scale he may 'hope for a still higher destiny in the distant future.'

DE'SERET. See U'TAH.

DE'SERT (*desertus*, solitary), a term used to denote any portion of the earth's surface which, from its barrenness, as in the case of the arid plains of Northern Africa and Arabia, or from its rank exuberance, as in the case of the *Silvas* of South America, is unfitted to be the site of great commercial and industrial communi-

ties. Many names, each differing in meaning to some extent, are employed to designate the desert-lands of different countries. The *Desert* proper may be said to signify the vast sandy plains of Africa and Arabia; while the flats extending from the Black Sea on the north, and from Persia on the south, onward across Tibet and Tartary to the north-eastern coasts of Asia, are called *Steppes*; those in the northern division of South America, *Silvas* or desert-forests; those in the other portions of South America, *Llanos* and *Pampas*; and those in North America, *Prairies* or *Savannahs*. All these, though widely differing in individual characteristics, have in common the important physical features of wide extent and uniform general level. The *Oases*, which are occasional spots in the desert where springs arise, and where the waste is enlivened by the presence of vegetation, are usually lower than the general level of the surrounding plain. The great and famous desert-ground, however, is to be found in the Old World. A huge tract of comparatively rainless country stretches almost continuously from the North Atlantic to the shores of the North Pacific, thus forming a great belt of sand from east to west, along the whole extent of the eastern hemisphere. Beginning from Cape Nun on the north-west coast of Africa, the *Great Sahara*, the grand type of all desert-grounds, stretches away eastward from the shores of the Atlantic to the banks of the Nile, its eastern division being frequently called the desert of *Libya*. Crossing the Nile, by the irrigation and inundations of which alone Egypt is preserved from subsiding into the waste condition of the surrounding country, the desert is again found, interposing a strip of hot sand between the right bank of the Nile and the western border of the Red Sea, upon whose shores no rain ever falls. On the right shore of the Red Sea, desert-grounds unvisited by any rains prevail over the greater portion of Arabia, and stretch onward, with occasional interruption, over Persia, Tibet, and the Tartaries. The most extensive desert in the eastern portion of these arid districts is called the Desert of Gobi, which extends from the western extremity of Tibet north-east to the shores of Lake Baikal. The cause of this extraordinary zone of parched land, and of similar smaller tracts in other parts of the world, will be best explained under the head of RAIN.

DESE'RTAS, the general name of three rocky islands in the Atlantic Ocean, situated to the south-east of Madeira, in lat. 32° 31' N., long. 16° 30' W. The southern and largest island is called Bugio; the center one, Deserta Grande; and the northern, Chao. Deserta Grande has a length of six miles, with a breadth of from half a mile to one mile; Chao and Bugio are only about a mile in length—the latter about the same in breadth, but the former not more than a quarter. The D. are not inhabited, but they yield considerable pasturage, and are visited at certain seasons of the year by fishermen and herdsmen.

DESE'RTION FROM THE PUBLIC SERVICE OF THE COUNTRY is the crime of a man absconding, during the period for which he is enlisted, from the service of the army or navy. This crime was, by certain old statutes, made punishable with death; but now the punishment for desertion is prescribed by the Army Discipline and Regulation Act of 1879, sects. 12 to 15. Formerly, any court-martial might inflict a sentence of corporal punishment, not exceeding fifty lashes, for desertion, and might in addition award imprisonment for a prescribed period. By 20 Vict. c. 13, s. 35, and 22 Vict. c. 4, s. 35, it was provided that deserters may be marked on the breast in gunpowder or ink with the letter D. This provision was omitted in the Mutiny Act, 1860. Reenrting deserters before they have joined their regiments, are to be taken to the regiment nearest to the place where they were found, but to suffer no punishment except loss of bounty. Inducing to desert was formerly punishable by death; the punishment has, by modern statutes, been commuted to penal servitude. If simply 'absent without leave,' a British soldier, besides undergoing some kind of punishment, forfeits his regular pay for the days of absence; but if his non-appearance involves actual desertion, he loses all claim to additional pay, good-conduct money, and pension. The number of deserters from the British army is very great. In one particular period of eight months, it was found that no less than 8822 men deserted from the army; in 1874, 7939; and in 1879, 4140. The introduction of the short service system, and improved arrangements for enlisting (see EXLISTMENT), have tended to reduce the number of desertions. In 1881–1882 there were 720 fewer deserters than in the preceding year. Many experienced officers attribute the evil to the temptations of bounty, rather than to any other cause (see BOUNTY).

Desertion is equally a crime when committed by a seaman of the royal navy as by a soldier. A sailor absent from three successive musters is a 'runaway;' and when discovered and brought back, his punishment consists in a deduction of his wages. If his absence is continued, it amounts to desertion. All harboring of deserters by other persons is punishable. The year 1860 was marked by great and scandalous desertions from the royal navy; the cause is very obscurely known, but is generally referred to

some points of superiority in the merchant-service, which tempt the seamen away from their duty.

DESERTION OF SPOUSE. Before the passing of the Divorce and Matrimonial Court Acts, there existed in England no means whereby a wife, wilfully deserted by her husband, could obtain redress. By 20 and 21 Vict. c. 85, and 21 and 22 Vict. c. 108, desertion by either spouse is made a ground of judicial separation; and desertion coupled with adultery, is a ground for dissolution of marriage. The same acts make provision for the protection of property acquired by a wife who has been deserted. In such cases she can go before justices of the peace, who can make a protecting order. Since 1873 the Divorce Court is part of the High Court of Justice.

In Scotland, where the wife deserts the husband, she forfeits her claim to aliment; but in the event of her contracting debt for necessities, the husband will be liable in payment, unless he show that the tradesman was aware of the separation. It is said that she may claim her legal provision of terce on the husband's death, though she have deserted him. A husband deserting his wife, continues liable to aliment her; and she can now obtain a similar protection order to that allowed in England, which has the effect of securing her earnings against the husband should he return. This order, however, can only be obtained in Scotland from the Lord Ordinary, and with greater difficulty and expense than in England, 24 and 25 Vict. c. 86, *Fraser On Domestic Relations*, 458, 680. See DIVORCE; JUDICIAL SEPARATION.

DESERTION OF THE DIET. See DIET, DESERTION OF.

DESI'CCANTS, in Medicine, are substances with astringent properties, which are serviceable in checking secretion and exhalation.

DESICCA'TION is the process of drying by the employment of heat, dry air, or chemical agents which have an affinity for water. Examples of the class of *desiccants* or drying substances are fused chloride of calcium, quicklime, fused carbonate of potash, and oil of vitriol. The latter is employed by being placed in a separate vessel near the substance to be dried, and under a bell jar.

DESI'GN, a preliminary work, either in outline or color, in which the conception of the artist is indicated, and more or less fully expressed. The design ought to exhibit the whole composition and drawing of the work, though the last only in a general way. The design ought thus to be a correct, though not a complete representation of the future work. When colors are employed in a design, it is rather tentatively, and for the purpose of ascertaining what their effect will be, than with a view to actually producing the effect required. A sketch differs from a design, inasmuch as the former is generally applied to a first drawing from an object placed before the artist; the latter, to a first drawing of an object which he has imagined, either wholly, or in the attitude and combinations in which he represents it.

In Architecture, the term is applied to a drawing mathematically correct, but in which the effects to the eye which will ultimately be produced by distance and by light and shade, are altogether ignored. An architectural design is consequently scarcely intelligible on first sight.

Designing on wood for wood-cuts or engravings is now a distinct profession, followed by a class of artists. A design of this kind consists of a drawing in pencil on the wood, the effects being as closely as possible what the printed engraving is intended to represent. See WOOD-ENGRAVING.

DESIGN, GOVERNMENT SCHOOLS OF, the original designation of what are now officially termed 'Schools of Art.' The establishment of Schools of Design had for its object the training of designers and artisans in the principles and practice of the fine arts, with a view to the improvement of the artistic quality of our manufactures, by imparting, where requisite, more symmetry of form, harmonious arrangement of coloring and general appropriateness of decoration. To Scotland is due the credit of having taken the lead in this matter, schools having been established at Edinburgh in 1760, 'for teaching and promoting the art of drawing for the use of manufacturers, especially the drawing of patterns for the linen and woollen manufactures.' In 1837, a Central School of Design was established at Somerset House in London, followed shortly afterwards by about twenty branch schools in important seats of manufacturing industry. These schools were at first placed under the control of the Board of Trade, and the education in art afforded by them was in a great measure restricted to students of the artisan class. This attempt, however, to circumscribe the action of the schools, gradually gave way to the admission of a more mixed element into their rôle of students; but no radical change took place in the management of these schools until 1852. The Great Exhibition of 1851, which brought to light the marked deficiency in the artistic element of British as compared with foreign manufactures, was no doubt the main cause of the subject of national art education being taken up with

renewed vigor. About this time Mr. Henry Cole was made general superintendent, and to him may in great measure be ascribed the complete reorganization of the government scheme for national art education that soon followed. It was grounded on the conviction, that in order to improve the artistic taste of our manufactures, the first step was to elevate the art education of the people at large. For this end it was to be brought into closer alliance with the system of general education. A National Art Training-school for educating art-teachers was instituted at Marlborough House.

The nucleus of an industrial museum was also formed there, the government granting a fund of £5000 for the purchase of specimens of industrial art from the Great Exhibition collection. Such was the comparatively humble origin of the wealthy and magnificent museum now established at South Kensington. From this date a rapid increase took place in the establishment of Schools of Art, which in 1881 numbered 160, situated all over the country. Including, however, the Elementary Day Schools in which children are instructed in drawing by teachers holding art-certificates of the second or third grade, the art-schools have risen from 11,000 in 1852, to 32,000 in 1881. The following summary is abstracted from the *Science and Art Directory* of the Committee of Council on Education, South Kensington.

The Central National Art Training-school for the United Kingdom is established at South Kensington, for educating art masters and mistresses, and for training students in drawing, designing, and modelling according to the requirements of trade and manufactures. A limited number of students are received into training as art-teachers, receiving a maintenance allowance, which is proportioned to their attainments and the certificates of qualifications obtained by them; in return for which they may be required to perform certain duties as teachers, and must engage to accept the situations to which they are recommended.

'National Art Scholarships.—A limited number of duly qualified students from the local Schools of Art, who may have given evidence of special aptitude for designs, are eligible for appointments to national scholarships in the National Art Training-school, with weekly allowance for maintenance: these appointments are for one year only, but in cases of marked proficiency they may be renewed for a second year.

'Aid to Schools of Art, &c.—The Department will aid the instruction given in Schools of Art, when under the direction of a local committee of not less than five well-known responsible persons, and instructed by teachers holding one or more art certificates of the third grade, provided that day classes be held, and that artisan night classes are taught at least three times in each week for two hours. A system of payment on results of teaching is made, on account of persons of the industrial classes, teachers, or their children above twelve years of age, who pay fees for their instruction. In a similar way the Department gives aid to the teaching of drawing in art night classes to artisans, in elementary day schools, and training colleges for teachers.

'Annual Examinations.—At the close of April or beginning of May in each year, a competitive local examination in drawing is held in all the Schools of Art on two consecutive evenings, conducted by means of examination papers supplied by the Department, the subjects given being free-hand and model drawing, practical geometry and linear perspective; certificates and prizes being awarded to the successful competitors. The works of the students from all the Schools of Art are annually transmitted to the Department in April for inspection, prizes being awarded to the most meritorious.

'National Competition.—The best of the more advanced of the above works are selected to compete with each other in this competition, which is annually held at Kensington in the month of May. The prize list for awards in this competition includes 10 gold, 30 silver, and 60 bronze medals. Additional prizes of works of art, books, &c., are also awarded.

'Prizes to Art Masters.—Monetary prizes are awarded annually, to the head-masters of Schools of Art, for the most satisfactory results in teaching.

'Circulation of Books and Examples.—The Art Library and Collections of Decorative Art, &c., at S. Kensington are as far as possible made available for the purposes of instruction in Schools of Art.

'Grants for New Buildings, and purchase of Examples.—In aid of new buildings to be adapted for Schools of Art, a grant not exceeding 2s. 6d. per superficial foot of internal area is made, up to a maximum of 4000 feet. Grants of 75 per cent. are made towards the cost of art examples selected from lists approved by the Department, on behalf of Art Schools, mechanics' and other educational institutions.'

DESIGNS, COPYRIGHT IN. Designs for articles, whether of ornament or utility, are protected by various statutes. Of these, the most important are the Act to consolidate and amend the Laws relating to the Copyright of Designs for ornamenting Articles of

Manufacture, of 1842 (5 and 6 Vict. c. 100), &c., to 24 and 25 Vict. c. 73. By the 21 and 22 Vict. c. 70, the protection which the former had granted for nine months, is extended to three years, to be computed from the time when the design was registered. By section 5, it is provided that the registration of any pattern or portion of an article of manufacture to which a design is applied, instead of, or in lieu of, a copy, drawing, print, specification, or description in writing, shall be sufficient. The copyright is only acquired where there was no previous publication except such as takes place at an exhibition (33 and 34 Vict. c. 27). The other statutes are 6 and 7 Vict. c. 65, 13 and 14 Vict. c. 104, 38 and 39 Vict. c. 93, and 24 and 25 Vict. c. 73. By the last-mentioned statute, the application of the design to articles of manufacture need not be done within the United Kingdom, as was the case under the first act, but the protection of the act applies generally, and whether the inventor or proprietor of the design be a British subject or not.

DE'SIO, a town of N. Italy, province of Milan. It is a well-built town, surrounded with gardens and vineyards, and has a fine hospital. Pop. 5500.

DESIRA'DE, or **DESIDERA'DE**, or **DESEA'DA**, the first of Columbus's discoveries during his second voyage, lies about 4 miles to the east of Guadeloupe, of which, under France, it is a political dependency. It measures 6 miles by 2, and contains (1871) 1637 inhabitants, chiefly emancipated slaves. The surface is elevated in proportion to the area, and the soil, though not generally fertile, is yet said to yield excellent cotton.

DE'SMAN. See **MUSK RAT**.

DESMIDIEÆ, according to the prevalent opinion of naturalists, a tribe or group of *Algae*, and as such ranked by some botanists among *Diatomaceæ* (q. v.); whilst other naturalists regard them as belonging to the animal rather than to the vegetable kingdom, some also esteeming them to be vegetable who maintain the animal character of the true *Diatomaceæ*. They are amongst those lowest organisms which seem to connect the animal and vegetable kingdoms at their common starting-point. The *D.* are readily distinguished from the true *Diatomaceæ* by their rounded—not angular—form, and by their want of silicious covering; also by their color, which is a herbaceous green, whilst the *Diatomaceæ* are generally brownish. Unlike the *Diatomaceæ*, they shrivel up, and lose their form in drying. They are, like them, microscopic, but are usually found in stagnant or very slowly running water, sometimes in brackish, but never in salt water. They may often be procured in great numbers, by pouring the water in which they exist upon a cloth; and if the cloth is kept moist, they will live for a long time, and their progress may be observed. They all exhibit a transverse constriction, sometimes not very distinct, but often almost dividing the single cell which forms the organism into two parts. It is at this constriction that new cells are formed; but this process ceases after a while, and a true reproduction takes place by spores, either through Conjugation (q. v.) or Swarming (q. v.). It is very much on account of these modes of reproduction, and of the presence of starch in the *D.*, that they are confidently referred by naturalists to the vegetable kingdom. See *Ralfs on the British Desmidiæ*.

DESMODIUM GYRANS. See **MOVING PLANT**.

DESMO'NCUS, a genus of palms, with slender stems, climbing over shrubs and trees, like the Rattans (*Calamus*) of the East Indies. They are the only American palms of this character. They have alternate pinnate leaves, with long hooked spines instead of several of the uppermost leaflets, which make them very formidable to those who attempt to penetrate the forests where they grow. The species are pretty numerous, and all American.

DESMOULINS, CAMILLE, one of the prominent personages of the French Revolution, was born in 1762 at Guise, in Picardy; studied law at the Collège Louis-le-Grand, Paris; but on account of a stutter in his speech, did not prosecute the profession. His mind was filled with lofty but confused notions of classical republicanism, which found vent on the eve of the Revolution in his *La Philosophie au Peuple Français* (Par. 1788), and *La France Libre* (Par. 1789).

To his exaggerated denunciation was owing that outburst of popular fury which resulted in the destruction of the Bastille on the night of the 14th July 1789. In the events of the Champ de Mars, August 10, 1792, D., like his friend Danton, took a leading part, but was less implicated in the September massacres. Elected to the National Convention by the people of Paris, he voted for the death of Louis XVI. His relation to Danton, which had always in it something of dependence, induced him to take up the pen against the Girondists, and in his *Histoire des Brissotins*, he covered these moderate republicans with ridicule. In this, however, D. was not quite sincere, for many of the Girondists he highly esteemed, and he was himself by nature much more like Vergniaud and Brissot than like Robespierre and St. Just. When the guillotine was erected, D. saw his error, and bitterly repented

his facile folly. Towards the end of 1793 he began to publish *Le Vieux Cordelier*; a journal which recommended, among other things, that the forms of justice should be restored, and attacked the members of the *Comité de Salut Public*. Twice accused before the Jacobin Club, he was at length, on the night of the 30th March 1794, along with Danton, arrested, and brought before the Revolutionary Tribunal. When asked his age, D. replied: 'J'ai l'âge du sans-culotte, Jésus, c'est-à-dire trente-trois ans, âge fatal aux révolutionnaires.' He was condemned without a hearing, and mounted the scaffold along with Danton, April 5, 1794. His wife, the beautiful Lucile Duplessis, vainly endeavored to excite an insurrection in his favor, and a fortnight after, she also was executed.—D. was essentially an enthusiast and hero-worshiper, always leaning for support on some stronger spirit than his own. His first idol was Mirabeau, after whose death he devoted himself to Danton. His aspirations were noble, his sympathies magnanimous, but he had neither sufficient moral resolution to oppose the political excesses of the popular party, nor even, until the close of his career, sufficient insight to assure him of their injustice and folly. Gifted abundantly by nature, as the light-hearted Camille was, with wit, fancy, and feeling, one cannot help regretting that he did not live in less troublous times, when he might have given to the world, in the form of poesy or fiction, the treasures of his rich and sparkling genius.

DE'SNA, a river of Russia, rises in the government of Smolensk, 50 miles south-east of the town of that name. It flows south-east through the governments of Smolensk and Orel, until it reaches Briansk, where it enters the government of Tchernigov, through which it flows south, then south-west to the town of Tchernigov, and finally joins the Dnieper nearly opposite Kiev. The D. is 500 miles in length, and is navigable throughout almost the whole of its course. Its chief affluents are the Seim, from the left, and from the right, the Snov.

DE'SPOT AND DE'SPOTISM. A despotism is a form of government which has for its object the interests either of an individual or of a class, to the exclusion of those of the whole community. In the former case, it is usually called a tyranny, which is the degenerate form of monarchy; in the latter, it may be either an oligarchy, which is the degenerate form of aristocracy, or an ochlocracy, which is the degenerate form of democracy.

A despot is the individual or class in whose favor and for whose benefit such a government is carried on. A despot may thus include any number of persons, from unity upwards—from a monarch to a mob. Much of the confusion which attends political speculation, and many of the disasters which befall political life in modern times, would be obviated, if these terms were used in the strictly scientific sense which was assigned to them by the Greek politicians more than 2000 years ago. See MONARCH, TYRANT, DICTATOR.

DESSALINES, JAKUES, some time emperor of the island of Hayti (St. Domingo), was imported into that island from the Gold Coast of Africa as a slave. On the liberation of the slaves 4th February 1794, he became one of the most prominent among the negroes who rose in insurrection against the white colonists. After the organization of the insurrection, D. occupied the position of first-lieutenant to the leader Toussaint l'Ouverture; and in the wars against the French troops, was always distinguished by his agility and swiftness of movement, as well as by his fearlessness and ferocity. D. submitted, however, and took advantage of the amnesty granted on the capture of Toussaint in 1802; but shortly after he headed another insurrection, attacked the French forces, defeated them in the battle of St. Mark, and compelled them to evacuate the island in October 1803. He was created governor in January 1804, when the people of the island declared themselves independent, and had himself crowned as Emperor of Hayti, 8th October of the same year, under the name of Jaques I.; but his despotism and cruelty soon alienated from him the sympathy and support even of those who were formerly his firmest adherents. On the 17th of October 1806, D. was attacked and killed by Christophe, a negro chief, who succeeded him as Emperor Henri I. of Hayti.

DE'SSAU, a town of Northern Germany, and capital of the duchy of Anhalt, is situated on the left bank of the Mulde, not far from its junction with the Elbe, about 80 miles by railway south-west of Berlin. The country round the town is pleasant and is very industriously cultivated. D. consists of three parts, the old and new town, and the Sand, and it has besides three suburbs. It is, in general, well built, and one or two of the streets are particularly handsome. Among the principal buildings are the ducal palace, a noble structure, built in 1748, with a picture-gallery, and a library containing many MSS. of Luther; a town-hall, an elegant theater, and several churches and benevolent institutions. Its educational establishments are numerous and excellent. It has a fine cemetery, and the environs are surrounded by beautiful gardens. The manufactures are woollen cloth, hosiery, tobacco, and spirits. Pop. (1880) 23,266.

DE'SUETUDE, a technical term in the law of Scotland, signifying that repeal or revocation of a legal enactment which is effected, not by a subsequent enactment in a contrary sense, but by the establishment of a contrary use, sanctioned by the lapse of time and the consent of the community. The corresponding term in English law is *nonuser*; but neither the word nor the idea attached to it is familiar to that system. The rule in England is, that a statute once formally enacted by the legislature, remains in force, however unsuited it may be to the altered conditions of society, till it be repealed by another statute. The repeal may be by implication, but here the law watches with a jealous eye. Such repeal 'is to be understood,' says Blackstone, 'only when the matter of the later statute is so clearly repugnant that it necessarily implies a negative. As, if a former act says that a juror upon such a trial shall have an estate of twenty pounds a year; and a new statute afterwards that he shall have twenty marks—here the latter statute virtually repeals the former.' So far was this principle carried, that it was formerly the rule, that if a statute repealing another was itself repealed afterwards, the first statute was revived without any formal words for that purpose. But this rule has been changed by 13 and 14 Vict. c. 21, s. 5 and 6, which enact that where any act repealing, in whole or in part, any former act, is itself repealed, such last repeal shall not revive the act or provisions before repealed, unless words be added for that purpose; and that where any act shall be made, repealing in whole or in part any former act, and substituting provisions instead of those repealed, such repealed provisions shall remain in force till those substituted shall come into operation by force of the last made act. In Scotland, an opposite principle prevailed, and it is still held that acts of parliament made before the Union may lose their force by disuse, without any express repeal, or 'go into desuetude,' as it is commonly said. But by desuetude is meant something more than mere non-use for a period of time, however great. There must be contrary use of a positive kind, inconsistent with the statute, and of such a kind as to prove the altered sense of the community; there must, in short, be consuetudinary law in a negative sense; and the so-called desuetude thus amounts to a repeal of statute law by consuetudinary law. Both rules are liable to objections. The result of that followed in England has been, that statutes have remained on the statute-book without formal repeal, after their enforcement had become morally impossible. Of this it may be mentioned, as one single example, that the judicial combat was formally demanded in virtue of an unrepealed statute, and had in point of form to be conceded in the present century. See DUEL. But, since 1869, the English statutes have been weeded of all obsolete and inconsistent enactments, and a new edition has been published by authority, containing only such parts as are in force.

The rule in Scotland is entirely the same as the English as to all statutes made since the union; but as regards the older Scotch statutes, the difficulty still exists in dealing with enactments more or less forgotten or violated, and in determining what constitutes such contrary use as to support the plea of desuetude. The best arrangement is now adopted, whilst retaining the Scottish rule as correct in principle, to endeavor, by purging the statute-book of all obsolete enactments, to render its practical application as limited as possible.

DETA'CHMENT, in military matters, is a small but indefinite number of troops, sent for some special duties away from the regiment, brigade, division, or army, as the case may be. In a fleet, also, a detachment of one or more ships may be told off in a similar way.

DETE'RMINANTS, the name given to a new method of great use, *inter alia*, in the solution of equations embracing several unknown quantities, whereby the student can almost on inspection write down the values, in terms of the known quantities of each of the unknown.

DE'TINUE, in English law, an action for the recovery of goods wrongfully detained, or their value, with damages and costs. The action is for the recovery of a specific article; the goods detained must, therefore, be of such a character that they can be distinguished from others, as a horse, money in a bag, &c. In this respect, the action of detinue differs from an ordinary action at law, and judgment in detinue is accompanied by its special remedy for enforcing execution—called writ of *Distingas*. There must actually be a title of property in the plaintiff at the time he brings his action; but property without possession is sufficient, and an heir can thus bring his action for an heirloom which has never been in his possession. This action was formerly subject to *Wager of Law* (q. v.), now abolished, whereby the defendant was allowed to clear himself by his own oath, supported by that of eleven neighbors. This proceeding rendered the action of detinue so inconvenient, that, by a fiction of law, remedy for wrongful detention was most frequently sought by the action of *Trover* (q. v.).

DE'TMOLD, a town of North-western Germany, on the Werre, capital of the principality of Lippe-Detmold, 47 miles south-west

of Hanover, consists of an old and new town, the latter of which is well built and adorned with public walks and gardens. The chief buildings are the palace, a fine old castellated edifice, the gymnasium, and the theater. D. has also a training-school, a public library, and a hospital. The manufactures are leather, woollens, and linens. There are also several breweries. On the Grotenburg, about 2 m. from D. is a colossal copper statue of Hermann (q. v.). Pop. (1880) 8053.

DETONATION is the phenomenon of combustion with explosive rapidity, accompanied by sound and light. Thus, the firing of gun-powder, gun-cotton, and fulminating-powders as in a percussion-cap, is detonation.

DETRITUS, applied in Geology to accumulations formed by the disintegration of rocks, which consist of gravel, sand, or clay, or of an admixture of them.

DETROIT (French for strait) is that part of the St. Lawrence which discharges Lake St. Clair into Lake Erie. With a south-south-west course, it forms the lowest section of that mighty body of waters before it assumes its north-east direction towards the gulf of its own name. It is about 28 miles long, with a minimum breadth of fully half a mile. Though the middle of its length is barely above the 42d parallel—about 550 miles to the south of any point in England—yet it is frost-bound for about four months in the year. It is navigable for vessels of any burden, the deeper channel being on the Canadian shore.

DETROIT, the chief city of Michigan, the oldest city in the west of the United States, and older than either Baltimore or Philadelphia on the sea-board, was founded by the French of Canada in 1670, as an outpost for the prosecution of the fur-trade, on the right bank of the river of its own name. The settlement of the adjacent wildernesses was at first so slowly carried on, that Michigan continued to be a subordinate territory, as distinguished from a sovereign state, from 1805 to 1837. Accordingly, as late as 1830, D. contained only 2222 inhabitants. But in 1840, the pop. had risen to 9102; (1850) 21,019; (1870) 79,577; (1880) 116,342. D. extends for seven miles along the bank of the Detroit River, which connects Lakes Erie and St. Clair. Throughout six miles of that length, the river side is lined with dry-docks, ship-yards, mills, foundries, and warehouses. The avenues of the city are from 100 to 209 feet wide, and the streets, which are generally shaded by trees, from 50 to 100 feet. In 1875, the assessed value of real estate amounted to 90,000,000 dollars, or £18,000,000. D. has 34 newspapers and periodicals, of which 8 are issued daily. Besides a network of navigable communications, which, with the aid of art, has added the open ocean and the Gulf of Mexico to the St. Lawrence, D. is a center from which 8 railways radiate. Eight lines of street-railway, with 40 miles of track, intersect the city. Among the chief buildings are the City Hall, 200 feet long, and 180 feet high to the top of the tower, completed in 1871 at a cost of 600,000 dollars; the opera-house; and the custom-house. D. has a well-organized system of public schools, and possesses 64 churches, of which the largest is the Roman Catholic cathedral. It is supplied from the river with water, which is forced into a reservoir 50 feet high. The manufactures are extensive and important, consisting of steam-engines, machinery, stoves, cabinet-ware, bricks, tobacco, &c. Brewing and tanning are also largely carried on.

DETTINGEN, a village of Bavaria, circle of Lower Franconia, on the right bank of the Maine; noted as the scene of a battle during the Austrian wars of succession. This conflict, in which George II. of England headed the armies of the allies, while the Duke de Noailles acted as commander of the French forces, took place on the 27th June 1743, and was the last occasion in which a king of England appeared in person on the field. The army of the allies was composed of English, Hanoverians, Hessians, and some troops from the Low Countries, amounting in all to an active force of 37,000 men; while the French leader Noailles had an army of about 60,000. The former occupied a valley extending from Aschaffenburg to Dettingen. Before the fight, Noailles threw 12,000 men into Aschaffenburg, and so made it impossible for his opponents to retreat with safety. The defile of D. in front of the allies was also held by De Grammont with 25,000 men, while Noailles himself, shifting his position on the Maine, so as to command with his batteries the flank and rear of the allies, rendered their position so critical that George resolved to force his way through the enemy. It was his only chance; and fortunately for him, De Grammont rashly and foolishly left his position, rushed over the morass and rivulet in his front, and engaged. At this moment, George, dismounting, placed himself at the head of the British and Hanoverian infantry, flourished his sword, and shouted: 'Now, my boys, for the honor of England! fire; behave well; and the French will soon run!' Shock after shock from the impetuous French horse broke on the steady lines of infantry in vain, and at length George, forming his infantry into one solid

column, advanced. Onward went the column, dense, steady, and overwhelming, breaking the squadrons of De Grammont, and driving horse and foot before them, until the enemy broke into promiscuous and bewildered retreat. Noailles's reserves were too late to be of any use: the allies had won the day. Many of the French were driven into the Maine, and so drowned; some were killed in the pursuit, which, however, was not prosecuted to any great extent. The loss of the French, in killed, wounded, and prisoners, was estimated at 6000, and that of the allies at 2000 men.

DE'TVA, a town in the north-west of Hungary, is situated in a deep valley, 20 miles east of Altsohl. Pop. (31st December 1880) 10,320.

DEUCA'LION, according to the Greek myth, was a son of Prometheus, grandson of Iapetus, and husband of Pyrrha. When Zeus had resolved to destroy the race of men by a flood, D. built and provisioned, by the advice of his father, an ark or ship, which he entered along with his wife. The flood came, and all Hellas was submerged. D. floated about for nine days, and on the subsidence of the waters, the ark rested on Mount Parnassus.

Other versions of the myth, however, make it rest on Mount Othrys in Thessaly, on Mount Athos, or on Mount Etna in Sicily. D. and Pyrrha, according to one account, now offered up sacrifice to Zeus *Phygios*, i. e., Zeus, the protector of fugitives, and prayed that he would repopulate the world, which he did; but the more common tradition was, that they went to the sanctuary of Themis for this purpose, and were told by the goddess that they must throw behind them the bones of their mother as they departed from the temple. Understanding by the 'bones of their mother' the stones of the earth, they obeyed the injunction, and from those thrown by D. sprang up men, and from those by Pyrrha, women. D. built his first dwelling-place at Opus or Cynus. He is also said to have founded the sanctuary of Olympian Jove at Athens, and in later ages his tomb in the vicinity was long pointed out. D. had by Pyrrha several children, Hellen, Amphictyon, Protogeneia, and others. It was at one time extensively believed, even by intelligent scholars, that the myth of D. was a corrupted tradition of the Noachian deluge, but this untenable opinion is now all but universally abandoned. The myth is a comparatively late one, being mentioned neither by Homer nor Hesiod.

DE'US EX MA'CHINA, an expression borrowed from the classical theater. In conformity with the popular mythological beliefs of their age, the tragic poets of Greece, instead of bringing about the dénouement of their plots by natural means, had often recourse to a more expeditious mode—viz., the intervention of a god, who descended in a machine, and abruptly solved whatever difficulty barred the proper termination of the piece. As examples of the *Deus ex Machina*, take the appearance of Hercules in the *Philoctetes*, and of Diana in the *Iphigenia in Tauris*. In modern tragedy, when a person or incident is introduced arbitrarily, forced, as it were, into the conduct of a plot, merely to remedy some inartistic negligence in its construction, or to save the author the labor of further ingenuity, such a contrivance is metaphorically called a *Deus ex Machina*. In modern comedy, the rich old uncle who suddenly comes home from the West Indies, and rescues the young couple (hero and heroine) from their dreadful pecuniary embarrassment, serves exactly the same purpose. When a savant or philosopher cannot explain some fact of nature by any known law, and has recourse to the supposition of the direct and immediate action of God, his assumption is also termed by analogy a *Deus ex Machina*.

DEUTERONOMY (Gr. *Deuteronomion*, i. e., the second law) is the name given by the Septuagint translators to the 5th book of the Pentateuch, because it contains a repetition of the laws which had been already promulgated. It is commonly presumed to have been written by Moses himself, with the exception of the last four chapters, which narrate the closing events in the life of the great lawgiver. Many critics, however, affirm that the entire book itself in its present form is post-Mosaic. The repeated allusions to the kingdom, the prophethood, the temple at Jerusalem, places in Palestine which Moses never saw, and could not have known, as well as various other particulars far too numerous to specify, are held to render it probable that D. is a late recension and enlargement of some Mosaic abridgment of the previous portion of the Pentateuch. Even in regard to the legislation, it differs materially from the Sinaitic code contained in the previous books. There are not only *deviations* from the latter, but also *additions* and *discrepancies*, suggesting another hand. The language, too, has late peculiarities. Ewald, Riehm, Bleek, Davidson, &c., fix the date of its composition about the middle of the 7th c. B.C.—See Davidson's *Introduction to the Old Testament*, vol. i., pp. 341—408.

DEUTSCH, EMANUEL OSCAR, was born, of Jewish parents, at Neisse, in Silesia, in 1829. His education was begun by an uncle,

to whom he owed his mastery of the whole range of Hebrew and Chaldee literature, and was finished at the university of Berlin. In 1855, he came to England to fill an appointment in the National Library; and from this time he was known for his labors in the British Museum, and his efforts to promote the study of the Semitic languages. He is best known to the outside world by his brilliant article on the *Talmud* in the *Quarterly Review*, to which he also furnished an article on *Islam*. He wrote excellent articles on the *Targum* and the *Samaritan Pentateuch* for Dr. Smith's *Dictionary of the Bible*, and was a valuable contributor to the present work, for which he wrote nearly 200 articles. The best monument of his official work in the National Library is to be found in the *Phœnician Inscriptions*, edited by Mr. Vaux, to whom D. rendered most valuable assistance. D. died in 1873 at Alexandria, whither he had gone in the pursuit of health. His engrossing public duties and comparatively short life prevented D. from fulfilling the dream of his life, an elaborate work on the *Talmud*. A volume of his literary remains, with a sketch of his life, was published in 1874.

DEUTZ. See COLOGNE.

DEUTZIA, a genus of shrubs of the natural order *Philadelphaceæ*, natives of the north of India, China, and Japan, some of which are now reckoned among the favorite green-house plants of Britain, in some situations even enduring the open air. They produce abundance of beautiful white flowers. The leaves of *D. scabra* are so rough with siliceous hairs, that they are used by joiners in Japan for polishing wood.

DEUX-PONTS (Ger. *Zweibrücken*), a town of Rhenish Bavaria, picturesquely situated among wooded heights on the Erbach, near its junction with the Serre, 34 miles west-north-west of Landau. D., which owes its name to the two bridges which there cross the Erbach, is well built, and has among its principle buildings a Lutheran cathedral, also the remains of an ancient ducal palace, now used as a Catholic chapel. Its manufactures are woollen and cotton cloth, hardware, leather, and tobacco. Pop. (1880) 10,382.

D., or, in Latin, *Bipontium* (whence the name *Bipontine* given to the edition of Greek and Latin classics here printed by a society of scholars in 1779), is not mentioned in history till 1197, and was then in the possession of Counts of Deux-Ponts. After various changes of masters, it finally came into the possession of Bavaria.

DE'VAPRAYA'GA, a town in India, remarkable chiefly for its situation, stands in the fork of the Alaknunda and the Bhageerettee, whose united waters immediately assume the name of Ganges. It is in lat. 30° 8' N., and long. 78° 39' E., belonging to the protected state of Gurwhal; and its elevation above the point of confluence is 313, and above the sea, 2266 feet. Marking, as it were, the source of the sacred river, D. is a favorite place of pilgrimage for the Hindus; and, in fact, its only permanent population consists of about 7000 Brahmins from the Deccan. In connection with the holy character of the locality, are two ancient temples, a flight of steps in the rock down to the very brink of the mingled streams, and three basins excavated in the solid stone a little below the level of the surface of the current. The town was much shattered by an earthquake in 1803, but was subsequently repaired at the expense of Scindia, the Mahratta chief of Gwalior.

DEVELOPMENT OF DOCTRINE signifies the modifying process through which Christian or philosophical opinion passes in its transmission from age to age. At first comparatively simple in its expression, doctrine has a tendency to become more complicated and technical in structure as argument is exercised upon it, and the spirit of controversy excited. The difference between the doctrinal statements in the Pauline Epistles and the earlier creeds, such as that of Nicea, the elaborate expositions of the medieval theologians, and again of the Protestant theologians of the 16th and 17th centuries, is a difference at once appreciable by the theologian, as it is full of interest to him. There is, beyond doubt, at these several points in the history of the church, a certain growth or extension of Christian opinion called forth by, and corresponding to, the exigencies of the times. This is what is meant by the development of Christian doctrine, and the name denotes with sufficient propriety an unquestioned series of phenomena.

It is true the idea of development in doctrine is one of modern origin, unknown to the earlier dogmatic ages of the church. But this merely proves that it is only in recent times that the history of the church has been reviewed in a critical and philosophical spirit. The idea of development is modern in its application to science altogether, and especially to the science of history. The ground upon which it is vindicated, in its application to Christian doctrine, is, that this doctrine is not a mere repetition of Christian truth in the language of inspiration, but really the rational or argumentative exposition of this truth. It represents this truth as it appears to the Christian reason in different ages. It is the expression of what has been called the *Christian consciousness* working in contact with the text of Scripture.

The Nicene doctrine of the Trinity, for example, is the definite explanation which the Christian reason of the 4th c. gave to the undefined and general expressions of the gospels and epistles as to the relation of the Father and the Son. The doctrine of the atonement, as a *satisfaction* to God for the sins of the world, is first clearly and explicitly unfolded by St. Anselm in the 11th century. It is not meant that the elements of either of these doctrines are not to be found in Scripture, or that they are the product of human ingenuity; it is only affirmed that the scriptural elements in the one case and the other, were first clearly and argumentatively unfolded by the ingenuity of the Christian reason at these different times. The very idea of *doctrine* implies the employment of reason, the exercise of inquiry and argument upon the divine truth of Scripture. It is this truth analyzed and reflectively given forth—not the mere equivalent of Scripture, but something derived from it by Christian investigation and culture. Such a process of investigation and culture is necessarily variable and progressive. The divine fact remaining the same, the human explanation or doctrine of it may and does greatly vary. The course of this variation—the rising and the falling of the human apprehension of the meaning of Scripture—is the development of doctrine.

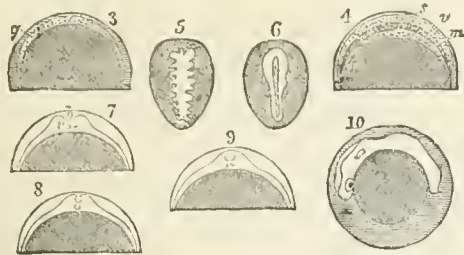
This view is to be distinguished from that which characterizes the extreme subjective school of German theology. According to this school, Christian doctrine is nothing else than the expression of the Christian consciousness at any time. Scripture maintains no permanent or authoritative relation to it. It is all progress—a continued flux, without any normal standard or expression. Scripture may be its primary expression, but it may leave its fountain-head, and in the course of time issue in developments not necessarily bound to Scripture. But according to the view above set forth, Scripture remains the absolute and complete revelation of Christian doctrine, which is continually unfolded, but never exhausted by inquiry—beyond which right reason and truth never travel. The Christian revelation not only admits of, but demands constant criticism, as the means of unfolding more comprehensively and perfectly its contents, but it remains in itself the consummate expression of all spiritual truth; and it is this very peculiarity of the Christian revelation, that makes its contents capable of continual and ever fresh development. It is just because its substance is divine, that its doctrinal expressions never cease to interest and to answer to the necessities of successive times. Other religions, while capable of development, reach a point where they cease to have any further living meaning, and pass on the one hand into mere popular mythology, or into an esoteric priestly tradition. They become transmuted into poetry or some ordinary product of philosophical speculation. Civilization overtakes and supplants them. But it is of the distinguishing divine character of Christianity that its doctrines possess a vital ever-renewing power, capable of adaptation to the highest forms of human civilization, and full of enlightenment and guidance to the most advanced intelligence. The development of Christian doctrine, therefore, is not merely a subject of curious and important study in the past, but of great and significant influence for the present and the future.

DEVELOPMENT OF THE EMBRYO. Harvey laid down the principle, in opposition to the views of those who believed in the doctrine of spontaneous generation, that all animals are produced from eggs (*omne vivum ex ovo*); and more recent researches have fully confirmed this view, if we are allowed to except the modes of reproduction known as *gemmiparous* and *fissiparous*, or multiplication by buds and propagation by division, and the series of cases in which the offspring never resemble their parents, but the original form reappears in the second generation, and which are consequently said to present the phenomena of *alternate generation*. These exceptional cases occur only in very low forms of animal life, and, as a general rule, in retracing the phases of animal life, we arrive at an epoch in which the incipient animal is enclosed within an egg. It is then termed an *embryo*; and the modifications which this embryo undergoes before the young animal has an independent existence, are included in the general term which stands at the head of this article. Before embryology was properly studied, all animals were arranged under two great heads—the *oviparous*, which lay eggs; and the *viviparous*, which bring forth their young alive. We now know that viviparous as well as oviparous animals are produced from eggs—the only difference in this respect being, that their eggs, instead of being laid before the development of the embryo, begin to undergo their early changes in the body of the mother.

The egg has generally a more or less spherical form; the eggs of birds have, however, the form of an elongated spheroid, narrow at one end, and hence the origin of the word *oval*. Some eggs, as for instance, those of certain insects (e. g., the *podurella*), are furnished with projecting filaments; others have a sculptured surface; and others, again, have peculiar forms, being cylindrical or prismatic. A simple sphere is, however, the normal form.

fluid from which the brain and spinal cord are subsequently formed.

The primitive stripe is gradually developed into a cartilaginous structure, termed the *chorda dorsalis*, which is the representative of the back-bone. In the meantime, the margin of the germ continues to extend over the surface of the yolk, until at length the latter is entirely enclosed in a cavity thus formed by the germ. In

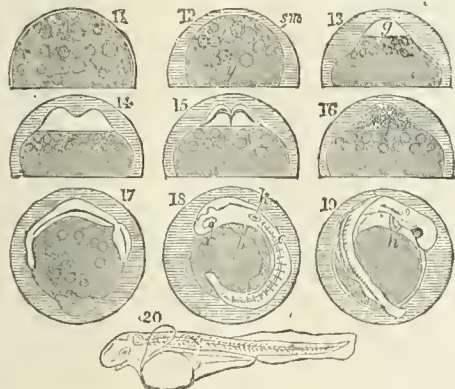


Figs. 3-10t

this lower cavity, the intestines and other organs of vegetative life are subsequently developed.

In all classes of the animal kingdom, the embryo rests upon the yolk, and covers it like a cap; but the direction by which its edges approach each other and unite to form the lower cavity, is very different in different kinds of animals, and is highly distinctive in reference to zoological classification. In all the vertebrata, the embryo lies with its face or ventral surface towards the yolk (fig. 10), and thus the suture or line at which the edges of the germ unite to enclose the yolk, and which in mammals forms the navel, lies in front. Another suture is found along the back, arising from the folding together of the upper surfaces of the germ, to form the dorsal canal. In the affection known as *spina bifida*, this suture is incomplete. In the articulates, the embryo lies with its back upon the yolk; in the cephalopoda, the yolk communicates, as in the vertebrata, with the ventral surface of the body, but no dorsal canal is formed in them; and in the other departments of animal life, we find special and characteristic relations between the embryo and the yolk.

The development of the embryo of vertebrated animals is best



Figs. 11-20.

observed in the eggs of fishes, as from their transparency they do not require to be cut open; and with due care the whole series of embryonic changes may be observed upon the same individual, and the succession of appearances of the different organs may be ascertained. Professor Agassiz has carefully examined and depicted the principal phases of development in the white-fish, which belongs to the salmon family, and we shall endeavor to give his chief results. The following magnified sections, copied from his plates, will show the period at which the different organs successively appear. The egg when laid (fig. 11) is spherical, about the size of a small pea, and nearly transparent. It contains no albumen, and the shell-membrane and the membrane of the yolk seem fused into one. In a few hours after it has been laid, provided it has come in contact with the fecundating fluid of the male, a separation between these two membranes takes place, in consequence of the absorption of water (fig. 12), by which the size of the egg is increased. Between the shell-membrane, *sm*, and the yolk, *y*, there is now a considerable transparent space, corresponding in position to the albumen of birds' eggs.

Oil globules are scattered through the yolk, but soon arrange themselves in a stratum or disc towards the upper part, where a swelling, in the shape of a transparent vesicle (fig. 13, *g*), begins to show itself. It is composed of very delicate and minute cells,

and is the germ in its earliest stage. As the germ increases, and has a larger surface in contact with the yolk, we notice a depression on its upper part (fig. 14), and soon after a second furrow appears at right angles to the former, so that the germ now presents four elevations, as we have attempted to show in fig. 15. A continuous subdivision of this nature goes on during the second and third days, until the germ is divided into numerous minute spheres, which form what is termed the mulberry mass (fig. 16). This appearance, however, does not long continue; at the end of the third day, the fissures disappear, and the germ continues to extend as an envelope around the yolk, which it at last entirely encloses.

On the tenth day, the first outlines of the embryo begin to appear, and we soon distinguish in it a depression between two little ridges, whose edges approach till they form a canal (see fig. 8). At about the same time, an enlargement at one end of the furrow is observed, which is the rudimentary head (fig. 17), in which may soon be distinguished traces of the division of the brain corresponding to the organs of sight, hearing, and smell.

Towards the thirteenth day, we see a transparent cartilaginous cord (the *chorda dorsalis*) in the position afterwards occupied by the back-bone, composed of large cells, in which transverse divisions are forming (fig. 18, *c*). In some fishes, as the sturgeon, this cartilaginous or embryonic state is persistent through life, and no true osseous vertebral column is ever formed. The rudiments of the eye soon appear in the form of a fold in the external membrane of the germ, in which the crystalline lens (fig. 18, *x*) is afterwards formed. At the same time we see at the posterior part of the head an elliptical vesicle, *k*, which is the rudimentary ear. At this period, the distinction between the upper (serous) and lower (mucous) layers of the germ is best traced; all the changes which have been mentioned occurring in the upper layer.

At or soon after the seventeenth day, the lower (or mucous) layer separates into two laminae, the inferior of which becomes the intestine. The heart at about the same time appears in the form of a simple cavity (fig. 18, *h*) in the midst of a mass of cells belonging to the middle or vascular layer. As soon as the cavity of the heart is closed in (fig. 19, *h*), regular motions of contraction and expansion are observed, and the movement of blood-corpuscles within it is seen.

It is not till the thirtieth day that any traces of a circulation of the blood are manifested; we then notice two currents, one running towards the head, and the other towards the trunk (fig. 19), with corresponding returning currents. The traces of the liver are now seen. The embryo begins to liberate itself at both extremities from the yolk, the tail first becoming free, and moving in violent jerks.

The embryo, although still enclosed in the egg-membranes, now unites all the essential conditions for the exercise of the functions of animal life: it has a brain, an intestine, a pulsating heart, and circulating blood, and a limited amount of spontaneous motion; but the forms of the organs are still incomplete, nor have they acquired the precise shape characterizing the class to which it belongs. The embryo is as yet only a vertebrate animal in general, and might be taken for that of a frog as well as for that of a fish.

Towards the close of the embryonic period, after the fortieth day, the embryo acquires a more definite shape: the jaws protrude; the nostrils approach the end of the snout; divisions are observed in the fin-like structure which surrounds the body; the anterior extremities, which were mere knobs, become rudimentary pectoral fins; and, finally, the gill-openings appear, so that the fish-type is now obvious. In this state, the young white-fish escapes from the egg about the sixtieth day after it is laid (fig. 20); but its development is still incomplete. We cannot yet tell to what genus the fish belongs. The gill-covers are not yet formed, there are no teeth, the mouth is below instead of at the most projecting part of the head, and the fins have no rays. The remainder of the yolk is suspended from the belly in the form of a bladder, but it daily diminishes in size, till it is at length completely absorbed by the animal. The duration of these changes varies extremely in different fishes; some accomplish them in a few days, while in others, months are required.

In frogs and all the naked reptiles, the development is very similar to that of fishes; in the scaly reptiles (snakes, lizards, turtles), and in birds, there are peculiar membranes surrounding and protecting the embryo during its growth, termed the allantois and the amnios; and in mammals there are additional complications of structure, which it would be impossible to describe clearly without occupying more space than could be allotted to a subject of this nature. For further information on this subject, we may refer to the various writings of Agassiz, especially his *Lectures on Comparative Embryology*, and his *Comparative Physiology*, from which this article is mainly drawn, and to Carpenter's *Comparative Physiology*.

DEVELOPMENT, IN PHOTOGRAPHY, the process which immediately follows exposure, and which renders the picture visible in all its details. It consists in the precipitation or deposition
Chambers' Cyclopedia. Vol. III.—6.

of *new material* on that portion of the sensitive surface which has been acted on by light; the same principle therefore prevails in all processes. This may be made clearer by reference to a few examples. In the Daguerreotype process (q. v.), an iodized silver plate, after exposure in the camera, is exposed to the vapor of mercury; the vapor adheres to those portions of the plate which have undergone a peculiar molecular change from the action of light, but not to those parts unacted on. The lights of the picture are therefore 'developed,' or 'brought out,' by the acquisition of *new material*, i. e., mercury. A collodion negative is similarly 'brought out' by the precipitation, by means of a de-oxidizing agent, such as pyrogallie acid, or proto-sulphate of iron, on the *actinized* portion of the plate, of *new material*, composed of metallic silver and organic matter. A similar change takes place in the Chrysotype Process (q. v.), where the metallic salt with which the paper is impregnated is reduced to a state of proto-salt, which reacts through the decomposition of water, and causes the precipitation of *new material*, in the form of finely divided metallic gold on the parts where light has acted. Other processes might be cited, but these are deemed sufficient to illustrate the principle stated above.

DEVELOPMENT THE'ORY. See SPECIES; DARWINIAN THEORY.

DEVENTER, a thriving town of Holland, in the province of Overijssel, situated on the Yssel. Tower-flanked walls surround D., which is further defended by a broad, deep ditch. The streets are narrow, but the market-places spacious. The principal buildings are the cathedral—a structure in the early Gothic style—the town-house, the court-house, and prison. From the ramparts, which are used as a promenade, there is a commanding prospect. The industry of D. consists in iron-founding, the manufacture of carpets, stockings, &c. Its gingerbread (called *Deventer Koek*) is celebrated throughout Holland, and many thousand pounds are exported annually. There is a large trade in grain, butter, beer, firewood, &c. Pop. (1880) 19,162.

DEVILCE—from the middle-age Lat. *divisa*, a drawing or design—is a motto expressed by means of a pictorial emblem. The motto proper originated in the emblem, a written inscription coming to be added to the pictorial design, with the view of rendering the meaning more explicit. Devices thus consist of two parts—a pictorial figure called the 'body,' and a motto in words called the 'soul' of the device. As early as the times of Æschylus, the 'Seven heroes before Thebes' all appear with devices on their shields; and the same is related by Xenophon of the Lacedæmonians and Sicyonians. In the middle ages, devices on coat-armor came into regular and formal use, and chivalry employed them in its courtly expressions of devotion to the fair sex. They were used both as charges on the shield and as crests.

The only respect in which the device differs from other heraldic emblems is, that it has always some specific reference to the history, or circumstances, or position of the bearer. As an example: Louis XIII. of France had a falcon as a device, with these words: '*Aquila generosior ales*' ('A more generous bird than the eagle'), by which he meant to denote his own superiority to the Emperor, whose device was an eagle. Devices, moreover, were generally borne only by the individual who assumed them, and not by the other members of his family or his descendants, like the crest or cognizance. They were often contrived to typify a special enterprise, the general character of the wearer, or even to designate his name—as the *mulberry* trees in the embroidered trappings of the horse of Thomas Mowbray, Duke of Norfolk. On all festal occasions they figured on triumphal arches, on banners and hangings. At a later period, it became customary to work devices into buildings; friezes and stained windows were often covered with them. This practice has recently much gone out, at least in its original form. See Radowitz's *Die Devisen und Motto des spätern Mittelalters* (Stutt. 1850).

DEVIL, or SA'TAN (Gr. *diabolos*, 'false accuser'; Heb. *satan*, 'adversary'), designates in the Old and New Testament a mighty spirit of evil who has, during unknown ages ruled over a kingdom of evil spirits, and is in constant and restlessly active opposition to God. This belief, however, was very gradually developed in the Jewish mind; and it is beyond all question, that it acquired clearness and prominence through extra-national influences. In England, the 'doctrine of Satan' has hardly received any critical treatment at the hands of scholars; but in Germany, the subject has been most learnedly investigated. The conclusions at which some of the profoundest biblical scholars of the continent have arrived, and even the principles on which they proceed, may be rejected by us, but a brief account of their method of historical analysis may be neither uninteresting nor unimportant. The older Hebrews, it is said, who lived before the Babylonish captivity—judging from the silence of Scripture—knew nothing, and certainly taught nothing, of evil spirits in the later sense; i. e., of beings separated from God, who were evil in the essence of their nature, and worked evil only. Moral evil was rather looked upon

as properly the act of man; physical evil, or adversity, on the other hand, as punishment merited through sin, and inflicted by a just and holy God, who was thus necessarily conceived as the true source of all calamity. The angels who foretold God's purposes, and executed his will, however great might be the physical evil they occasioned, are never accused of moral evil. Even in the Mosaic account of the seduction of Eve, there is nothing to induce us to believe that the author regarded the serpent other than 'the most subtle of all the beasts of the field,' or that he meant to conceal under so plain a statement an allusion to Satan.

It is probable, however, that at some early period in their history, the popular faith of the Jews, partly divorcing itself from its grand religious conceptions of the 'one living and true God,' and lapsing—as has everywhere been the case with the popular faith—into petty superstitions, had become familiar with the idea of certain fearful unearthly beings haunting wildernesses, similar to the fauns and satyrs of Greece, who might form the connecting-link in the latter development of an actual demonism. Traces of this are clearly visible in the Pentateuch. The Hebrew word *seirim*, occurring in Leviticus xvii. 7, which our translators have rendered 'devils,' means only 'hairy ones.' Now, the Egyptians worshipped the *he-goat*, and the Hebrews partook, as we know, of their idolatry. Therefore Moses in this verse, forbidding them to commit this sin in future, says: 'They shall no more offer their sacrifices to *seirim*;' i. e., to the Egyptian he-goats. The development of demonism was materially furthered during and after the Babylonish captivity by Medo-Persian influences. In those canonical books of the Old Testament which belong in their present form, to the post-exilic period—i. e., the period subsequent to the exile—the Jewish conceptions of angels become more definite. They possess different ranks, names, and specific offices. They are the tutelary guardians and helpers of particular lands and peoples, but are everywhere in absolute dependence on God. And now we meet also, for the first time, with an angel called *Satan*, who, however, still figures as a minister of God, and along with the others appears in heaven before the throne of Jehovah, but with the function assigned to him of accuser and seducer. It is he who—1 Chron. xxi. 1 (*Chronicles*), it should be mentioned is considered by most critics, both orthodox and heterodox, to be the composition of Ezra, and therefore *post-exilic*)—stirs up David to number the people; while in the older Hebrew version (2 Sam. xxiv. 1) the same act is attributed to an angry God, the conception of Satan not then having clearly, if at all, presented itself to the Hebrew mind. It is Satan also who throws suspicion on the piety of Job, and with the permission of Jehovah, causes a series of misfortunes to befall him; while in Zachariah iii. 1, he is represented as 'resisting' the angel of God, and as a false accuser of the high-priest Joshua. As yet, however, an evil nature is not expressly ascribed to him, but, what is much the same, it is assumed that he takes a pleasure in active evil. It is a purely arbitrary and untextual interpretation of Isaiah xiv. 12 ('How art thou fallen from heaven, O Lucifer, son of the morning!') that would force these words to refer to the fall of the D., or determine from them his name.

In the Apocrypha, of which only a small part is Palestinian, the rest being either Chaldaico-Persian (as, for example, *Tobias* and *Baruch*) or Egyptian-Alexandrian (as, for example, *Wisdom*) in its origin, the older Hebrew doctrine of misfortune coming from the angel of Jehovah is, so to speak, dismembered, and demons or evil spirits, in the New-Testament sense of the term (*pneumata ponera*), are for the first time mentioned (and in *Tobias* and *Baruch* frequently) as the authors of calamities. According to the representations of these writings, the evil spirits dwell, like the older Hebrew hobgoblins, in waste places, but associate themselves for the injury or destruction of men, enter into them as tormentors, and can be expelled only by magical or mysterious means. To this class of beings the heathen deities were reckoned to belong. But even here there is no mention of an organization or kingdom, or prince of demons. The first trace of a *Diabolos* or D. proper (and one in all probability springing from a foreign source) shows itself in the Book of *Wisdom* (ii. 24), in relation to the seduction of Eve, where it is said that through the D. the necessity of death has come into the world.

In the period elapsing between the close of the Apocrypha and the appearance of Jesus, the Jewish ideas of angels, as well as of demons and the D., received an extensive development. This angelology and demonology, wholly foreign to the older Hebrew religion, was derived in all its essential characteristics from the system of Zoroaster, with which the Jews had become familiar by their long and close intercourse with the Persian empire during the exile, and subsequently. It was, however, impossible to transfer the *dualism* of Zoroaster into a creed so purely *monotheistic* as that of the Jews; this would have destroyed the foundation on which their entire history rested. Two beings, equally eternal, equally powerful, was an idea which no Hebrew—mindful of the glorious deliverance of his forefathers out of the land of Egypt, of the law given amidst the thunders of Sinai, of the manna in the wilderness, of the triumphs in Canaan, and the golden psalms of

David—could for one moment entertain. But, on the other hand, now that as a nation the Jews were become weak and of little account, hemmed in, and crushed by mighty and advancing empires, no conception could seem more true, or prove more consolatory, than that which permitted them to attribute their misfortunes to the agency of a demoniacal race, headed by a potentate only inferior to Jehovah himself. They could now believe that God had not forsaken his 'chosen people.' Thus, the dualism of Zoroaster suggested the kingdom and royalty of Satan, but the doctrine shaped itself in harmony with the national monotheism. The D. and his demons were represented as having been originally *angels*, who had fallen from their 'high estate,' been punished by God, and had therefore assumed a position of hostility, without, however, being able to materially frustrate the divine purposes.

These opinions found an almost universal reception among the people, as well as among those Jewish theologians who, along with the Mosaic Law, held oral tradition to be an authentic source of religious doctrine. Indeed, the only Jewish sect which rejected them, was that of the Sadducees, who considered them, as also the doctrines of the Resurrection from the Dead, of the Messiah, of the Messianic kingdom, of the Last Judgment, of rewards and punishments, and of angels and demons, to be new, outlandish anti-Mosaic myths and theories. This conflict of opinion among the Jews prevented their ideas of D. and demons from obtaining, in spite of their broad diffusion, a dogmatic and systematic stability. The populace and the Pharisees believed fervidly in the existence of such evil spirits; but their conceptions had not only all the heat, but all the confusedness of superstition.

In this condition were the Jews when the New Testament lifts up the veil of oblivion that had partially dropped on the face of the nation more than two centuries before, and the light of history again falls brightly on its features. We now find a swarm of demons in Palestine. These unclean spirits, however, can be exorcised. When expelled from the soul of the demoniac, their proper home is 'the abyss' (*Eis ten abussos*, Luke viii. 31). According to the popular conceptions, therefore, we must suppose their dwelling to be a dark subterranean region, although, like the demons of the Old Testament, they inhabit also the earth and the air. They were not, as the Greeks and Josephus thought, the evil spirits of dead men, but had angelic natures (see Matt. xxv. 41), and formed a society governed by a chief, called Satan, Devil, Beelzebub, Belial, &c. He is now firmly seated in the popular imagination as a fallen angel; but as yet there is no hint of his having seduced his followers from their allegiance to Jehovah, or of their having fallen at the same time. This idea first appears in the book of Revelation, chap. xii., where mention is made of a great war in heaven between Michael and his angels on the one hand, and the D. and his angels on the other. 'And the great dragon was cast out,' says the writer, 'that old serpent, called the Devil, and Satan, which deceiveth the whole world: he was cast out into the earth, and his angels were cast out with him.' Whether or not these popular conceptions of the D. and his influence were materially or spiritually interpreted by Christ himself, it is impossible to say. He may either have accommodated his language to suit the popular mode of realizing the Power of Evil (a supposition which involves nothing unworthy of his sinless character), or (for this is the only other hypothesis compatible with a belief in his divinity) he may have intended to recognize the essential truth of that doctrine of an evil personality which the Jews derived from, or, at all events, developed under the inspiration of Zoroastrian ideas.

But whether Christ meant to accommodate his language to the popular conceptions or not, the primitive church assumed the personality of the D. as an unquestionable fact. The New Testament ideas on this point were not only greatly enlarged, but in many respects entirely changed, partly through the introduction of a considerable number of heathen notions, and partly through the dogmatic tendencies of the time, in consequence of which the various statements in the Bible regarding Satan and evil were *uncritically* and *unhistorically* heaped together, and a doctrine of Satanic agency elaborated *logically* but not *theologically*. Holding firmly to the belief of a Satanic kingdom of darkness opposed to Christ's kingdom of light, the majority of the early Christians ascribed all evil, physical as well as moral, to the D. and his demons; failures of the crop, sterility, pestilence, murrain among cattle, mental maladies, persecutions of the Christians, individual vices, heresies, astrology, philosophy, and especially the whole body of heathenism, with its mythology and religious worship. The heathen gods were believed to be conquered by the work of Christ, but not to be wholly powerless; they sank down into demons, and so a part of their mythology passed into the doctrine of the Devil. It was they who, as demons, meaning to deceive, uttered oracles, were present at sacrifices, and inhaled the sacrificial incense, whereby the notion gained ground that the demon-nature was ever growing more and more sensual and materialized—a notion that reacted again on the conception of hell,

which soon began to be painted in coarse earthly colors, bazing, with eternal fire, through which blackened devils and scorched souls flitted in endless torment. From the gross materialism that now vitiated all conceptions of the D. and of demons, sprang the loathsome belief, common enough in the early church fathers, but during the middle ages exhibiting itself only in the superstitions of the vulgar—viz., of the carnal intercourse of devils with women. See WITCHCRAFT.

Concerning the fall of the 'devil and his angels,' opinions were long diverse. Some supposed that it occurred through envy; others, through pride; and others, again, through concupiscence and excess; some placed it before, and others after the seduction of Eve by the serpent. Several of the Fathers (for example, Augustine) believed that man was created to fill up the gap which had been caused in the kingdom of Christ through the apostasy of Satan and those whom he had led astray. Meanwhile, the idea of the importance of the death of Jesus had been dogmatically elaborated. At first, Christians saw in that death a sacrifice, and in his blood a propitiatory power; but soon after, their thoughts reverted to the other scriptural representation of an actual victory over the D., a restoration of the Divine image in man, and the source and condition of holiness; whence was developed a very wonderful dogma concerning the devil. God having declared that whoever should transgress his law, should incur death and damnation; and man having done so, God's justice and veracity compelled him to keep his word.

But inasmuch as Eve was beguiled into transgression, and fell as it were unwittingly, it did not seem for the honor or good of the Deity that rational beings, partakers also of his own spirit, should be lost through a trick of the Fiend; wherefore Jesus offered himself to the D. as a ransom for the souls of men. The D., thinking 'the man Christ Jesus' of more value than all the rest of the race put together, closed the bargain immediately. But deceived in his turn by the 'appearance of flesh,' he did not recognize the Deity concealed beneath it; and not being able to retain the latter (shrinking from it, in fact, horrified and dismayed), he lost *both*—Christ and man. The D. was, however, *actually* deprived only of Christians; in all other men he dwelt and ruled through the force of original sin. In consequence of this, he was formally 'banished' (until the 3d c.), not only from 'demoniacs,' but also from all converts from Judaism and heathenism to Christianity; and when the practice of baptism had shaped itself into the dogma, that it was 'a necessary preliminary to holiness,' exorcism, or 'driving out the devil,' became a Christian 'art,' exercised on all new-born children. Those who died unbaptized, were (by that ruthless logic that frequently marks a barbarous theology) sent to hell; for although *potentially* Christ's, the church had not yet rescued them from their satanic master, by the appointed rite, and so the conditions being unfulfilled, the D. carried off his prey. Yet the heart of humanity, stronger in its simple instincts than the most iron creed ever hammered out of the human brain, showed its holy presence even in so fearful a dogma; and although it could not deliver the lost infants from the region of eternal fire, it assigned them less painful pangs, and a less dreadful dwelling-place. But while the power of the D. over all not guarded by Christian faith and rites, was supreme; over those who were so guarded, it was utterly weak. No Christian, not even the weakest, could be *forced* by him to do evil. Thus far had the 'doctrine of the devil' been developed at the 8th c., and at this point it has essentially remained in the Eastern or Greek Church; but in the Western, it took yet another development. This was mainly occasioned by the writings of Pope Gregory the Great, who partly took up the popular notions himself, infused into them other then prevalent theological opinions, and elevated the result of the incongruous mixture to the dignity of church doctrine. He calls the D. 'a stupid beast,' because he hopes for heaven, without being able to reach it, and entangles himself in his own net; but on the other hand, he admits him to have a *potentia sublimitatis*, and utters the profound idea that he cannot comprehend our thoughts. In these three notions lie the essential germs of the Germanic Faust-devil. The old German and Norse mythologies poured a flood of heathen fancies into the 'doctrine of the Devil.' Even Ulfilas, at a much earlier period, had translated the New Testament word *daimon*, or *daimonion*, by *unhulthó*, i. e., she-devil, or sorceress, because the old Germans believed in *female* demons, while the Christian *usus loquendi* contains no trace of such.

The peculiarly German conception of a now malignant, now gentle *female* devil, lives to this day in the German phrase, 'The devil is beating his mother' (when rain and sunshine quickly alternate). In England and Scotland, too, the phrase is, or recently was current, 'The devil and his dam.' The Germans have also the proverb, 'Where the devil cannot come, there he sends his grandmother.' Soon, however, the word *diabolus*, in violation of the New Testament distinction between it and *daimon*, came to signify devils of every or any sort. The Gothic form of the word was *diabolus*, *diabailus*; old Saxon, *diubul*, *diubhal*, *diabol*; old High German, *diufal*, *tiaval*, *tiubil*, &c. The dwelling

of the D. was, of course, hell, which however, according to old Germanic and Scandinavian notions, was placed in the dreary regions of the north. Although his mischievous powers are to be pretty well controlled till the coming of Antichrist, when he expects to hold carnival, yet, like the ancient gods and demons, he occasionally appears on the earth. He then assumes at times a purely human form, but, like Vulcan, who was thrown down from heaven like himself, and the smith Wieland, of German mythology, he is somewhat lame. He is covered with a gray, green, or red cloak, like the Kobolds (q. v.) and Dwarfs (q. v.), (the earth and house spirits of the suppressed heathenism): sometimes, also, he appears black and sooty, as befits his dwelling-place, and his opposition to a pure God. But as the old deities, both classical and German, possessed the power of transformation to a most remarkable degree, the D., through his relationship with these, inherited this power when they vanished from the scene. The form he most frequently assumed was that of an animal, approximating, in this respect, to the German forest-spirits and the Greek satyrs and fawns. At one time, he shows the foot of a horse or goat, with horns and tail; at another, he appears as a black horse, a he-goat, a hog, a wolf, a hell-hound, a raven, a serpent, a worm, a dragon, or a fly. The conception of the power of the D. was vastly enlarged by the influx of these new fancies. In fact, it rose almost to a new dualism; but, on the other hand, also, many mild and friendly traits of the heathen gods passed over into the popular conception of the D., and gave to his nature a quite new, humorous, and even merry side. As, after the introduction of Christianity, offerings were still occasionally made to the old gods, the D. shared in these honors. A horse, a he-goat, or a hound was at times sacrificed to him; and to the present day the expression has survived, 'To kindle a fire for the devil'—obviously an allusion to altar-flames. Various features of the old Norse gods, especially of Loki and Donar (Thor), the gods of fire and thunder, were also transferred to him. Hence the still current phrases in Germany, when thunder is heard: 'The devil must be striking,' and 'The runaway goose is gone to the devil.' (Donner, 'thunder,' is the word used for devil in this case.)

Every power, too, which, according to the older heathen belief, was lodged in the lesser demons, giants, &c., had now its proper center in the great Fiend himself, who could perform all the pranks attributed to the more grotesque creations of the Norse mythology, and work all the evil of the more malignant spirits; but, in general, these beings were rather pressed into his service than absorbed by him, or incarnated in his person.

So did this great, originally Persico-Judaic belief spread itself through all Christian lands, incorporating with itself, first, the kindred conceptions of the ancient classical world, and, ultimately, the rich and varied superstitions of our Teutonic and Scandinavian forefathers. Thus decked out in the costume of many different climes and ages, the Image of Evil passed into the light of the modern world. Every step forward that it now took robbed it of some potent spell that used to chill the blood and strike the heart with awful horror. Men first lost faith in the D.'s occasional incarnation; then medical science destroyed his claims to the origination of mental phenomena, which he was once supposed to have directly caused; natural science deprived him of his control over the elements; historical criticism plucked from him his borrowed feathers; while metaphysics and a deeper religious exegesis have combined, not, perhaps, to annihilate his personality or deny his influence, but certainly to realize the former under a more spiritual form, and to limit the latter by a reverential belief in the wisdom and goodness of God. See Mayer's *Historia Diaboli* (1780), Horst's *Demonomachie* (1817) and *Zauberbibliothek* (1826), and Grimm's *Deutsche Mythologie* (2 edit. 1844); also Moncreux Conway's *Demonology and Devil Lore* (1878).

At the outset of this article, it was stated that the 'doctrine of the devil' had received little critical treatment from English scholars. The following appears to be the prevalent mode of regarding the subject in this country. The doctrine of the existence of a personal D., the chief of evil spirits, and directly or indirectly the author of at least all moral evil, is maintained by reference to the Bible, regarded as containing one revelation of truth harmonious in all its parts, and gradually developed. The Scriptures of the Old and New Testaments being thus regarded, and the supposition of conflict between the doctrines of their different books, or of error in any of them being rejected as inconsistent with a full recognition of their inspiration and divine authority, the doctrine in question is unavoidably deduced from them. It is assumed to appear in the narrative of the Fall in Genesis, and the name *serpent* is again applied to the D. in the book of Revelation, where he is described as 'that old serpent . . . which deceiveth the whole world' (Rev. xii. 9); he is believed to be repeatedly mentioned in the Old Testament. The hypothesis of an extra-national origination and development of the idea of the D. would, of course, be repudiated, and orthodox divines would consider it more probable that the Persians borrowed from the Jews than that the Jews borrowed from the Persians.

The mention of the D. in the New Testament is held to be conclusive, not only of his existence, but of the belief in that existence (even when not expressed or hinted at) among the older Jews. The warnings and exhortations addressed to Christians are, it is also said, framed on the supposition of dangers arising from his violence, power, and subtlety. It is further argued, that the principal objections urged against the doctrine of the existence of a D. are substantially the same which present themselves to the mind as difficulties when we speculate on that which, however, is so undeniable—the existence of moral evil.

DEVIL'S DUST, the name sarcastically given to old woollen materials manufactured into some variety of cloth. See SHODDY.

DEVISE, in English Law, the conveyance of land by will. As personal property or chattels is said to be bequeathed, so lands are said to be devised. It is said, *Co. Litt.* 111 b. n. 1, that, under the Saxon and Danish rule in England, the owners of land were entitled to convey their lands by will. It is certain that so soon as feudal customs were established in this country, the testamentary power over land ceased; and from the Conquest to the reign of Edward IV., this species of property could be transferred by conveyance *inter vivos* only; but during the reign of the latter monarch, a new mode of transfer began to be adopted, called a Conveyance to Uses (q. v.). By means of this species of conveyance, a party wishing to convey land otherwise than the common law allowed, actually conveyed the land to another person to such uses as he should appoint. The equity courts then regarded the party in whose favor the conveyance had been made as a mere trustee, and obliged him to relinquish the land in favor of any one whom the original owner might appoint. The power of appointment thus remaining in the owner might be exercised by will. By a statute of 27 Henry VIII., this mode of passing land by will was abolished; but, five years after, by 32 Henry VIII. c. 1, followed by 35 Henry VIII. c. 5, it was enacted, that all persons having estates in fee-simple should have power to devise the whole of their *Socage* (q. v.) lands, and two-thirds of their land holden by *Knight's Service* (q. v.). Finally, by 12 Charles II. c. 24, tenure by knight's service was abolished, and converted into socage; so that the power of devising land was extended to all lands except Copyholds (q. v.). But to the general rule that land could not pass by will, there had always existed an exception in favor of lands which, by the custom of the manor, had always been so conveyed; and this mode of devise by custom continued to exist even after the statute of wills of Henry VIII.

For this practice there were two grounds: 1. That the power of devising lands was limited by statute to two-thirds of the land held by knight's service, whereas devise by custom might carry the whole land. 2. In order to an effectual devise of land under the statutes of Henry VIII., it was necessary that there should be a will in writing, while a verbal or nuncupative will would carry land by custom. By 29 Charles II. c. 3, the statute of Frauds (q. v.), this distinction was removed, and it was enacted that a will in writing, attested by three or four witnesses, should be necessary for conveyance of all lands. It must be observed that this power of devising lands was confined to lands belonging to the testator at the time of making his will, so that after-acquired lands would not pass by it; and also, that religious bodies and other corporations were, by the law of Mortmain (q. v.), restrained from being devisees of land. Thus stood the law at the period of the recent Wills Act, 7 Will. IV., and 1 Vict. c. 26. By this statute, devises of land are placed on the same footing as to execution as other wills, and will carry all landed estates belonging to the deviser at the time of his death. See WILLS, and generally on this subject, see Jarman on Wills.

In Scotland, it is usual to convey lands by deed, which has, however, precisely a similar effect to a will, so that the difference between English and Scotch wills is chiefly formal. In foreign countries the power is subject to various rules differing from those in force in England. Hence, where a person resides in one country, and is possessed of landed property in another, questions of jurisdiction frequently arise as to the law which shall govern the power of disposal. In these cases, it is now a recognized principle that the *lex rei sita* is that which must prevail.—See Story's *Conflict of Laws*, p. 719, et seq.

DEVIZES (anciently *Divisa*, *Divisis*, *De Vies*), a parliamentary and municipal borough, in the middle of Wiltshire, near the Avon and Kennet Canal, 22 miles north-north-west of Salisbury. It lies high at the mouth of Pewsey Vale, between the thinly peopled tracts of Salisbury Plain and the Marlborough Downs. Pop. (1881) 6645. D. returns one member to parliament. It has silk-throwing mills, and manufactures of snuff and malt, and is the seat of one of the most important corn-markets of the west of England. The Corn Exchange has standing-room for nearly 3000 persons. The chancel of St. Mary's Church in D. is believed to be nearly as old as the Conquest. Roman household gods and coins have been found here. D. arose in a castle built by Roger,

Bishop of Salisbury, in the time of Henry I. This castle, of which only the walls of one of the dungeons remain, was besieged and taken by Cromwell in 1645. From the time of Henry VIII. till about 1820, D. was the seat of extensive cloth manufactures.

DEVOIRS OF CALAIS were the customs due to the king for merchandise brought to, or carried out of, Calais while our staple (q. v.) was there.—*Cowell's Interpreter*. 'Merchants of the west may buy merchandises, so that they find sureties to carry them to the west or to Calais.'—2 Rich. II. st. 1. c. 3.

DEVONIAN SYSTEM. The name proposed by Murchison and Sedgwick to replace the more characteristic and older term Old Red Sandstone, because the slaty and calciferous strata in Devonshire contain a much more copious and rich fossil fauna than the red arenaceous rocks of Scotland, Wales, and Herefordshire, with which they were shown to be contemporaneous. The older descriptive name, Old Red Sandstone, is still generally retained, and to it we refer for a description of the rocks of the system.

DEVONPORT (before 1824, called **PLYMOUTH DOCK**), a parliamentary and municipal borough, maritime and fortified town, and naval arsenal, in the south-west of Devonshire, situated on Stone-house Creek, on the east shore of the estuary of the Tamar (which is four miles long by half a mile broad, and called the Hamoaze), two miles west-north-west of Plymouth. It stands on high ground, with ramparts defended by batteries. The south-east and south walls are 12 feet high, with three gates, and externally a fosse cut 12 to 20 feet deep in the solid rock. The streets are regular, and the footpaths of marble. D. is supplied with water from Dartmoor by a circuitous route of 30 miles. It owes its importance to the dock-yard established here by William III., and still one of the chief naval arsenals in Britain. Locally, the yard is in Devonport, although official documents and popular phraseology frequently refer it to Plymouth. The yard comprises six building-slips, for various rates of vessels. The docks cover an area of 100 acres, and have cost an enormous sum of money. The most recent basin was completed in 1868. Rope-making, sail-making, and anchor-forging are also carried on. D. has residences for the port-admiral and governor, barracks for 2000 men, a military hospital, telegraph establishment, victualling-office, and grand parade. D. has breweries, soap-works, and an extensive trade in refitting and victualling ships. Pop. (1881) of mun. bor., 48,745; of parl. bor., 63,870. D. returns two members to parliament.

DEVONSHIRE, a maritime county, in the south-west peninsula of England, between the Bristol and English Channels. Greatest length, 71 miles; greatest breadth, 68; average, 46; area, 2590 square miles, $\frac{1}{4}$ ths being in pasture or arable. The north coast, 60 miles long, is mostly steep and rocky; the chief indentation being Bideford Bay, 18 miles broad and 8 deep. The south coast, 100 miles long, is also lined with cliffs, and has Tor Bay, 3 by $3\frac{1}{2}$ miles, and Plymouth Sound, 3 by 3 miles. The general surface is hilly, and the table-lands of Dartmoor in the south of D., Exmoor in the north-east of Devon and north-west of Somerset, and Blackdown in the east of D. are high, healthy, and rocky. The lower hills are grassy. The loftiest eminence is Yes Tor, in Dartmoor Forest, 2050 feet. The chief rocks are granite in Dartmoor, and Devonian Carboniferous, and Permian strata, with some Silurian strata, magnesian limestone, green-sand, chalk, and trap.

Copper, tin, iron, and other metals occur, with potters' and pipe clays, Bovey coal, marble, gypsum, fluor-spar, and loadstone. The rivers are very numerous, the chief being the Exe, 54 miles long; Dart, 36; Tamar, 59; Torridge, 53; and Taw. These rivers have tidal estuaries, 5 to 11 miles long. There is an inter-mitting spring at Brixham. The climate is humid and equable—cool in summer, and mild in winter. The great mildness of the south coast in winter has made it much resorted to by invalids, especially those in consumption. Here myrtles flourish in the open air, and, with little care, the orange and lemon. From its humidity, D. is more grassy than Cornwall, and there are fine meadows along the rivers. In the south, especially in Exeter Vale, the soil is very productive. The chief crops are grass and clovers, alternating with corn and potatoes. The fertile red loam of Exeter Vale produces wheat, barley, beans, pease, and flax. D. has much oak-wood and extensive orchards. It is famed for clotted cream and cider. The apple-trees grow on the hill-slopes and in the hedges. The chief manufactures are serges, linen, gloves, and lace; the chief exports are butter, cheese, cattle, and sheep. The red Devon breed of cattle is highly valued. Dartmoor mutton and Exmoor ponies are famous. D. has important pilchard, mackerel, dory, and salmon fisheries. The electric torpedo occurs in the estuaries. D. is divided into 33 hundreds, 470 parishes, and 17 poor-law unions. The chief towns are Exeter (the county town), Plymouth, Devonport, Tavistock, Tiverton, and Barnstaple. D. sends 17 members to parliament—6 for the county, and 11 for the above towns. Pop. in 1871, 601,374; in 1881, 604,397. Prior to the Reform Act of 1867, D. had 22 mem-

bers, but by that act, and the Scottish Reform Act of 1868, the county gained 2 members, while the boroughs lost 7. D. has many British and Roman remains, as stone circles, dolmens, barrows, and camps. The Saxons failed to conquer D. till the 9th century. It was ravaged by the Danes in the 9th and 10th centuries, and by the Irish in the 11th century. At the Reformation, 1549, there were great disturbances in Devonshire. In 1688, the Prince of Orange landed at Tor Bay.

DEW. For any assigned temperature of the atmosphere, there is a certain quantity of aqueous vapor which it is capable of holding in suspension at a given pressure. Conversely, for any assigned quantity of aqueous vapor held in suspension in the atmosphere, there is a minimum temperature at which it can remain so suspended. This minimum temperature is called the dew-point. During the daytime, especially if there has been sunshine, a good deal of aqueous vapor is taken into suspension in the atmosphere. If the temperature in the evening now falls below the dew-point, which after a hot and calm day generally takes place about sunset, the vapor which can be no longer held in suspension is deposited on the surface of the earth, sometimes to be seen visibly falling in a fine mist. This is one form of the phenomenon of dew, but there is another. The surface of the earth, and all things on it, and especially the smooth surfaces of vegetable productions, are constantly parting with their heat by radiation. If the sky is covered with clouds, the radiation sent back from the clouds nearly supplies an equivalent for the heat thus parted with; but if the sky be clear, no equivalent is supplied, and the surface of the earth and things growing on it become colder than the atmosphere.

If the night also be calm, the small portion of air contiguous to any of these surfaces will become cooled below the dew-point, and its moisture deposited on the surface in the form of dew. If this chilled temperature be below 32° F., the dew becomes frozen and is called *hoar-frost*. The above two phenomena, though both expressed in our language by the word dew, which perhaps helps to give rise to a confusion of ideas on the subject, are not necessarily expressed by the same word. For instance, in French, the first phenomenon—the falling evening-dew—is expressed by the word *serén*; while the latter—the dew seen in the morning gathered in drops by the leaves of plants, or other cool surfaces—is expressed by the word *rosée*.

The merit of the discovery of the 'Theory of Dew' has been commonly ascribed to Dr. Wm. Charles Wells, who published in 1814 his *Essay on Dew*, which obtained great popularity. The merit should however, be divided between him and several others, M. Le Roi of Montpellier, M. Pictet of Geneva, and especially Professor Alex. Wilson of Glasgow, largely contributed by experiment and induction to its formation. Its history is very interesting, and the curious reader will be well repaid by a perusal of an article on the subject by Mr. Tomlinson of King's College School, London, in the *Edinburgh New Philosophical Journal* (New Series), vol. xiii. No. 1. January 1861.

DEWA'S, a town of Malwa, India, 24 miles north-north-east from Indur. It is the capital of a petty state or raj under British protection, held conjointly by two chiefs of the lineage of the Puar or Pramara Rajpoots, once very powerful, although now of fallen fortune. Area, 6500 sq. miles; pop. 121,800.

DE'WBERRY (*Rubus caesius*), a plant of the same genus with the bramble (q. v.), and very nearly allied to it, but having weaker and more prostrate roundish stems, which take root at the end, their prickles unequal and passing insensibly into hairs, the fruit consisting only of a few (1—5) grains, which, however, are much larger than those of the brambleberry. The name is derived from the dew-like, bluish bloom which covers the fruit. The D. is common in some parts of Britain, and in many parts of Europe and of Asia. The fruit is very sweet and agreeable, and makes an excellent wine. The D. of North America (*R. procumbens*), abundant in the forests of Canada, is a delicious fruit, much superior to the British fruit of the same name, and more tart. The plant is of very humble growth, scarcely rising above the ground.



Dewberry.

DE WETTE, **WILHELM MARTIN LEBERECHE**, one of the ablest theologians of modern Germany, was born 14th January 1780, at Ulla, near Weimar, and studied at the university of Jena. In 1807, he was appointed extraordinary professor of philosophy at Heidelberg; in 1809, professor of theology; and in 1810, was

called to Berlin. By his popularity as a teacher, as also by his writings, De W. soon acquired a great reputation. In 1819, on account of a letter which he wrote addressed to the mother of the assassin of Kotzebue, he was deprived of his chair. Not long after, however, he was appointed professor of theology in the university of Basel, where his prelections and sermons in a short time secured him universal esteem and applause. In 1829, the grand Council of Basel made him a member of the Council of Education, and granted him the freedom of the city. In 1849, he was elected rector of the university, but died the same year, on the 16th of June.

De W. was a man of comprehensive learning, and acute philosophical discernment. His antipathy to the shackles of dogmatic theology gave keenness and vigor to his criticism. Yet he formed to school, and followed no master, so that it is difficult to describe his position. He cannot be classed either with Paulus, Strauss, or Baur. A temperate but very decided historical rationalism, on a broad basis of moral reverence, would perhaps best express his biblical stand-point. His principal works are: *Beiträge zur Einleitung in das Alte Testament* (Contributions to an introduction to the Old Testament). 2 vols. (Halle, 1806—1807); *Commentar über die Psalmen* (Commentary on the Psalms), Heidelberg, 1811; *Lehrbuch der historisch-kritischen Einleitung in die Bibel Alten und Neuen Testaments* (Historico-Critical Introduction to the Books of the Old and New Testament), 2 vols. (Berlin, 1817—1826); *Lehrbuch der Christlichen Dogmatik* (Compendium of Christian Dogmatics), 2 vols. (Berlin 1813—1816); *Christliche Sittenlehre* (Christian Ethics); *Vorlesungen über die Religion, ihr Wesen und ihre Erscheinungsformen* (Lectures on Religion, its Essence, and Forms of Manifestation), Berlin, 1827; *Das Wesen des Christlichen Glaubens* (The Nature of the Christian Faith), Basel, 1846; and *Exegetisches Handbuch zum Neuen Testament* (Exegetical Handbook of the New Testament). Besides these, De W. published a critical edition of the entire works of Luther.

DE WITT, JAN, a celebrated statesman of Holland, born at Dort in 1635, was the son of Jacob de Witt, a vehement opponent of William II., Prince of Orange. Jan inherited his father's hatred of the office of Stadtholder, and the family that filled it. His education was carefully attended to, and he soon exhibited remarkable ability. He was one of the deputies sent by the States of Holland in 1652 to Zealand, for the purpose of dissuading that province from adopting an Orange policy. There his eloquence secured him universal confidence, which, however, in such troublesome times could not long be retained. In the same year he was made grand pensionary.

The Orange party (supported by the populace and the clergy), during the war carried on between England and Holland, was ever striving to increase the power of the young prince (afterwards William III.), who was then a mere infant; the republican or oligarchic party, composed of the nobles and the wealthier burghesses, at the head of which was De W., sought, on the other hand, to strip the House of Orange of all power, and to abolish entirely the office of stadtholder. During William's minority, the advantage was, of course with De W. and the republicans. In 1654, on the conclusion of the war with England, a secret article was inserted in the treaty drawn up between De W. and Cromwell, in virtue of which the House of Orange was to be deprived of all state-offices. After the restoration of Charles II., De W. leaned more to the side of France. This tendency necessarily received an impetus from the renewal of hostilities between England and Holland in 1665. These lasted for two years; and although De W. acted with great vigor, his influence was diminished, and his party was compelled to concede a larger measure of power to the House of Orange. De W.'s prospects became still more clouded when the designs of Louis XIV. upon the Spanish Netherlands became manifest. The Orange party carried their point in the elevation of William to the family dignity of stadtholder. On the invasion of the Netherlands by Louis XIV. in 1672, the Prince of Orange was appointed commander of the Dutch forces; and the first campaign proving unfortunate, the popular clamor against De W. greatly increased, who had previously resigned his office of grand pensionary. His brother, Cornelius, accused of conspiring against the life of the stadtholder, was imprisoned, and tortured. De W. went to see him on his release. When they were coming out of prison, they were attacked by an infuriated crowd, and were both murdered, August 20 1672. The states-general demanded an investigation, and the punishment of the murderers, but the stadtholder did not take the necessary steps. De W. was personally a man of upright character. His *Memoirs* were published during his lifetime. See *the History of the Administration of John De Witt*, by James Geddes, of which the first volume was published in 1880.

DE WSBURY, a manufacturing town and parliamentary borough in the West Riding of Yorkshire, situated at the base of a hill, on the left bank of the Calder, is 32 miles south-west of York, and 8 miles south-south-west of Leeds. It is governed by a local

board of health, possesses a chamber of commerce, and is the center of the Dewsbury union. Pop. (1881) 29,617. D. is noted for its manufactures of low woollen goods—as pilots, sealskins, unions, &c., and carpets and blankets. There are collieries and ironworks in the immediate neighborhood. Railways—London and North-Western, and Lancashire and Yorkshire. Calder navigation connects the town with Hull and Liverpool. The parliamentary borough was formed in 1867, and includes Batley and Soothill. Pop. of p. b. (1881) 69,531. It returns one member to parliament.

Near D. is situated BATLEY, the principal manufacturing town in the kingdom for low woollen and army cloths. It is governed by a local board of health, and possesses a chamber of commerce. It is on the Manchester and Leeds line of the London and North-Western Railway. Pop. (1881) 27,514.

DE'XTRINE (syn. British gum, torrefied starch). When starch is carefully heated to 400° F., or until vapors arise from it, it becomes soluble in cold and hot water, and loses its gelatinous character; it also has the property, when viewed by polarized light, of turning the plane of polarization to the right; hence its name. It is often used as a substitute for gum-arabic in the processes of calico-printing, and for stiffening different goods; it is also applied to the back of postage-stamps. Its value as a substitute for gum consists in its being more flexible and less brittle when dry than that substance. Starch may be converted into dextrine by the long continued action of dilute acids at a high temperature; also by the action of Diastase (q. v.). Dextrine and starch are isomeric, both being composed of $C_{24}H_{20}O_{20}$; but dextrine may be distinguished from the latter body by its pale buff color, its insolubility in alcohol, and its not being rendered blue by iodine, which gives with it a dingy purple tint.

DEY, a word of doubtful origin, but appropriated by the ruler of Tripoli, and also of Algiers until its conquest by the French. At one period, Tunis likewise was governed by a Dey, but this title has long been supplanted by that of Bey. See BEG.

DHALA'C, an island in the Red Sea, off the coast of Abyssinia, in lat. 15° 46' N., long. 40° 6' E. It is 30 miles long, 15 miles in average breadth, and 120 miles in circumference. It is composed of coral rock, and its surface in general is flat and sandy. Doo-belloo, a village on the east side, trades with Loheia and Ghizan, ports on the Arabian coast, exchanging fish, sharks' fins, turtle, and pearls, for millet and dates. The groups of islands in the vicinity of D. are called the Dhalac Archipelago. The inhabitants are good sailors and skilful fishermen.

DHAMEE', a hill-state of India, of about 25 square miles on the left bank of the Sutlej, in about lat. 31° 12' N., and long. 77° 8' E. It is merely a collection of mountains and valleys. The general elevation exceeds 4000 feet, and even the margin of the river is 2283 feet above the level of the sea. D. contains 5500 inhabitants, and yields a revenue of 8000 rupees a year, of which 360 rupees are paid as tribute to the British government.

DHAR, a town situated on the table-land of Malwa, in Central India, stands in lat. 22° 35' N., and long. 75° 20' E., at an elevation of 1908 feet above the sea. It is said to have at one time consisted of 20,000 houses, implying a population of about 109,000, and though very greatly decayed, it yet retains many traces of bygone magnificence—two large mosques of red stone, ten water-tanks of various sizes, and a fort defended by many considerable towers. It is the capital of a protected state of the same name, having an area of 2091 square miles, with 145,000 inhabitants.

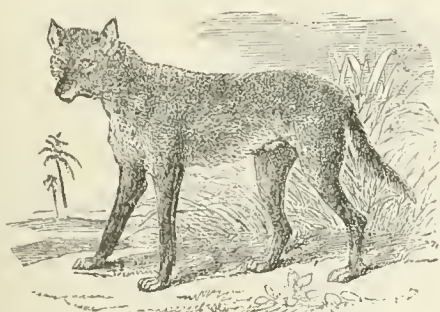
DJIA'RWAR, town in the province of Bombay, close to the frontier of Madras, stands in lat. 15° 28' N., and long. 75° 4' E. It has government schools for Maharrattas and Canarese, besides schools established by the natives themselves. D. is the center of a cotton district. Pop. (1872) 27,136.

DHARWAR, the district of which the town above mentioned is the capital, extends in N. lat. from 14° 16' to 15° 50', and in E. long. from 74° 50' to 76°, containing 4565 sq. m., and (1872) 988,037 inhabitants. Its drainage is divided between the Arabian Sea and the Bay of Bengal, passing to the latter by the Tumbudra, a feeder of the Kistnah or Krishna, and to the former by the Kali Nadi, through a deep valley of the Western Ghauts. The most interesting feature of the country is its suitability for the growth of American cotton. In 1842, after several previous failures, the New Orleans staple was cultivated with success to the extent of 25 acres; and within five years, the breadth of land thus sown had increased a thousandfold. In connection with this enterprise, a good road has been constructed to Coompta, on the Arabian Sea, where the cotton is shipped for Bombay. It is hence commonly called 'Coompta cotton.' The prevalent language is Canarese, and there are a number of vernacular schools in the district.

DHOB. See CYNODON.

DHOLE (*Canis scylax*), an Indian species of dog, existing in a wild state in the Western Ghauts and some other mountainous

districts. It is in size between a wolf and a jackal, with rather long legs, sharp muzzle, wide and pointed ears, straight and not bushy tail, light-bay color, fierce keen eyes, and great courage. The name D. is extended to some other very similar species or varieties, natives of Ceylon, Nepal, and other parts of the East, to which the common name *Red Dogs* has been sometimes applied, and for which Colonel Hamilton Smith has proposed the sub-generic name *Chryseus*. They seem not incapable of domestication, but whether any of the domesticated dogs are derived from them is wholly uncertain. There is no reason to think that any of them are the wild offspring of once domestic races. They all



The True Dhole (*Chryseus scylax*).

want the second tubercular tooth in the lower jaw, have oblique eyes, and the soles of the feet hairy. They hunt in packs. They are all inhabitants of the deepest recesses of wild mountain-forests. A remarkable characteristic of the dholes is their hostility to the feline races, the weaker and the young of which they attack and destroy. To this is ascribed the alarm which the tiger exhibits at the sight even of a domestic dog; and 'we may surmise,' says Colonel H. Smith, 'that the species of *Chryseus* are the instruments nature has appointed to keep down the superabundant increase of the great *feline* of the wilderness.'

DHO'LKA, a town of India, in the British district of Ahmedabad, presidency of Bombay. It is surrounded by a mud wall 4 miles in circuit. Pop. (1871) 20,854.

DHOLPO'RE, a town of Hindustan, on the left or north-west bank of the Chumbul, is in lat. $26^{\circ} 41'$ N., and long. $77^{\circ} 58'$ E., being 34 miles to the south of Agra, and 37 to the north of Gwalior. Here are some elaborately wrought mosques and mausoleums of freestone. Of the former, one is said to have been built by Shah Jehan, the founder of the modern Delhi, in 1634; and of the other edifices, some are of still earlier date. D. is the capital of a protected state stretching along the left bank of the Chumbul, containing 900 square miles, and 250,000 inhabitants.

DHOORCATEE', a protected state in Hindustan, of not more than five square miles, is in lat. $31^{\circ} 8'$ N., and long. $77^{\circ} 40'$ E., lying in the basin of the Jumna towards that of the Sutlej. Small as it is, it is worthy of notice as containing the peak of Toongroo, which, at an elevation of 10,102 feet above the sea, forms one of the stations of the large series of triangles in the trigonometrical survey of the Himalaya.

DHUBBOOEE', a decayed town in Guzerat, belonging to the Guicowar, in lat. $22^{\circ} 8'$ N., and long. $73^{\circ} 25'$ E., lies 78 miles to the north-east of Surat, and 225 to the north of Bombay. It presents many memorials of ancient grandeur—such as a rampart of two miles in circuit, backed inwardly by a handsome colonnade; a magnificent tank, bordered by a grand flight of stairs and numerous Brahmanical temples—the whole richly adorned with curious sculptures. But a still more remarkable circumstance is, that, in a purely alluvial neighborhood, where even a pebble is unknown, all these structures are of hewn stone. The population, which is inconsiderable in number, shares the place with swarms of monkeys.

DHUMTOU'R, or DUMTAU'R, a valley of the Punjab, stretches in N. lat. from 34° to $34^{\circ} 10'$, and in E. long. from $72^{\circ} 55'$ to $73^{\circ} 15'$. Here a traveler from the north first finds the peculiar vegetation of Hindustan. While behind him are luxuriant forests of oak, plane, walnut, and pine, the sugar-cane grows before him in such abundance as to form a principal article of fodder for cattle. The population is distributed into villages, each defended by a small fort against neighboring marauders. The chief town, of the same name, is 16 miles to the east of the Indus, on the route between Attock and Cashmere.

DHUNCHEE, or DHANCHI (*Sesbania aculeata*), a plant of the natural order *Leguminosae*, sub-order *Papilionaceae*, of a genus having an elongated many-seeded pod, alternately swollen and contracted, as if it contained a string of beads. The D. is an annual herbaceous plant, much cultivated in Bengal upon account of its fibre; it has an erect, sparingly branched stem, 6—10 feet high. It is a plant of rapid growth, and succeeds best in low and

wet soils. Its fibre is coarser than hemp, unless when it is cut at a very early period of its growth, is durable in water, but contracts considerably when wetted. It is steeped and prepared very much like Sunn (q. v.).

DHWALAGI'RI, once supposed to be the highest peak of the Himalaya, but now ascertained to be at most only the third in point of altitude, is stated at 26,826 feet above the sea. Its lat. and long. are $28^{\circ} 42'$ N., and $82^{\circ} 33'$ E. The mountain is within the limits of Nepal.

DIABE'TES (Gr. literally a syphon, from *diabaino*, I go or flow through), a disorder of the general system, of which the principal symptom is a very much increased flow of urine. Diabetes is of two distinct kinds: the one, *diabetes insipidus*, is a mere exaggeration of the water-excreting function of the kidneys, accompanied by extreme thirst, and hence called *polydipsia* (Gr. excess of thirst) by some authorities; the other is a more complex disorder of the assimilation, consequent on the formation first, and the excretion by the kidneys afterwards, of an enormous excess of animal sugar (see GRAPE-SUGAR), the sugar being found in excess, not only in the renal excretion, but in the blood, and in nearly all the secretions which have been examined. The pathology of this disease, called *diabetes mellitus* (Lat. *mel*, honey), is very obscure, notwithstanding the numerous recent physiological researches which tend to throw light on the development of sugar in the animal organism, and which must undoubtedly be regarded as bearing on the solution of the problems connected with this disease. Unhappily, the cure of it is still entirely unknown, except in so far as it may be controlled or retarded by good management of the diet, drink, and clothing. All diabetics are subject to progressive emaciation, and they often become subject to true tubercular consumption (q. v.), or other chronic disease of the lungs; it is chiefly in warding off this termination that the medical art can be of service, as well as in relieving the symptoms as they occur. The first fact observed in cases of diabetes is usually the increased flow of urine, when it becomes so great as to amount to a practical inconvenience; and also a considerable increase of the appetite, and an unquenchable thirst, which rarely fail to accompany the disease from the beginning, but often do not attract attention, or at least suggest the idea of anything wrong, till an advanced stage of the disorder.

When the patient demands medical assistance, he is usually somewhat thin; the pulse is quiet, the skin cool, the heat of the surface, indeed, habitually rather low and easily depressed. There is often a complete absence of perspiration, which gives a peculiar feeling of harshness to the surface, especially of the palms of the hands. With these symptoms, the first approaches of pulmonary disease may concur. In the very last stages, there is sometimes dropsy of the feet; and the urine may be natural in quantity, or even diminished. For the other characters of diabetic urine, see URINE. The cure consists in removing from the diet, as far as possible, consistently with comfort and due nourishment, everything which easily turns to the formation of animal sugar in the system, especially all excess of farinaceous food. The complete suppression of sugar-forming food, however, as recommended long ago by Rollo, has not been found possible in practice in the majority of cases. Bread composed of gluten of wheat without starch, or bran-cakes baked with eggs, have been strongly recommended; and in most of the great capitals, as London and Paris, bakers may be found who regularly furnish bread suitable for this unfortunate class of sufferers; indeed, any intelligent baker who will take the trouble, may, under medical direction, be got to manufacture such bread when required; or it may be ordered in the form of cakes and biscuits, in quantities at a time, from London houses. Dr. Camplin, himself a diabetic patient, has minutely studied the diet and regimen required, and published a little book, which we have no hesitation in recommending to all concerned. *On Diabetes, and its Successful Treatment*, in which full directions will be found for the manufacture of palatable and useful diabetic bread. The 'success' alluded to, however, is simply keeping the disease at bay by constant watchfulness. Medicines proper should be used only under the advice of the physician. There is no specific, and the unguarded use of strong remedies is to be condemned. Flannel should be worn next to the skin, and the languid function of the cutaneous perspiration aided by the warm bath. The Turkish bath might possibly prove useful in this disorder, and could hardly do harm if carefully employed; but we have not heard, as yet, of any actual experiments in this direction for the cure of diabetes.

DIABE'TIC SU'GAR, is a variety of sugar found in the blood and secretions of the higher animals, especially when afflicted with the disease called diabetes. It is a variety of grape-sugar or glucose. See GRAPE-SUGAR.

DIABLERETS, a remarkable mountain of the Bernese Alps, Switzerland, situated between the cantons of Bern and Valais, in lat. about $46^{\circ} 18'$ N., and long. $7^{\circ} 15'$ E., with an elevation of 10,670 feet above the sea. The D. is composed of limestone strata,

the lower beds of which are so soft and shaly, that they are easily disintegrated by the infiltration of water given off from the glaciers on the north-east. The consequence is that, the foundation being worn away, the peaks tumble over into the valley, occasioning the most terrible catastrophes. Three peaks have already fallen in this way, and the two that yet remain threaten to follow sooner or later. In the fall of 1714, 15 people, 100 head of cattle, and 55 châteaux were destroyed; and the result would have been much more appalling, had not premonitory noises given the inhabitants timely warning to escape. In 1749, the fall of another peak arrested the course of the Liserne, which thereafter formed two small lakes known as Derborenze.

DIACAU'STIC. See **CAUSTIC.**

DIA'CHYLON (Gr. literally, from juices—i. e. vegetable juices, a deceptive etymology, as the plaster has really no such composition), the common healing or adhesive plaster, made by combining litharge, or the red oxide of lead, with olive oil, so as to form a kind of soap. The preparation of this plaster is now entirely taken out of the hands of druggists, it being prepared on a great scale by machinery.

DI'ADEM was the name given to the fillet of silk, woollen, or linen which served as the distinguishing ornament of kings. It was generally narrow, being only a little broader on the forehead. The diadem of the Egyptian goddesses and kings bore the symbol of the sacred serpent. The diadem of Bacchus, as it appears in antique sculptures, was a plaited band going round the forehead and temples, and tied behind, with the ends hanging down. Among the Persians, the diadem was bound round the tiara or turban, and was of a blue color worked with white. The early Roman emperors refrained from using this ornament, in order not to call up recollections of the hated kingly office. Diocletian was the first to introduce it again, and Constantine the Great added new ornaments to it. After his time, it was adorned with a single or double row of pearls and precious stones. Queens are also seen on coins ornamented with the diadem, with the addition of a veil. It was finally superseded by the Crown (q. v.).

DIE'RESIS (Gr. *diairo*, I divide), a term used in Grammar to signify the resolution of a diphthong, or of a contracted syllable, into two syllables; as Lat. *auræ* into *aurai*. The name is also given to the mark ' placed above a vowel letter, to indicate that it is to be independently pronounced, and not in conjunction with a preceding vowel; as in the above example, or in the word *aërial*.

DIAGNO'SIS (Gr. *dia*, through, and *gnosis*, knowledge), the through-knowledge or thorough knowledge of a disease, embracing its points of distinction from other diseases, its symptoms, their relations to one another, and to the state of the different organs and functions of the body, in so far as this can be appreciated during life. Diagnosis is usually spoken of in contrast with Prognosis, which implies the judgment framed by the physician as to the issues of disease; and also with Prophylaxis (*pro*, from, and *phylaxis*, protection), which refers to the warding off disease, when supposed to be impending. Diagnosis includes the study of all the vital phenomena of diseases, and also of their appearances after death, in so far as this can aid their discovery during the life of the patient. It is usual to speak of rational or physiological diagnosis, or diagnosis by symptoms—i. e., functional changes; and of physical diagnosis, or diagnosis by signs—i. e., objective phenomena appreciable by the senses of the observer. The latter method of diagnosis has been much enlarged in scope, and increased in importance of late years by the modern discoveries in Auscultation (q. v.) and Percussion (q. v.), and also by the great advances made in physiological chemistry, and by the use of the microscope.

DIA'GONAL, in Plane Geometry, is a straight line joining any two angles, not adjacent, of a rectilinear figure. A line drawn between two adjacent angles would coincide with the boundary-line. A triangle has no diagonal, because any two of its angles are adjacent; a four-sided figure has two diagonals; a five-sided, five; a six-sided, nine; &c. The number of possible diagonals in any figure is found by taking three from the number of sides, multiplying the remainder by the number of sides, and taking half the product. Thus, in the six-sided figure, the process is $\frac{3 \times 6}{2} = 9$. If the diagonals must be so drawn

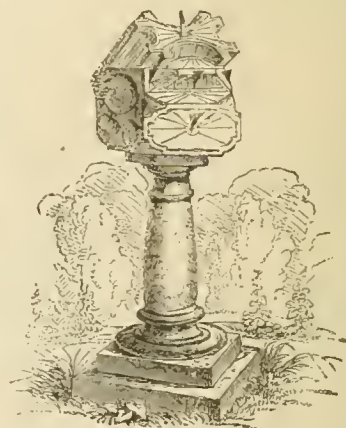
as not to intersect, their number is always three less than the number of sides. It makes no difference whether they all proceed from one angle or not. A diagonal is a solid bounded by planes, in a line joining any two solid angles so situated that the line does not coincide with any line on the surface. To find the number of such diagonals in a given solid: Multiply the number of solid angles by the same number diminished by one, and from half this product subtract the number of edges on the figure, and also the sum of the number of diagonals in all the faces. Thus, the cube gives $\frac{8 \times 7}{2} - 12 - 6 \times 2 = 4$ diagonals.

DIAGONAL SCALE, a system of lines by means of which hundredths of units may be laid down or measured with compasses. It is thus constructed: Lay off, on the straight line, any equal parts EA, AB, BC, CD, &c. Draw ten lines parallel to DE, and equidistant; and draw EP, AQ, BI, C2,...&c., perpendicular to DE. Divide QP, AE, into 10 equal parts. Join the 1st, 2d, 3d,...divisions on QP with the 2d, 3d, 4th,...divisions on AE respectively. If the divisions on AD each represent 100, each of those on QP will represent 10. Thus, from 3 on AD to 8 on QP is 380; but by moving the points of the compasses down to the fourth line, and extending them from *n* to *o*, the number will be 384. For the distance of 8 on QP from Q is 80, and of *r* from A is 90; and hence that of *o* from the line AQ is 84. When the divisions on AD denote tens, those on QP denote units, and from *n* to *o* would then represent $38\frac{4}{10}$ or 38.4. When the numbers representing the lengths

of the sides of any figure would give lines of an inconvenient size taken from the scale, the numbers may be all multiplied or all divided by such a number as will adapt the lengths of the lines to the required dimensions of the figure.

DIA'GORAS, a Greek poet and philosopher, was born in Melos, an island of the Cyclades. He flourished in the 5th c. B.C., but beyond his reputation for atheism, nothing very positive is known regarding his career. He is said to have been a disciple of Democritus of Abdera, and to have resided during the more important part of his life in Athens. He is alluded to by Aristophanes in the *Clouds* (424 B.C.); and from an epithet applied there to Socrates, it is highly probable that that great philosopher had been a pupil of D., or at least held similar opinions. This will perhaps explain to us the accusation brought against him of atheism. In all likelihood, D. was no atheist but simply a *disbeliever in polytheism*; and the anecdotes related of him, such as his once throwing, when ill-off for fuel, a wooden image of Hercules into the fire, to cook his dinner, serve to confirm such a supposition. He seems to have been witty and fearless, and probably treated the rude superstitions of the common-place Athenians with dashing contempt. In this way he may have become specially notorious, and so fixed himself in the Greek mind as the *representative* atheist. D. was banished from Athens professedly on account of his impiety, but really on account of his politics. He went first to Pallene, and afterwards to Corinth, where he died. He wrote lyrics of various kinds, and a philosophical work entitled *Phrygiol Logoi*. Personally, he was a man of untainted character, and discharged his duties as a citizen in an earnest and exemplary manner.

DIAL AND DIALLING. A *sun-dial* is an instrument for measuring time by means of the motion of the sun's shadow cast



Old Sun-dial:

In the former Zoological Garden, Edinburgh.

by a stile erected on its surface. It is an instrument of very great antiquity, the earliest mention of it being in Isaiah xxxviii. 8; and before clocks and watches became common, it was in general use as a time-keeper. The art of constructing dials to suit any place and situation, was then an important branch of mathematical study; now the subject is more an object of curiosity than utility.

A dial consists of two parts—the *stile* or gnomon, usually the edge of a plate of metal, always made parallel to the earth's axis, and pointing towards the north pole; and the *dial-plane*, which may be of any hard substance, and on which are marked the directions of the shadow for the several hours of the day, their halves, quarters, &c. Dials receive various names, according, mostly, to the positions which they are constructed to occupy. When the dial-plane is on the plane of the horizon, the dial is called a horizontal dial; when perpendicular to that plane, a ver-

tial dial. An equinoctial dial is one whose plane is parallel to the equinoctial plane. Besides these names, there are others, such as the south dial, north dial, east dial, west dial, polar dial, declining dial, of which it is useless to write at length. These names all depend on the position of the dial-plane. The cylindrical dial is a dial drawn on the curved surface of a cylinder. The ring dial is an ingenious small portable dial, but rather a curious toy than a philosophical instrument.

A *night or nocturnal dial* is an instrument for showing the hour of the night by the shadow of the moon or stars. Moon-dials may be constructed relative to the moon's motion; or the hour may be found by the moon's shadow on a sun-dial by the following rule: Observe the hour pointed out by the moon's shadow; find the days of the moon's age in the calendar, and take three-fourths of that number for the hours to be added to the time shown by the shadow to give the hour of the night.

Dialling.—The *stile* of a dial being parallel to the earth's axis, those familiar with spherical trigonometry will readily see that the problem of constructing a dial resolves itself into that of ascertaining where the hour-lines cut a given circle, with a view to the graduation of the dial-plane. We do not here presume the reader to be acquainted with spherical trigonometry, and accordingly proceed to illustrate the principles of dialling in a popular

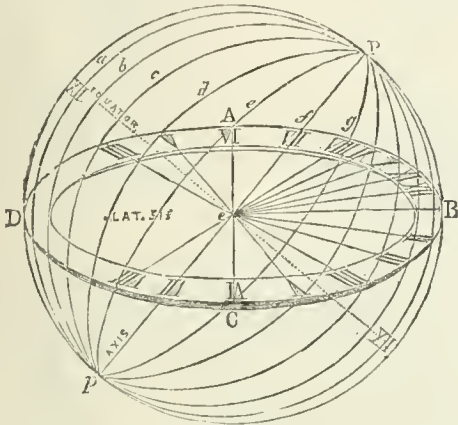


Fig. 1.

manner, taking our illustrations from Ferguson's *Lectures* (4th ed., 1772, Lecture 10), which should be referred to for fuller information. Suppose *Pcp* (fig. 1), a hollow and transparent sphere, as of glass, to represent the earth; and suppose its equator divided into 24 equal parts by the meridians *a, b, c, d, &c.*, one of them passing through a given place, say London (see HORIZON), at the point *a*. If the hour of twelve be marked at the equator, both on the latter meridian and that opposite it, and all the rest of the hours in order on the other meridians, those meridians will be the hour-circles of London. The sun passes from one meridian to another in one hour. Then, if the sphere has an opaque axis, as *Pcp*, terminating in the poles *P* and *p*, the shadow of this axis would fall in the course of the day, on every particular meridian and hour, as the sun came to the plane of the opposite meridian, and would thus show the time at London, and at all other places on the same meridian as London. If the sphere were cut through the middle by a plane *ABCD*, in the rational horizon of London, and if straight lines were drawn from the center, *e*, of the plane to the points where its circumference is cut by the hour-circles of the sphere, those lines would be the hour-lines of a horizontal dial for London; for the shadow of the axis would fall upon each particular hour-line of the dial, when it fell upon the like hour-circle of the sphere. Similarly, if we suppose the sphere cut by any other plane facing the meridian, the hour-circles of the sphere will cut the edge of the plane in those points to which the hour-lines must be drawn straight from the center; and the axis of the sphere will cast a shadow on these lines at the respective hours. The like will hold of any plane, whether it face the meridian or not, provided it do not coincide with it, or do not coincide with a plane through the poles, and perpendicular to the plane of the equator. In the latter case, the axis would have no elevation above the plane of the dial; in the former, the shadow would not move circularly.

The *universal dialling cylinder*, an invention of Ferguson's, is represented in fig. 2. *ABCD* is a glass cylindrical tube, closed at both ends with brass plates, on the centers of which a wire or axis, *EFG*, is fixed. The tube is either fixed to a horizontal board, *H*, at an angle equal to the latitude of the place, or moves on a joint, so that it may be elevated till its axis is parallel to the earth's at any latitude. The 24 hour-lines are drawn on the outside of the glass, equidistant from one another, and parallel to the axis. The

XII next *B* stands for midnight; the XII next the board, for noon. When the axis is adjusted for the latitude, and the board levelled, with the line *HN* on the meridian, and the end towards the north, axis *EFG*, when the sun shines, will serve as stile, and cast a shadow on the hour of the day among the parallel hour-lines. As

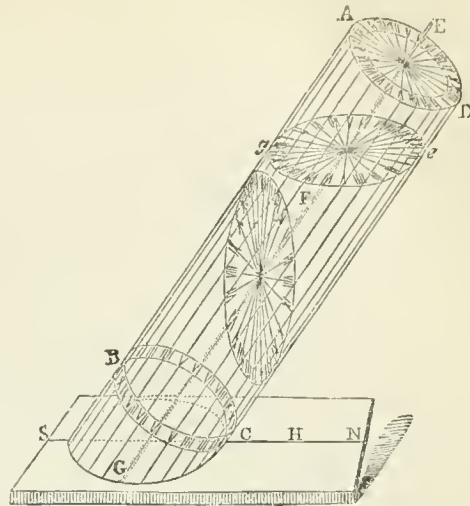


Fig. 2.

the plate *AD* is parallel to the equator, and *EFG* perpendicular to it, right lines drawn from the center to the extremities of the parallels will be the hour-lines of an equinoctial dial, and the axis will be the stile. A horizontal plate, *ge*, if put into the tube, with lines drawn from the center to the several parallels cutting its edge, will be a horizontal dial for the given latitude; and similarly a vertical plate fronting the meridian, and touching the tube with its edge, with lines drawn from its center to the parallels, will be a vertical south dial, the axis of the instrument in both cases serving for the stile; and similarly for any other plate placed in the cylinder. If, instead of being of glass, the cylinder were of wood, any of these dials might be obtained from it by simply cutting it in the planes of the plates, and drawing the lines on the surface of the section.

DIALECT. In speaking of a people having essentially all one language, but living extended over an extensive territory, the name of Dialects is given to those varieties or peculiar forms which that language assumes among the various tribes or other local divisions of the people. It is clear that the wider the separation comes to be between the several tribes, and the more they differ in mode of life and other circumstances, the more marked will the differences of dialect become. Also when a particular tribe of this people increase in numbers, and also extends its territory, the same process is repeated, and its dialect becomes broken into a number of sub-dialects. The principal check to this tendency to seemingly endless subdivision of language, is furnished by an increasing degree of common culture and civilization. Where this is wanting, as in Africa and among the native populations of America, the subdivision is practically endless.

Another element is introduced into the problem by the fact, that the civilization of some tribes develops itself more richly and ripens earlier than that of others, while some even undergo decline; this must occasion corresponding differences of dialect. Further, one dialect may become dominant over one or more of the others, through various influences, the chief of which is the power of poetry, especially if favored by external relations. Finally, if to superior manifestations of oratory and poetry in any dialect, the conservative aid of writing be added, there is created a written language, which passes current among other tribes to the same extent that the literature of which it is the vehicle finds favor. It is not always the dialect most perfect in itself, nor yet that of the most powerful tribe or division of a people, that comes to be the written language. Accidental circumstances have, in many cases, decided the rivalry. The Bible happened to be translated by a High German, Luther, into his native dialect; other works on the then all-engrossing subject of religion followed in the same dialect; happily, too, the art of printing had just attained the perfection necessary to give these productions general circulation. It was this concurrence of circumstances that decided that High German should in future be the spiritual bond among the widespread German people. For there were other dialects whose claims to the distinction were at that time equal, if not higher. See also **ENGLISH LANGUAGE**.

When a dialect has thus become the vehicle of written communication, and of the higher kinds of oral address, its character and

position become changed; and it stands henceforth in a sort of antagonism to the other dialects, and even to that out of which itself sprung. For written language is chiefly employed in the higher departments of human thought and activity. The intellectual and moral elements, therefore, predominate in it over the sensible; and what it gains in dignity, precision, and pliancy, it loses in richness of inflection, in friendly familiarity and naturalness. In conflict with this standard speech, the dialects must go to the wall. They live for a considerable time, it is true, even in the mouth of the educated classes, becoming, however, gradually more and more confined to the most necessary and familiar forms of intercourse, and losing their characteristics in the stream of the written language. They thus become, after a time, the exclusive possession of the lower orders, in which position they preserve many relics of old grammatical forms long after these have disappeared in the language of literature, but without the power of advancing or of being enriched by the products of deep thinking; and though they may abound in single expressions of great beauty and delicacy, the general character comes to be low and coarse. But so long as a language lives, the literary standard and the dialects never cease to act and react on one another.

The chief points of difference between the dialects of a language and the standard fall under four heads. The first consists of differences in the elementary sounds or letters, each dialect having a tendency to substitute some one or more vowels or consonants for others. Thus, the standard English *bold*, is in Ireland *bould*; in Scotland, *bauld*; *what*, where the *h* is nearly evanescent, becomes, in a Scotchman's mouth, or rather throat, *chwat*, and in Aberdeenshire Scotch, *fat*—*f* in this sub-dialect being regularly substituted for *wh*, or rather *hie*. 2. Each dialect has peculiarities of grammar: In many parts of England and in Scotland, the plural of *eye* is not *eyes*, but *eyen*, or *een*, like *oxen*. The habitual use of *be* where the standard grammar prescribes *am*, *is*, *are*, &c., is prevalent in large districts of England. Of this kind is the use of the strong conjugation for the weak, or vice versa; as *loup*, *lap*, *lup*, *pen*, for *leap*, *leaped*, *leaped*. 3. Peculiarities of vocabulary: These individual words current in one or more districts, but unknown to the standard vocabulary, are properly *provincialisms*. They are generally genuine words of an older stage of the language, that have survived longer in some localities than in others. Some provincialisms, as *bearn* or *bairn*, for child, *marrow* for fellow or match, to *greet* for to weep, are common in Scotland and the north of England. Others are more local, as to *cleam* for to fasten, or cement; *heppen*, a Yorkshire term for pretty near; *thrippa*, in Cheshire, to cudgel. The exclusion of such words from the standard language is often accidental, and many of them might be and are with advantage resumed; ex., *marrow*, *gloaming*, &c. 4. Peculiarities of intonation: This is sometimes, though with little propriety, called accent, which means strictly the stress laid upon a particular syllable of a word. There are no doubt local peculiarities of this kind too. The tendency of standard English, especially the more recent, is to throw the accent toward the beginning of the word; in Scotland, the tendency lingers to say *eney* for *e'ny*. But peculiarities of intonation lie in the different ways in which the *pitch* of the voice is managed—in the musical accompaniment of articulation. Differences in this respect give rise to the monotonous drawl of one district, the angry querulous tone of another, the sing-song of a third, &c.

So long as dialectic varieties of language were looked upon indiscriminately as corruptions and barbarities, they were only noticed by scholars that they might be avoided. A more rational philology, without trenching upon the rules of good writing, considers them as essential parts of the speech of a people, and a knowledge of them as necessary to any thorough investigation of the genius of that speech.

It is obvious that *Dialect* is entirely a *relative* term, and that what we call by that name in one connection, we may call a language in another connection. Thus, Greek and Latin may be called sister-dialects of that primitive language from which it is held that they, as well as the other members of the Indo-European family, branched off. See *ARYAN LANGUAGES*. Speaking of Greek by itself, however, it is a language, and Ionic, Doric, Attic, &c., are dialects of it. The same holds good with the others.

In practice, however nearly related the speech of two peoples may be, we do not apply the term dialects, unless the peoples are mutually intelligible and have a common literary standard. Intelligibility does not go for much, but political relations enter more or less into the notion. Thus, Scotch is sometimes spoken of as a distinct language from English; and yet in no part of Scotland is the common speech so unintelligible to an Englishman as is that of Somerset, which is always a 'dialect.' This arises from Scotland being thought of as a separate country, which it once was; and its speech as the vehicle of a peculiar literature. See *AMERICANISMS*.—Dialect is not to be confounded with artificialities, such as the jargon of thieves.

DIALECTIC is a Greek word which signified originally, 'the art of conversation,' but came to have a technical signification in

the language of philosophy. At first, it implied a regular and scientific method of treating general conceptions or general terms—a sort of anatomy of names, and through them of the things denoted. In the Socratic philosophy, and more especially in that of Plato, dialectic was thus the method of the highest and deepest kind of speculation. Aristotle gave another signification to the word. According to him, a scientific proof or deduction is different from a dialectic proof, which is only a probable deduction. After this, dialectic came round to imply a sort of word-fence, the art of so using the forms of reasoning as to confound your opponent, and make fallacies pass for truth. Dialectic is sometimes used as synonymous with logic. Logic, however, which originated with Aristotle, is properly the science of the forms of thinking; it is less directly concerned with words than dialectic, which in this view becomes a subordinate province of logic—the art of disputation. Dialectic, in fact, is little heard of where philosophy is positive and experimental; it is chiefly used with regard to the more ideal and *a priori* speculations of such philosophers as Kant, Hegel, Schelling, &c.

DI'ALLAGE, or **SCHILLER-SPAR**, a mineral nearly allied to Angite (q. v.), and by some regarded as a variety of it. Its chemical composition is essentially the same. It is seldom found very perfectly crystallized, but usually massive, granular, or disseminated. It has generally a metallic and pearly or silky lustre. A very beautiful bright green D. (smaragdite), found in Switzerland, Italy, Corsica, India, Labrador, &c., is prized for ornamental purposes; in Corsica, it occurs disseminated in a felspar (*Labradorite* or *Saussurite*), which when cut and polished, appears spotted with it, and is of great beauty. It is made into boxes, vases, &c., is much valued, and is known by the names *Gabbro* and *Verde di Corsica duro*. A variety of D., usually yellowish or brownish, is sometimes called *Bronzite*.

DI'ALOGUE, a conversation between two or more persons, implying, however, greater unity of subject and formality than an ordinary conversation. The ancient Greek philosophers were fond of this way of conducting their investigations and conveying their instructions. The Socratic dialogue is a conversation in the form of question and answer, so contrived that the person questioned is led himself to originate those ideas that the questioner wishes to bring before him. The dialogues of Plato, are, as it were, philosophical dramas, in which the Socratic method of investigation is brought to bear upon speculative subjects. The form of the dialogue is but ill adapted to the modern state of science. Of the more eminent modern writers in this form, we may mention Erasmus in Latin; Lessing, Herder, and Wieland among the Germans; Petrarch and Machiavelli in Italy; Fénelon and Fontenelle in France; and Berkeley, Hurd, and Harris in England. Landor's *Imaginary Conversations* are a happy effort of this kind. When dialogue is combined with action, we have the drama.

DIA'LYSIS. See **OSMOSE**.

DIAMA'GNETISM. The fact that iron is attracted by the magnet, has been known from very remote times; that bismuth exhibits a repulsive action towards the magnetic needle, has been now known for nearly 100 years. Dr. Faraday was the first (1845) to show that all bodies are more or less affected by magnetic influence, and his beautiful researches on the subject have opened up a new field in the domain of science. He found that the mag-

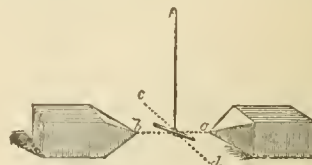


Fig. 1.

netism of bodies was manifested in two ways—either in being attracted by the magnet, as iron; or in being repelled, like bismuth. When a needle or slender rod of iron is suspended between the poles of a magnet, as in fig. 1, being attracted by them, it takes up a position of rest on the line *ab*, joining the two poles. When a substance behaves itself in this manner, it is said by Faraday to be *paramagnetic*, and to place itself *axially*, *ab* being the axis. A rod of bismuth, on the other hand, being repelled by the poles of the magnet, comes to rest in the line *cd*, at right angles to *ab*. Bismuth, and the like substances, he calls *diamagnetic*, and they are said to place themselves *equatorially*, *cd* being the equator. These terms, being both definite and graphic, have been universally adopted. Magnetic is the term used by Faraday to indicate magnetism of either sort, although in general language it is understood to refer to paramagnetic bodies, such as iron, &c.

Paramagnetic bodies, then, are those which manifest the same properties with regard to the magnet that iron does; and diamag-

netic bodies are those which, like bismuth, show opposite but corresponding properties; so that in circumstances where paramagnetic bodies place themselves axially, diamagnetic bodies place themselves equatorially; and where the former are attracted, the latter are repelled, and *vice versa*. A paramagnetic, therefore, not in the elongated form, but in a compact shape, such as a ball or cube, is attracted by either pole of the magnet, when suspended near it; a ball or cube of a diamagnetic, on the other hand, experiences, when so placed, repulsion. The paramagnetism of iron, nickel, and cobalt, becomes manifest in the presence of magnets of ordinary power; but the magnetism of most other substances is so feeble as to be developed only under the influence of the strongest magnets. As electro-magnets far exceed permanent steel magnets in strength, they are selected for investigations on the magnetism of bodies. Fig. 2 represents an electro-magnet which may be employed for this purpose. The soft iron horse-

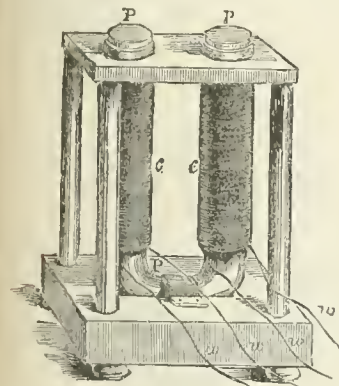


Fig. 2.

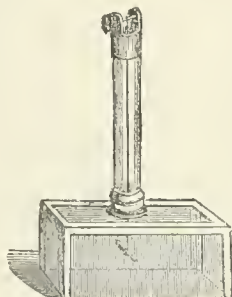


Fig. 3.

shoe PPP, enveloped towards its extremities in the coils of insulated copper-wire *cc*, which communicate with a galvanic battery by the wires *vv*, is fixed in an upright wooden frame. The ends or poles of the magnet rise slightly above the table or board which forms the upper part of the frame. In order conveniently to suspend substances between the poles, and to protect them while under observation, from currents of air, a glass frame of simple construction, fig. 3, is made to fit the table. The upper plate of the frame admits a wooden ring, into which an upright glass tube is fitted. The thread by which the needle is suspended is wound round a slender movable bobbin at the top, so that it can be elevated or lowered to the proper position. To modify and direct the action of the magnet, two pieces of soft iron (fig. 1) are made to rest on the end faces; these are pointed at one extremity, and flat at the other, so that the force of the magnet may be concentrated in the points, when they are turned towards each other; or diffused over the opposite flat surface, when their position is reversed.

To observe the effect of the magnet on liquids, Faraday placed them in long tubes of very thin glass, and suspended them as in the case of solid needles. It was found that some arranged themselves axially, and others equatorially. The attraction and repulsion that liquids experience in the presence of the magnet has been prettily shown by Plucker.

A large drop of liquid is placed in a watch-glass, figs. 4, 5, and laid upon two poles of the shape shown in the figures. If the liquid be paramagnetic, the surface becomes depressed at the in-



Fig. 4.

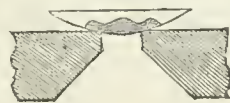


Fig. 5.

terval between the poles, and heaped up over the extreme edges of them, fig. 4. A diamagnetic liquid, on the other hand, shows a depression at each edge of the poles, and a heaping up at the center, fig. 5.

The magnetic nature of flames and gases has been also studied. When the flame of a candle is brought between the poles of a magnet, it is repelled by them, and thrown out horizontally into an equatorial position. To ascertain the magnetism of gases, Faraday inflated soap-bubbles with them, and their para- or diamagnetism was exhibited by their being attracted or repelled by the poles. He ascertained the same by causing the gases to flow out from glass tubes in the presence of the poles, when the peculiar magnetism of the gas was shown by its choosing an axial or equatorial means of egress.

The following list gives the kind of magnetism displayed by the more common substances:

Paramagnetic.—Iron, nickel, cobalt, manganese, chromium, titanium, palladium, paper, sealing-wax, peroxide of lead, plumbago, red-lead, sulphate of zinc, shell-lac, vermilion, charcoal, proto and per salts of iron, salts of manganese, oxygen, air.

Diamagnetic.—Bismuth, antimony, zinc, tin, cadmium, sodium, mercury, lead, silver, copper, gold, arsenic, uranium, tungsten, rock-crystal, mineral acids, alum, glass, litharge, nitre, phosphorus, sulphur, resin, water, alcohol, ether, sugar, starch, wood, bread, leather, caoutchouc, hydrogen, carbonic acid, coal-gas, nitrogen acid, coal-gas, nitrogen.

The nature of the medium in which the body under examination moves, exerts a powerful influence on the nature and amount of the magnetism it exhibits; thus, if a glass tube be filled with a solution of the proto-sulphate of iron, and suspended between the poles it will place itself axially. It will do the same if made to move in water, or a solution more dilute of the proto-sulphate of iron. It will be indifferent in a solution of the same strength; but it will place itself equatorially in a stronger solution. Thus, the same substance may appear paramagnetic, indifferent, or diamagnetic, according to the nature of the medium in which it moves.

As a general rule, a body shows itself paramagnetic towards one less paramagnetic than itself, indifferent towards one equally magnetic, and diamagnetic towards one more paramagnetic than itself. The same takes place, *mutatis mutandis*, with diamagnetic substances. This has given rise to the theory, that there is no such thing as diamagnetism *per se*, and that bodies are diamagnetic only in media of greater paramagnetic power than their own. This view of the case is, however, rendered highly improbable from the fact, that diamagnetism is exhibited as decidedly in a vacuum as in any medium, and a vacuum cannot be supposed to possess magnetic properties of any kind.

DIAMANTI'NO, a significant name in the diamond districts of Brazil, indicates a river and two towns.—1. The river, apparently an affluent of the Paraguay, and, through it, of the Plate, rises in the province of Matto Grosso, being joined by the Ouro 70 miles to the north-north-west of Cuyaba.—2. Of the two towns, the more westerly stands at the confluence above mentioned, having a population of 4500.—3. The more easterly town, again, is in the province of Minas Geraes, and stands amid the head-waters of the St. Francisco at an elevation of 5700 feet above the sea. It has about 7000 inhabitants.

DIA'METER, in Geometry, is generally used in speaking of curves, and its most general definition is, a straight line bisecting all parallel chords in a curve. In the circle, ellipse, and hyperbola, all diameters pass through the center, and are there bisected. Only the circle has all diameters equal; and each bisects the chords at right angles to it. In the ellipse, this last is only the case with the two diameters called the major and minor axes. In the parabola, all diameters are parallel to the axis. Many curves of the higher orders have no diameter at all.

We speak also of the diameters of solid bodies of a round shape. In the sphere, lines passing through the center are diameters, and so in the ellipsoid; they are all bisected in the center.

DI'AMOND (corrupted from Gr. *adaman*, untamable, refractory), the most valuable of precious stones after the ruby, and the hardest of all known substances. It consists of Carbon (q. v.), a simple or elementary substance, crystallized, and in its greatest purity. Diamonds are commonly colorless and clear like water; although sometimes, from some slight foreign intermixture, they are white, gray, yellow, green, brown, and more rarely orange, red, blue, or black. The lustre is adamantine and very high; the transparency perfect in specimens perfectly free from foreign substances, the presence of which, however, even in very small quantity, mars it, and sometimes almost produces opacity. The D. becomes positively electric by friction, but is not electrified by heat, a test which sometimes serves to distinguish it from the topaz. Its specific gravity is about 3.6. Its primary form is a regular octahedron, but it appears also in rhombic dodecahedrons; and its crystals often have curvilinear faces and edges. Its structure is distinctly lamellar.

It burns before the blow-pipe in air or in oxygen gas, combining with oxygen to form carbonic acid. Its hardness renders it incapable of being scratched by any other substance, and in cutting and polishing diamonds, diamond-dust is employed. The estimation in which it is held as a precious stone is due to its remarkable hardness, rarity, and brilliancy. The art of cutting diamonds, although long practised in India and China, was not known in Europe till after the middle of the 15th c., when it was discovered by Louis van Berguen of Bruges. Previous to that time, diamonds were set without being cut, and in that state they have often a rough, dull, and uneven surface. Diamonds are indeed found not only in the form of perfect crystals, but also in rolled grains; and they are obtained partly from alluvial soils and the sands of rivers, and partly from rocks, chiefly a quartz sandstone or conglomerate, in which they are often associated with

gold. A number of localities in India have long been celebrated as productive of diamonds, particularly Golconda (q. v.); they are found also in Malacca, Borneo, and other parts of the East; nor were any diamonds procured in any other part of the world till the beginning of the 18th c., when they were discovered in remarkable abundance in the district of Serra do Frio, in the province of Minas Geraes in Brazil. In 1829, they were discovered in the Ural Mountains. They have also been found in North Carolina; in Georgia; in the province of Constantine, Algeria; in Australia; and in South Africa. In 1867, the first South African diamond was recognized as such; and by 1881, stones to the value of £23,000,000 had been found. The Kimberley mine, one of the 'dry diggings,' is about 250 feet deep. Of late, 650,000 natives have been employed in the diggings. Diamond mines generally consist of mere diggings and washings of alluvial deposits. In Brazil, the method pursued is to rake the alluvial matter backwards and forwards on inclined planes, over which a stream of water is made to run, till the lighter particles are carried away, when large stones are picked out by the hand, and what remains is carefully examined for diamonds. Large diamonds are comparatively rare among those of Brazil. Brazil produces yearly from 25,000 to 30,000 carats of diamonds, of which, however, not more than 9000 carats are capable of being cut, the rest being either very small or of inferior quality. A rotary drill, armed with impure, black diamonds, is now much used in boring rock, and is found very valuable.

The small and inferior diamonds are called *BORT*, and command a ready sale for their use in the arts, being pounded in a steel mortar, and much employed in the form of diamond-dust by lapidaries for cutting and polishing diamonds and all kinds of gems, and even for polishing rock-crystals for spectacles. Minute fragments or splinters of bort are also used for making fine drills, which are used for drilling small holes in rubies and other hard stones to be employed in watch-making, gold and silver wire-drawing, &c., and for piercing holes for rivets in china, in artificial enamel teeth, &c. The use of small diamonds by glaziers for cutting glass is well known. The diamonds so used are uncut, and they are so mounted as to act upon the glass not by an angle, but by a curvilinear edge of the crystal. The cut is only to the depth of about one two-hundredth part of an inch, but is sufficient to make the glass readily break in accordance with it.

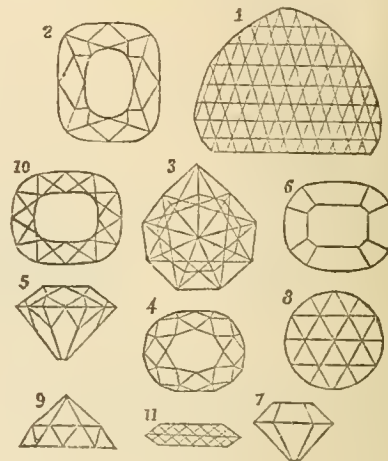
Diamonds are cut into various forms, but principally into *brilliant* and *rose diamonds*. The *brilliant* cut is the most expensive and difficult, but is also that which best brings out the beauty of the stone; it has an upper or principal octagonal face, surrounded with many facets, and other things being equal, the greater the number of facets the more valuable is the diamond. The lapidaries of the East, sometimes multiply facets to hide imperfections of the stone. *Rose diamonds* have a flat base, above which are two rows of triangular facets, the six uppermost uniting in a point. Rose diamonds are made of those stones which are too broad in proportion to their depth to be cut as brilliants. Stones still thinner are cut as *table diamonds*. The art of sawing diamonds, when too thick in proportion to their surface, was invented by a Dutchman named Dalbeck in the beginning of the 19th century.

The value of diamonds is variously estimated. The rule generally given is to square the number of carats the diamond weighs, and then to multiply by the price of a single carat. Thus, a rough diamond of 12 carats weight, one carat being estimated at £2, would cost $12 \times 12 \times 2 = £288$. The value of a diamond is much increased by its being cut, although the actual weight is diminished. Beyond a certain weight, no rule of calculation can be applied, owing to the limited number of purchasers, and the most fabulous values have been assigned to famous diamonds. The price of diamonds varies according to the supply and changes in fashion, and is now lower than formerly.

There is a way of falsifying diamonds by joining an under part of some other stone to an upper part of genuine diamond. Some varieties of Sapphire, Hyacinth, and Topaz, are often passed off for diamonds. The first two may be distinguished by their greater specific gravity, the latter by its becoming electric when heated. Rock-crystal, and glass or 'paste' imitations, are lighter than true diamonds, and less hard and brilliant. The best test of a genuine diamond is hardness. Care must be taken, however, to avoid breaking off its angles, in testing it by scratching other substances with it, as, though hard, it is somewhat brittle.

Some particular diamonds, from their unusual magnitude, or from circumstances of their history, are of such interest as to entitle them to notice. The collection of the emperor of Brazil is said to contain an uncut diamond—the Braganza diamond—of the enormous weight of 1680 carats, or about 12 ounces; but it is suspected to be only a fine colorless topaz.—The largest diamond certainly known is that belonging to the rajah of Mattan, weighing 367 carats. It is egg-shaped, with an indented hollow near the smaller end. Many years ago, the governor of Borneo offered for it 500,000 dollars, two war-brigs fully equipped, a number of can-

non, and a quantity of powder and shot. But the rajah refused to part with it, the fortunes of his family being supposed to be connected with it, and the Malays ascribing to water in which it has been dipped the power of healing all diseases. Perhaps the most famous diamond is the Koh-i-noor (q. v.), once a boasted possession of the Great Mogul, and now belonging to the Queen of Great Britain. It is said to have weighed 900 carats in the rough; but now, after various cuttings, weighs 106 carats. The Orlov diamond, belonging to the Russian emperor, and which was once the eye of an Indian idol, is said to have weighed, when rough, 779 carats, but is now cut, egg-shaped, and weighs 192½ carats.—The Regent diamond, or Pitt diamond, which weighs in its cut state 136½ carats, is unrivalled in its limpidness and its form, its diameter and depth being nearly equal. It was found in Golconda, was brought from India by an English gentleman named Pitt, the grandfather of the first Earl of Chatham, and by him sold to the Duke of Orleans for £130,000. It decorated the hilt of the sword of state of the first Napoleon, was taken by the Prussians at Waterloo, and now belongs to the king of Prussia.—The



Diamonds:

1, the Koh-i-noor; 2, Regent or Pitt Diamond; 3, Grand Duke; 4, 5, vertical and lateral appearance of the brilliant diamond; 6, 7, vertical and lateral appearance of the brilliant diamond before being recut; 8, 9, vertical and lateral appearance of rose-cut diamond; 10, 11, the table cut diamond.

Sanci diamond, weighing 106 carats, has a still more interesting history. It belonged to Charles the Bold, Duke of Burgundy, who wore it in his hat at the Battle of Nancy, where he fell. A Swiss soldier found it, and sold it to a clergyman for a gulden. It passed into the possession of Anton, king of Portugal, who was obliged to sell it, the price being 100,000 francs.

When owned by a French gentleman named Sanci, it was sent as a pledge to King Henry III. The servant carrying it was attacked by robbers and slain, but swallowed the diamond; and the master causing the faithful servant's body to be opened, found the diamond in his stomach. This diamond came into the possession of the crown of England, and James II., carried it with him to France in 1688. Louis XV. wore it at his coronation. In 1835, it was purchased by a Russian nobleman for £80,000. The Porter Rhodes diamond, found at Kimberley, South Africa, in 1880, is of a remarkably clear blue-white. It weighs uncut 150 carats, and is the largest found this century; as a brilliant, it would be about 100 carats. £60,000 was offered for it in vain.

DIAMOND BEETLE (*Curculio impositus*), a beetle or coleop-



Diamond Beetle (*Curculio splendens*).

terous insect of the tribe to which the name *WEEVIL* is generally appropriated, but remarkable for the splendor and exquisite beauty

of its colors, in which it is thought to be unrivalled even among coleopterous insects. It is of a golden-green color, with two black longitudinal bands on the thorax, and several rows of depressed spots on the elytra (wing-covers), which exhibit a beautiful and sparkling green with intervals of black. It is a native of warm parts of South America.

DIAMOND HARBOR, the port of Calcutta for large ships, is situated on the left side of the Hoogly, about 30 miles below the capital, with which it is connected by an excellent road and by electric wires. As the adjacent country is swampy and unhealthy, the spot is marked only by a few native huts. The commercial value of the locality, however, is likely to increase, in proportion as the silting up of the river above impedes the upward navigation.

DIAMOND NECKLACE, THE, a wonderful piece of jewelry, made in Paris, about the year 1775, and intended for Madame Du Barry, the favorite of Louis XV. She, however, was excluded from court on the death of Louis (1774), and before the necklace was finished. After being made, this beautiful ornament, adorned with 500 diamonds, was discovered to be so costly that no one could purchase it. It was valued at 1,800,000 livres, which in present sterling money is equal to about £80,000.

The Prince Cardinal de Rohan, a wealthy, vain, and profligate man, persuaded by a woman named De Lamotte, who waited about court, that the queen (Maria Antoinette) regarded him with an eye of favor, became so infatuated with the idea, that he was ready to do anything, however, extravagant, in order to preserve this feeling in the queen. De Lamotte had stated to the cardinal that the queen was desirous of obtaining this glorious necklace, and that not having sufficient money just then, she would sign an agreement to purchase it if the cardinal would become security. The cardinal consented. The agreement was approved of and signed with the royal signature, as also with that of the cardinal, who, on the 1st February 1786, carried off the treasure to Versailles, where it had been agreed the queen should send for it. On the following day, a person, dressed in the uniform of one of the court valets, entered the apartments of the cardinal, and repeating as he entered the words, *de par la reine*, 'in the name of the queen,' he advanced to the table whereon the casket containing the treasure lay, and bore it away. In a few days De Lamotte, her husband, and the *soi-disant* valet, having all disappeared from Paris, were busily engaged separating the diamond necklace into portions, and selling them. The whole transaction had been a trick; the messages from the queen, verbal and written, were without foundation, the latter, indeed, being forged by the 'valet,' who was skilled in imitating handwriting. The plot was discovered by means of the maker of the diamond necklace, who, not receiving any money when the period of the first instalment had arrived, went to court, demanding to know if the necklace had been delivered to the queen. In a few months the cardinal found himself in the Bastille, where those by whom he had been duped were already sent. In May 1786, the trial of the prisoners was brought to a close. De Lamotte was branded on each shoulder with the letter V (for *voleuse*, thief), and was sentenced to be imprisoned for life. All the others were acquitted. The queen was falsely supposed by the populace of Paris to have been implicated in the plot, and the odium resulting from it was cast upon her, even at the last, when she sat on the cart that bore her through a raging and ensnaring mob to the guillotine.

DIA'NA, a Roman goddess, corresponding in most of her attributes to the Grecian Artemis. According to the myths, she was the daughter of Jupiter and Latona, and the twin-sister of Apollo.

She was born, along with her brother, on Mount Cynthus, in the isle of Delos, which till then had been a floating island, but was fixed by Neptune in its present place, that Latona might there give birth to her children in peace and safety from the persecutions of the Jealous Juno. D. was worshiped by Greeks and Romans alike, as both a destroying and a preserving goddess. In the former capacity, she was represented as a full-grown virgin, armed with bow and arrows, with which she avenged herself on her enemies; as a preserving deity, she watched over the sick, and helped the unfortunate. Young girls, and women in childbirth, were the objects of her special care. She was herself beyond the allurements of love; and the ministers of her worship were vowed to lives of the strictest chastity. As sister of the sun-god Apollo, D. was regarded as the goddess of the moon; hence her Greek name *Selene*, and her Latin names *Lucina* and *Phæbe*. Her worship was conducted with splendid rites in different cities. Her temple at Ephesus was one of the seven wonders of the world. In Tauris (the Crimea), she was propitiated with sacrifices of human victims; and before her statue at Sparta, the public scourging of the Lacedæmonian youth used to take place. In Arcadia, she was looked upon as the special patron of hunting and all sylvan sports, and as such was represented in Greek works of art as a tall and handsome maiden,

with long hair floating down her neck, drawing an arrow from her quiver with one hand, and with the other holding a struggling



Diana

deer. As goddess of the moon, she wears a long robe reaching to her feet, and bears on her brow a crescent moon.

DIA'NO, a town of Southern Italy, in the province of Salerno, 45 miles south-east of the town of Salerno. It occupies a beautiful situation on an isolated hill overlooking the river Calore, and in the fertile vale of Diano, which takes its name from the town. There are several churches and an old castle. The commune has a pop. of about 6000.

DIA'NTIUS. See PINK.

DIAPA'SON, a term in music by which the ancient Greeks designated the octave. In modern music, diapason is used to denote the range, or compass of the voice, or of an instrument. The French use the term as equivalent to *pitch*. Diapason is also the English name given to certain stops of pipes in the organ, of eight feet pitch, which are considered the fundamental stops, of which there are generally two—a stopped diapason and an open diapason on each manual. See ORGAN-BUILDING.

DIAPA'SON REGULATOR. The French, who gave the name of *diapason* to the tuning-fork, have lately made attempts to use that instrument in connection with clockwork, partly as a means of counting very small intervals of time. M. Duhamel made an arrangement in which a cylinder, by means of a screw-tapped end, was made to advance a little in the direction of the axis; this cylinder was covered with blackened paper, and was rotated by means of clockwork. A diapason had a style or marker, made of a small bit of pointed spring, fixed to the end of one of the prongs. On the diapason being sounded in the usual way, and the spring placed lightly against the cylinder, the style traced a sinuous white line on the black paper. The sinuosities became visible representatives of minute intervals of time, the prongs vibrating hundreds of times in a second. M. Breguet then proposed clockwork to prolong the vibrating of the prongs, superseding the pendulum and the spiral spring by a diapason. Fuller details are given in Breguet's description of the apparatus in the *Revue Chronometrique*.

DI'APER (Ital. *diaspro*), a term derived from *jasper* or *diasper* (see letter D), which stone being much used in ornamenting jewelry, originated the Mid. Lat. name *diasprus*, for a texture ornamented or variegated in an analogous way. In textile manufactures, the term is applied to fabrics with patterns of geometrical regularity, such as are produced by the kaleidoscope, woven in their texture, and produced with shafts and heddles, without the Jacquard machine. In Architecture, **DIAPER-WORK**, or **DIAPER-ING**, is a kind of decoration applied to plane surfaces, and consists of a small pattern either of flowers, leaves, or arabesques, carved or painted. The flower or other object, is generally enclosed in a small frame; and these frames, which touch each other at the edges, constitute in themselves a sort of mathematical diapering. When the pattern is carved, it is generally sunk; and when painted, it consists of a darker shade of the same color as the plane surface, by which the effect of shadow is communicated to it. The accompanying illustration, from Bloxam's *Gothic Architecture*, exhibits a very beautiful example of decorated English diapering. It is taken from Canterbury Cathedral.



Diaper.

DIAPRE is applied in Heraldry to fields and charges, relieved by arabesque and geometrical patterns. These patterns were

generally of a darker shade of the same tincture. This being merely an ornamented device, not affecting the heraldic value of the objects to which it was applied, was generally left to the fancy of the painter.

DIAPHORE'SIS (Gr.), the cutaneous perspiration, whence

DIAPHORETICS, remedies to excite the secretions of the skin. The simplest of all diaphoretics are baths, which may be either warm baths of water, or of vapor, either simple or medicated. See BATHS. The most powerful of all, however, as regards educing perspiration, is probably the so-called Turkish bath, which consists essentially in the use of a sweating process, by means of air heated to a temperature of 140° , or even more. The following remedies, used internally, are powerful diaphoretics: antimony, ipecacuanha, opium (these three either singly or in combination); ammonia, and the carbonate or acetate of ammonia (spirit of mildererus), sarza, guaiacum, dulcamara, and sassafras. On most of these substances, special articles will be found. A favorite formula is Dover's powder, consisting of a grain of opium, and a grain of ipecacuanha in each ten grains of the powder. This in doses of from five to eight grains, followed by warm drinks and plenty of blankets in bed, usually produces copious perspiration, and is very soothing and useful in many commencing inflammatory and febrile complaints. James's powder, in doses of from three to eight grains, is often added to the above in domestic prescriptions; but neither of these medicines should be used rashly, as in certain states of the system they may prove dangerous; should never be given to very young children.

DIAPHRAGM (Gr. *diaphragma*, a partition). This is the name applied in anatomy to designate the transverse muscle which, in man and the mammalia generally, separates the cavity of the thorax or chest from that of the abdomen or belly. It is not easily described, but will be best understood by a reference to the accompanying figure (fig. 1).

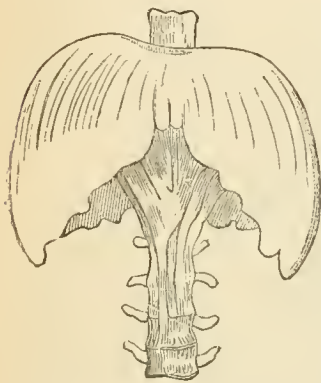


Fig. 1.—The Diaphragm in a state of repose. Anterior view.

In form, it is nearly circular; it is fleshy at its edges, tendinous in its center, and ending in a point below. In front, it is attached to the ensiform cartilage of the sternum, or breastbone; laterally, to the inner surfaces of the six lower ribs; and posteriorly, to two tendinous arches on either side, termed the *ligamenta arcuata*, and to the anterior surface of the bodies of the second, third, and fourth lumbar vertebrae on the right, and only the second and third on the left side; these origins from the vertebrae forming two large fleshy bellies (termed the *crura*), which ascend to join the central tendinous portion.

The diaphragm presents three principal openings; one quadrilateral, in the tendinous center, for the upward passage of the inferior vena cava; one of an elliptic shape, formed by the two crura for the oesophagus and pneumogastric nerves; and a third for the aorta, the azygos vein, and the thoracic duct.

The diaphragm is in relation superiorly with the pleurae and pericardium, enclosing the lungs and heart; inferiorly, on the left side with the stomach and spleen, on the right with the convex upper surface of the liver; posteriorly, with the kidneys and supra-renal capsules and the duodenum; and by its circumference with the ribs and intercostal muscles, with the sternum, and with the vertebral column.

We see from figure 1 that it is convex superiorly, and concave inferiorly. When it contracts, its upper convexity approximates to a plane surface, and the cavity of the chest being thus enlarged, air rushes in to fill the partial vacuum, and expands the lungs during the act of inspiration (fig. 2). It is thus an inspiratory muscle, and is the sole agent in tranquil inspiration. The enlargement of the thoracic cavity caused by the contraction of the diaphragm, must obviously be associated with a corresponding diminution of the abdominal space. Hence this muscle, by its action on the abdominal viscera, aids in the expulsion of the feces and urine.

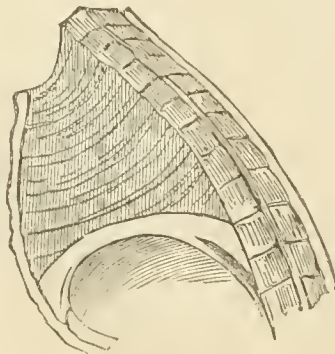


Fig. 2.—The Diaphragm in a state of contraction. View of lateral section.

Spasmodic action of the diaphragm produces hiccough and sobbing; and in laughing, the alternate contractions and relaxations of this muscle occur with increased rapidity. Stoppage of the action of the diaphragm, whether from great external pressure or from paralysis, is very speedily fatal.

DIAPHA'NOSCOPE (Gr. *diaphanos*, transparent; *skopeo*, I see), a dark box, suitably constructed for exhibiting transparent photographs or other pictures. It may or may not be furnished with a lens.

DIAPHRAGM, a partition with a hole in it, employed not only in landscape and portrait lenses for photography, but also in telescopes, microscopes, and other optical instruments, for the purpose of cutting off the superfluous rays of light, and producing greater intensity or sharpness of the image, as well as to correct aberration.

DIAPHRAGM SHELL. See SHELL.

DIARBEKIR, a town of Asiatic Turkey, capital of a vilayet of the same name, is situated on the right bank of the Tigris, at a short distance from the river, the intervening space being occupied by rich gardens; lat. $37^{\circ} 55' N.$, long. $39^{\circ} 52' E.$ The town, which is circular in shape, covers a considerable area, and is surrounded by high strong walls, flanked with towers, and pierced by four gates. The streets are dirty, and the houses for the most part are built of rough stone, plastered with a composition of mud and straw, but some of the better class are of black basalt. It has numerous handsome mosques, khans, and bazaars, and five Christian churches. Extensive manufactures of silk, cotton, and other goods, affording, with an active commerce between Aleppo and Bagdad, employment to about 40,000 families, were at one time carried on here; but the manufactures and trade have now greatly declined, and the population of D. does not amount to more than 8000 families, 6300 of whom are Turkish, the rest being Greek, Armenian, Catholic and Jewish.

The silk manufacture, which is now the staple, is said to be improving. D. occupies the site of the ancient *Amida*, which was a place of importance in the reign of Constantius, by whom it was strengthened and enlarged. In this reign it was taken by the Persians, from whom it was again captured by the Romans; but in 502 the Persians once more became masters, and put 80,000 of the inhabitants to the sword. After many vicissitudes, it passed into the hands of Sultan Selim in 1515. Many Roman and Sarcenic remains still exist here.

DIARRHOEA (Gr. *dia*, through, and *rheo*, I flow), a disease, or rather a tribe of diseases, characterized by an increase in the discharges from the bowels, which are usually unduly liquid, sometimes overcharged with bile, and sometimes the contrary. Diarrhoea has many varieties and many causes; but the whole tribe of diarrhoeal diseases present certain relations in common, which have been studied of late years to a considerable extent from the preventive or sanitary point of view. Thus it is observed of all these diseases, without exception, that they are more apt to prevail during summer and autumn than during the earlier seasons of the year; and it is also well established that their prevalence is to a great extent dependent on the intensity of the solar heat, so that a temperature above $60^{\circ} F.$ seems to be almost essential, under ordinary circumstances, to their epidemic diffusion. Moreover, it has been shown that the decomposition of organic matters in the neighborhood of human dwellings, and the introduction of the products of decomposition into the food, drink, or air used by the healthy, has been a direct exciting cause of diarrhoea in a great number of instances where the disease has been locally epidemic; from which it is inferred that the real source of diarrhoeal diseases is usually to be found in a morbid poison closely associated with the process of putrefaction, although not, perhaps, necessarily generated during that process. It has been noticed that cold and wet seasons are the least favorable to the production of diarrhoea, which is explained on the theory above alluded to by the rapid removal in such seasons of all organic debris; and there is little doubt that this explanation is correct, as the converse is equally true, the combination of heat with long-continued drought being almost sure to waken into life the epidemic seeds of diarrhoea. Again it is noticed that where drainage is imperfect, and drinking water impure, diarrhoeal diseases are specially apt to occur (see CHOLERA); the class of the population most apt to be affected being those who occupy low levels, or who are otherwise exposed to the influence of this aqueous or gaseous poison. Infants are especially apt to suffer from diarrhoea, and a large number of the infantile deaths in many English towns are caused either directly by this disease, or by the abuse of stimulants and narcotics for its cure.

Diarrhoea is either simple, bilious, or choleraic; the last form has already been discussed. See CHOLERA. The ancients applied the name *lientery* to a diarrhoea in which the dejections consisted of matters not digested, or very partially so; this form is,

however, very unusual, at all events in this country. Dysentery (q. v.) is also a form of diarrhoeal disease; as is the form of fever (q. v.) called gastric, typhoid, or enteric fever. Simple and bilious diarrhoea probably often differ only in degree; they are both distinguished from the advanced stages of cholera and dysentery by the presence of abundance of biliary coloring matter in the stools, and by the absence of the distinctive features of the other two diseases as described elsewhere. Diarrhoea frequently depends on organic disease, either of the intestines themselves, or of the liver, kidney, or spleen. It is also one of the most common symptoms of the advanced stage of consumption (q. v.).

When diarrhoea is plainly the consequence of improper food or drink, when it is very recent, when the strength of the patient is not much impaired, when there is much griping pain or distention of the belly, when the evacuations are very unnatural in character, and especially when they are dark colored and very fetid; when the disease has been preceded by habitual constipation (q. v.), and when there is no organic disease to be discovered, it is well to let diarrhoea run its course, at all events for a time, and either to aid it by small doses of very simple laxatives, or, at all events, to abstain from hastily checking the discharge, which in these cases is to be regarded as a truly curative and beneficent process, calculated to disburden the system of some poisonous or deleterious substance, and only requiring time for the restoration of the patient to health. In other cases, especially of febrile diarrhoea, an emetic of ipecacuanha at the very beginning will sometimes remove the disease with remarkable rapidity; and in most forms of diarrhoea it may be alleged that this medicine (in doses of from one to five or even ten grains) is well borne. Sometimes it is combined with opium in the form of Dover's powder. Vegetable astringents, as catechu, kino, tannin, matico, logwood, are also much employed both in acute and chronic cases; some prefer the acetate of lead, with opium (which, however, is more suitable to dysentery). It should be observed that in some forms of diarrhoea the use of opium, though a most powerful remedy, is contraindicated by the state of the constitution; it should in no case be largely given without medical advice. In many chronic cases the metallic tonics and astringents are of service—e. g., iron, sulphate of copper, zinc, and bismuth. In a very large class of cases, especially of infantile diarrhoea, depending upon a too acid state of the secretions, the leading remedy is chalk, either in powder or in the very serviceable form of the *mistura cretæ* (mixture of chalk) of the pharmacopœias, from one to three dessert spoonfuls of which may be given after every disturbance of the bowels. Lime-water, mixed with milk in the proportion of one to four or five, is easily given to very young children, and serves nearly the same purpose.

DI'ARY (Lat. *diarium*, from *dies*, a day), means simply a daily record. It does not, however, comprehend every sort of daily record, but only such as have reference to the writer personally. In it the *littérateur* inscribes the daily results of observation, reading, or thought; to the mercantile man, it serves the purpose of an order or day book; while the physician finds it indispensable as a register of engagements. The use of diaries has become so general, especially in England, that the making of them now forms an important branch of the book-manufacture. Letts and Co., of London, issue annually upwards of a hundred varieties of diary, from the large folio to the smallest pocket volume. The usual diary may be described as a book with a separate blank space for every day in the year, these spaces varying in size and form, as the particular bent or profession of the diarist may render necessary. Bound up with these diaries is a summary of the important events of the past year, a list of the acts of parliament passed during the previous session, an enumeration of public holidays, terms, &c., a great amount of valuable information regarding banking and insurance businesses, with a vast quantity of miscellaneous memoranda, so that the proprietor possesses in one book a diary and an almanac.

Diaries have often furnished the historian with invaluable material, supplying the absence of public records, and furnishing minute and graphic details of the social condition and of the secret springs of public events that are not to be looked for in more formal records. Perhaps the most notable in this respect are the diaries of Evelyn and Pepys.

DIASCHI'SMA, the Greek name of a small musical interval which only appears in the mathematical calculation of greater intervals. The diatessisma is, (1) the difference between the great half tone and the small *limma*, or the remainder when the latter is subtracted from the former, 2048:2025; (2) the difference between the *diesis* and the *syntonic comma*, also 2048:2025. The diatessisma and the small *limma* added together always make the greater half tone, or 16:15; and the *syntonic comma* added to the diatessisma always make the *diesis*, 128:125.

DI'ASTASE is a peculiar ferment developed during the germination of all seeds. An impure solution of diastase may be procured by adding one part of hot water to two parts of ground

malt (see BEER), or freshly germinated barley, and, after standing for a short time, straining through a cloth. The proportion of diastase in malt is not more than 1 part in 500 parts, and yet it performs important functions. Thus diastase has a powerful action upon starch, and at a temperature of 150° Fahr. one part is considered powerful enough to change 2000 parts of starch into dextrine, and then into grape sugar. When obtained separately, diastase is a white tasteless substance. See GERMINATION.

DIATHE'RMANOUS. See HEAT.

DIA'THESIS (Gr. *dia*, through, and *tithemi*, I place or arrange), a Greek word signifying a disposition or arrangement, and applied by the old medical authors to the predisposition or constitution of the body which renders it prone to certain diseased states. Thus the tubercular, scrofulous, gouty, rheumatic, cancerous, or calculous diatheses, are described as something different from the corresponding diseases, but leading to these as natural or probable consequences, under certain conditions or exciting causes. The study of diathesis apart from existing disease, however, is almost always unsatisfactory, and leads to over-refinement and the pursuit of intangible abstractions, without due regard to evidence; inasmuch as the existence of a state which is not disease, but leads to disease, can rarely be established upon an unassailable basis.

DIATOMACEÆ, or DI'ATOMS, a group of organized beings, now generally regarded as belonging to the vegetable kingdom, and ranked as a sub-order of *Alga*; but formerly reckoned among animalcules, a view of their nature still entertained by some naturalists. Lindley makes D. an order of his *Algal Alliance* of thallogenous plants, including *Desmidiæ* (q. v.) as a sub-order, and distinguishing the true D. as another sub-order, under the name *Cymbellæ*. The D. are generally of a brown color, although they not unfrequently become greenish when dry. They are remarkable for their silicious covering, composed of two pieces or valves, and their angular shape, and are among the most beautiful and interesting of microscopic objects, exhibiting great variety of markings—striae, dots, &c.—regularly and symmetrically arranged. The valves, or pieces of the silicious covering, are always equal in length, but their sides often differ much in breadth. All within appears to be only a single cell; but many of these cells are often united or in contact, according to some mode of arrangement characteristic of the particular species. D. are found both in salt and fresh water, also on the surface of damp rocks and walls, garden-paths, flower-pots, the glass of hot-houses, &c. They may generally be obtained in great numbers by allowing water in which they exist to stand for a few hours, and then pouring off all except the more muddy or slimy part at the bottom. They may often be seen to move a little in the water or slime in which they exist, particularly those of most elongated form; and this was once regarded as a very conclusive evidence of their animal nature, but is now believed to be no more so than the movements of vegetable zoospores, and to be owing to their imbibing and emitting fluids in the processes of their vegetable life. They increase by division (whence the name diatomeæ, Gr. through-cutting), which takes place not transversely but longitudinally; and the lines which mark its progress are almost always visible in them. In this process, new silicious valves are formed along the line of division, the old valves remaining on the outer sides, and each new diatom cell having an old valve and a new one.

True reproduction takes place by conjugation (q. v.), and by the formation of *Sporangia* (see SPORE). D. very rapidly putrefy, but their silicious shields resist decomposition more perfectly than almost any product of organic nature, and are found in immense numbers in many marls, clays, and rocks. They are capable of resisting even the action of fire, and of the gastric-juice of the stomachs of animals, and are found in pumice and volcanic ashes, and in guano. The abundance of the D. as existing organisms, corresponds with what we infer from their remains in the oolite, chalk, &c., as to former geological periods. Britain is known to possess hundreds of existing species. Dr. Hooker found them in such numbers in the Antarctic Ocean as to give an ochreous brown color to the surface as far as the eye could reach, and to the icebergs floating in it; whilst a submarine deposit is in process of formation, composed of their silicious shields. Thus, these minute organisms, unimportant as they may be deemed individually, fill no insignificant place, collectively, in the general scheme of creation.

Fossil D. have been observed in strata of every age. Though so minute in the individual, they form, in the aggregate, considerable thicknesses of rock—they have, in fact, in common with the associated and nearly as minute and simple organisms of the animal kingdom, the Foraminifera, produced greater changes, and left more lasting records than any effected by higher members of either kingdom. In the older rocks, D. have not been noticed in any quantity, their existence, however, in the clay-slates of the Lower Silurian was discovered by Mr. A. Bryson, and has been

subsequently noticed by other observers. In Tertiary strata they occur in abundance. There is good reason for believing that the silicious substance of flint was obtained, to a large extent, from these organisms; many of their frustules may yet be discerned in it. Tripoli-stone consists entirely of their silicious plates, hence its value as a polishing agent. Several extensive deposits of tripoli are found in Bohemia—one at Egea is two miles in length, and averages 28 feet in thickness; another at Bilin, forming the upper layer of a hill, is 14 feet thick; it is composed chiefly of a species of *Gallionella*, with specimens of *Navicula*, &c., as many as forty-one thousand millions exist in every cubic inch of the stone! The city of Richmond, in Virginia, is built on a stratum of diatomaceous earth, 18 feet thick. Similar deposits are found in different localities in Britain, as at Premnay, Dolgelly, Lough Mourne, Raasay, and Mull. From the last locality, Gregory has given a catalogue of 150 species. The whitish powder of which the deposit consists is called in Sweden Bergmehl (q. v.), and is, in seasons of scarcity, mixed by the poor with their food, though probably without any advantage, save increasing its bulk. D. occur in more or less abundance in marl, peat, guano, estuary mud, and other recent deposits.

DIATONIC, a term used in the science of music, originally from the Greek, meaning 'by tones,' or 'from tone to tone.' The diatonic species of the ancient Greeks—apart from their chromatic and enharmonic species—formed the foundation of their whole system of music, and was arranged in tetrachords composed of one semitone and two whole tones. The diatonic scale of modern music is a combination of the Greek tetrachord, forming a succession of sounds progressing from degree to degree, by tones and semitones in a certain fixed order, neither omitting nor repeating; the position of the semitones varying, as the scale is major or minor.

DI'ATRIBE (Gr. *diatribè*, a disputation, or critical exercise) was a name originally given to a critical examination of a literary work, and at a later period to a bitter and violent criticism, either written or spoken, on any subject, in any department of literature.

DIAZ, BARTOLOMEO, a Portuguese navigator of noble birth, who flourished during the latter half of the 15th century. His residence at the court of King John II. brought him into contact with many scientific men, among others the German cosmographer Behaim (q. v.). D. took a great interest in geographical discovery, and his knowledge and abilities were so highly estimated, that the king gave him the command of two vessels with a view to following up the discoveries already made by Portuguese adventurers on the west coast of Africa. D. soon reached the limit which had been attained in South Atlantic navigation, and first approached land in 26° south lat. After disembarking at various places, and taking possession of the shores in the name of the Portuguese king, he sailed round the southern extremity of Africa without suspecting it, and cast anchor at the mouth of the Great Fish River, a little to the east of Algoa Bay. A storm now rose, and drove him into Algoa Bay. He there found, near Port Elizabeth, his companion-vessel, from which he had been separated before rounding the Cape; but unfortunately the greater part of its crew had been murdered by the blacks. He now, for the first time, noticed his discovery, and called the cape, in remembrance of his danger, *Cabo de todos los tormentos* (Cape of all the Storms)—a name which the king of Portugal afterwards changed into its present, *Cabo de Buena Esperanza* (Cape of Good Hope). D. arrived in Lisbon December 1487, and was at first greeted with enthusiasm, but soon saw Vasco da Gama preferred before him, and was compelled to act under the latter in the grand expedition of 1497. Vasco da Gama even sent him back to Portugal after they had reached the Cape Verd Isles, so that he had no share in the honor of discovering a maritime route to the Indies. Three years after, he joined the expedition of Cabral, the discoverer of Brazil, but was lost in a storm, 29th May 1500.

DIBBLE AND DIBBLING. The common garden dibble is an implement too well known to require any lengthened description. A round piece of wood, about an inch and a half in diameter, sharpened at the point, is the most simple and common form. To allow it to be more easily pressed into the ground, a handle is usually added. This is all that is needed for a garden dibble. In some parts of England, where labor is plentiful, large breadths of wheat are put in with the dibble. Several dibles are usually joined together, and made of sufficient length to enable a man to perform the operation, as he walks backwards, without much stooping. Children follow with the seed, and drop two or three grains of wheat in every hole. The dibbler is often used to put in beans. By dibbling, a considerable saving of seed is effected. From one bushel to six pecks of wheat is the usual quantity required to sow an acre. Dibbling is thought to be advantageous for light lands which are in good condition. More recently, several ingenious machines for dibbling have been constructed. The one most worthy of notice is Newberry's Horse-dibble, which

sows from one to seven rows, and accomplishes the operation with great nicety and accuracy. Being an expensive machine, however, it has not come into general use. Dr. Newington has invented a hand-dibble, a very perfect implement of its kind; the same machine makes the holes and deposits the seed at once. This has been a useful article on small holdings, and it is the greatest favorite at the present moment.

Dibbles of every kind are unsuitable for stiff or clayey soils; the soil, compressed and hardened around the hole which they make, not readily admitting the young fibres of the root, and retaining water to the injury of the young plant.

DIBBS, the English name of a game of great antiquity, played by boys and girls; and in Russia, as is described by Dr. Clarke, it is played sometimes even by old men. It consists in throwing up the joint-bones of the legs of sheep, and catching them first on the palm and then on the back of the hand. The antiquity of this simple kind of play is proved by figures on Grecian vases, on which females are seen kneeling and engaged in the sport. In Scotland, where the game is more usually played with small pebbles or shells, it is called 'the chucks.'

DIBDIN, CHARLES, musician and poet, was born at Southampton in 1745, educated at Winchester, and at the early age of sixteen made his literary *début* in London, by writing an opera called *The Shepherd's Artifice*, which was produced at Covent Garden Theater, of which he afterwards became musical manager. In 1789, he commenced giving a series of musical entertainments in the city, entitled *The Whim of the Moment*, which acquired a great celebrity. After several vicissitudes, he withdrew, in straitened circumstances, from public life in 1805, when government granted him, in consideration of his literary merits, a pension of £200. He died in 1814. D. is an admirable writer of sea-songs, of which he composed about 1200. Neptune, and not Apollo, seems to have inspired him.

In fact, he is the only song-writer who has reached the heart of 'the mariners of England.' His verses smack of the briny deep, and reflect with astonishing felicity the easy, childlike virtues and the fearless courage of the English tar. It is known that they had a great effect during the war between France and England in supplying the navy with volunteers, and they have even been quoted in mutinies to the restoration of order and discipline. Among D.'s happiest pieces are *Poor Jack* and *Poor Tom Bowling*. The last edition of D.'s songs, with a memoir by T. Dibdin, illustrated by G. Cruikshank, appeared in 1850 (3d ed. 1863). D. also wrote a great number of dramatic pieces, &c.—He left two sons, CHARLES DIBDIN (died 1833), and THOMAS DIBDIN (died 1841), both of whom composed songs and dramas.

DIBDIN, REV. THOMAS FROGNALL, nephew of Charles Dibdin, the famous writer of sea-songs, was born at Calcutta in 1776. He lost both his parents when hardly four years of age, and was brought up by his mother's brother, a Mr. Crompton. He studied at St. John's College, Oxford, but left the university without taking a degree. After a short and unsuccessful career as a lawyer, he entered the church in 1804, and from that period until his death, 18th November 1847, continued to labor as a bibliographer with a diligence that would have been more commendable if it had been accompanied with a stronger judgment and a greater accuracy. D.'s principal works are an *Introduction to the Greek and Roman Classics* (1802), *Typographical Antiquities* 4 vols. (1810—1819), *Bibliomania* (1811), *The Bibliographical Decameron* (1817), *Bibliotheca Spenceriana* (1814), *Bibliographical, Antiquarian, and Picturesque Tour in France and Germany* (1821), *The Library Companion* (1824), and *Reminiscences of a Literary Life* (1836). All D.'s books contain valuable and rare information, but are far from trustworthy in matters of detail. Many of them are exquisite in typography and artistic decoration.

DICE (plural of die), small cubes of bone or ivory, marked on their six sides with black dots, from one up to six in number. Two dice are employed in certain games of chance, such as backgammon; also in throwing for high stakes, or settling some dispute in which the decision is referred to the highest number thrown. In this latter point, the throwing of dice is equivalent to what is usually spoken of as 'casting lots.' The throwing of dice is in all cases effected by means of a small tubular box, which, held in the hand, is shaken at will by the player. When the dice are true cubes, there is no plan by which any kind of shaking can bring out a desired number. In order to repress gambling, and secure players against deception, the state, by the Act 9 Geo. IV. c. 18, imposed a duty of 20s. on each pair of properly made dice, which were accordingly stamped, and a penalty was imposed on the sale of unstamped. Nevertheless there appears to have been a pretty free sale of unstamped dice under the name of 'bones' at an insignificant price.

In 1862 the stamp-duty was abolished, yet the repeal of the restriction has not to any extent stimulated the use of dice. Unscrupulous gamblers adopt the odious practice of loading dice, by plugging them with lead on a particular side, so that the

higher numbers may turn up. Where there is any suspicion of this trick, the thrower should be requested to turn down the mouth of the box abruptly, to prevent the dice from rolling, and improperly adjusting themselves. See GAMBLING.

DICHLAMYDEOUS (Gr. *dis*, twice, and *chlamys*, a covering), a term in botany, applied to those flowers which have both a calyx and a corolla. Flowers in which the calyx and corolla are very similar, and unite to form a *perianth*, are dichlamydeous, as well as those in which they are very different. Decandolle divides dicotyledonous or exogenous plants into *Dichlamydeous* and *Monochlamydeous*; the former including the three sub-classes of *Thalamifloræ*, *Calyceifloræ*, and *Corollifloræ*, whilst the latter form a single sub-class.

DICHO'TOMOUS (Gr., divided into two equal parts), a term often used in botanical description to designate branching by repeated forkings. The veins of the fronds of ferns and of the leaves of some coniferous trees, the stems of some ferns, the fronds of some algæ, and the stems of a few phanerogamous plants, are dichotomously branched. The stem of the mistletoe is generally divided in this manner, and it is a remarkable characteristic of that of the doom palm.

DI'CHROISM (Gr. *dis*, twice, *chroma*, a color) is a term chiefly used in Crystallography to designate the property which many doubly-refracting crystals possess of exhibiting different colors, when viewed in different directions. It, or the allied term *Dichromatism*, has also been applied to those fluids which appear of different colors when viewed by reflected and refracted light; when seen in thick or thin layers, &c. For example, venous blood, or any blood impregnated with carbonic acid, hydrogen, or nitrogen, appears, when seen in moderately thin layers, to be of a purple color; while in extremely thin layers it appears green.

DICK, THOMAS, LL.D., a well-known religious philosopher, was born in 1774, near Dundee, Scotland, educated at the university of Edinburgh, and intended for the ministry in connection with the Secession Church. After a brief pastoral charge, however, he devoted himself to teaching, lecturing, occasional preaching, and authorship. D. proved himself to be a truly useful writer; but although his productions obtained a great popularity both in England and America, they brought him very little pecuniary return. Towards the close of his life, a small pension was granted him in consideration of his literary services. He died at Broughty Ferry, near Dundee, 29th July 1857, in the 83d year of his age. D.'s principal works are—*The Christian Philosopher* (1823), *The Philosophy of Religion* (1825), *The Philosophy of a Future State* (1828), *Celestial Scenery* (1838), *The Sideral Heavens* (1840), and *The Practical Astronomer* (1845). Several of D.'s writings have been translated into other languages; one, even into Chinese.

DICK BEQUE'ST, the name given to a fund bequeathed by James Dick of Finsbury Square, London, for the benefit of the parochial school-masters of Moray, Banff, and Aberdeen. Mr. Dick was born at Forres, Morayshire, in November, 1743. Having entered mercantile life in the West Indies at the age of 19, he amassed a considerable fortune, which he subsequently increased in London. He died on the 24th May 1828, leaving the chief part of his fortune for the purpose above mentioned. The sum bequeathed amounted in 1833 to £113,147, 4s. 7d., since increased to £122,000. These funds being invested in heritable securities, yield (after deducting all expenses) for annual distribution a sum which amounts, on an average, to £4000. Mr. Dick's object was 'to encourage active schoolmasters, and gradually to elevate the literary character of the parochial schoolmasters and schools.' Acting on this declaration of the testator's wish, the trustees in whom the administration became vested* ordained first, that with a view to raise the literary character of the schoolmasters, none should, after a certain date, participate in the bequest who had not passed, to the satisfaction of examiners appointed by them, an examination in the English language and literature, geography, arithmetic, geometry and trigonometry, algebra to quadratic equations inclusive, Latin, Greek, history and chronology. To these branches have lately been added an examination in the art of teaching and in physics. To those who highly distinguish themselves in these examinations, a sum of money is awarded by the trustees, and they are entitled to a small allowance during their term of office. Further, with a view to raise the literary character of the schools, and to encourage active schoolmasters, the trustees appointed a Visitor, who should report annually to them on the condition of the schools, making a round of all those schools, whose teachers claim participation, once in three years—now, once in two years.

In allocating the fund at their disposal, the trustees take into consideration the number of scholars attending each school, the branches taught, the fees paid, and the salary fixed by the school-

board. Each of these elements has attached to it a certain value, the object of this being to make it the interest of teachers, and school-boards to promote the education of the parish. The sum to which a teacher may be entitled in consequence of the position he holds on the books of the trustees in the above respects, is allowed, increased, restricted, or refused, according to the report of the visitor on the condition of the school. The highest sum paid to any teacher in 1877, for example, was £59, 8s. 5d.; the smallest, £18; the average about £30. A small proportion of teachers do not participate in consequence of their having failed to comply with the conditions of the trustees.

There can be no doubt that the operation of this bequest has been most advantageous. There is no district in Scotland in which the parochial schools are so uniformly taught by highly qualified men; the results of the teaching, it would not probably be easy to equal anywhere. The rights of the teachers of these schools, and of their successors, to participate in the bequest, are not prejudiced by the Education Act of 1872.

DICKENS, CHARLES, novelist and humorist, was born at Landport, in Hampshire, in February 1812. His father, Mr. John Dickens, was employed for some years in the Navy Pay Department, but at the conclusion of the war with France was pensioned, and became a parliamentary reporter. In this pursuit his son was soon distinguished for uncommon ability; and after a literary engagement—at a very early age—upon *The True Sun*, he attached himself to the staff of the *Morning Chronicle*. In this newspaper he gave the first evidence of his talents in the lively essays, entitled *Sketches by Boz*, published in 1836. Encouraged by their success, he undertook to write the letterpress of the *Adventures of Mr. Pickwick*, the illustrations of which were to be executed by the then more famous Mr. Seymour, a comic draughtsman. The result was as though Shakspeare had been engaged to write the libretto for an opera of Mr. Balfe's. The *Pickwick Papers*, which had an enormous commercial success, commenced also an era in English literature. It was the first of a series of fictitious works exhibiting the life and manners of the middle and lower classes, which up to that time had had scarcely any exponent. In one respect, however, this book had neither predecessor nor progeny. Neither before nor since has there ever been such a literary embodiment of healthy animal spirits. There is none like it for unflagging but never unwise merriment—for humor that is very much the reverse of dry. That Mr. D. gave us no more *Pickwick Papers* is to be lamented, but may be easily explained by the fact, that he never had the advantage of being five-and-twenty again. Since then, however, he has given us many works more admirable in other respects. *Nicholas Nickleby*, his next effort, was, as a story, greatly in advance of it. It was also the first of those social novels which form so marked a feature in modern literature. It was aimed at the wrongs and cruelties inflicted upon their wretched pupils by the cheap schoolmasters of Yorkshire—and it hit its mark. After this beginning, our author set lance in rest against many a social monster. He may be sometimes wrong, but he can scarcely be accused of want of honesty of purpose; while quite as little can partisanship (except that he is always for the poor) be laid to his charge, since at the very time that the country gentlemen were shaking their heads at him for his want of reverence for 'land,' he incensed the manufacturing interest by the publication of *Hard Times*.

His sarcasm is of a rather peculiar character; too good-natured to sneer, and with eyes, notwithstanding their indignant fire, that never lose sight of the ludicrous side of things, his style is mocking argument. After *Nicholas Nickleby* came *Master Humphrey's Clock*, containing the *Old Curiosity Shop* and *Barnaby Rudge*. In the former of these, and in the character of Little Nelly, he first exhibited that power of setting forth child-life and child-thought which may have been said perhaps, before the publication of George Eliot's works, to be peculiarly his own. *Barnaby Rudge* was his first, and, with the exception of his subsequent *Tale of Two Cities*, his only attempt to describe the past; and it was a successful one. It is probably, with reference to plot and circumstance, his best novel, barring *David Copperfield*. The *Old Curiosity Shop* began in a curious dreamy manner, which, although obviously a favorite one with our author, he soon perceived was unappreciated, and had the prudence to discontinue. This disposition of his mind towards the weird and the grotesque he subsequently developed with greater success in his *Christmas Stories*. After a voyage across the Atlantic, Mr. D. published in 1842 his *American Notes for General Circulation*; but a much more admirable result of that expedition appeared in his *Martin Chuzzlewit*. This was certainly the greatest of his humorous works since the *Pickwick Papers*, and it may almost be said to have been his last. From this period, his animal spirits—a rare gift among even comic authors, and rarely lasting so long as in his own case—appeared to have deserted him. His humor, except in some rich creations, such as Mr. Micawber, was no longer so apparent, while, on the other hand, his wit and pathos increased. *Dombey and Son* was considered a falling off in

*The Keeper and Deputy-keeper of the Signet (Edinburgh), the Treasurer of the Society of Writers to the Signet, and eight Commissioners chosen by and from among the Commissioners of the Signet.

one who stood so high; but his death of little Dombey brought tears to the eyes of lawyers. When men were expecting that he should wane and weaken like other prolific writers before him, he produced a novel as fresh as the dawn. In this, he, for the first time, adopted the autobiographical form, and that perhaps offered him some advantages; but at all events, the result was admirable. *David Copperfield* is, in our judgment, by far his greatest work, and will endure—though for very different reasons—as long as the *Pickwick Papers*. Its Agnes is one of the most charming female characters in the whole range of fiction. *Bleak House*, *Hard Times*, *Little Dorrit*, the *Tale of Two Cities*, *Great Expectations*, and *Our Mutual Friend*, afterwards succeeded one another with almost periodical punctuality, and an audience larger than any English author ever had awaited each. We must also note *Oliver Twist*, one of his most popular works, the first instalment of which appeared in 1837 in *Bentley's Miscellany*. No prose-writer was ever more quotable or more quoted than he. In 1845, the *Daily News* was started under Mr. D.'s editorial auspices, but the task appears to have been ungenial, for he soon withdrew from it. In 1850, he commenced a weekly periodical entitled *Household Words*, afterwards merged in *All the Year Round*. In 1867, he again visited America, giving numerous readings, and meeting with a brilliant reception. He was till the last engaged in writing a new novel, *The Mystery of Edwin Drood*, which was left unfinished. He died on June 9, 1870. See his *Life*, by Forster (3 vols. 1871–1874); and a selection of his *Letters* (1879–1881).

DICLINOUS (Gr. *dis*, twice, and *kline*, a bed), a term in botany, signifying that flowers are unisexual, having stamens only, or pistils only, and opposed to *monoclinous* or *hermaphrodite*.

DICOTYLE'DONOUS PLANTS, are those of which the embryo is ordinarily furnished with two seed-lobes or cotyledons (q. v.) opposite to one another, or with more than two, which in that case are verticillate. In general there are only two cotyledons; a greater number being of rare occurrence, but being found in some of the *Coniferae*, as Spruce Fir, Larch, &c., in *Ceratophyllum*, &c. It is not, however, always quite easy to determine whether a plant belongs to the class of Dicotyledonous Plants or to that of Monocotyledonous Plants (q. v.), as sometimes, in the former, only a single cotyledon presents itself, which is the case with a number of species of the sub-genus *Bulbocarpus* in the genus *Corydalis*; or the cotyledons are altogether wanting, as in Dodder (*Cuscuta*), or the embryo is in so rudimentary a state in the seed, that it at first consists only of a pair of cells as in *Monotropa*. The habit of the plants is therefore also to be taken into account, and particularly the structure of the stem and its mode of increase. The *radicle* of the embryo in dicotyledonous plants generally elongates itself by degrees until it forms the root of the plant itself; wherefore Richard designated these plants *Exorhiza* (Gr. *exo*, outward, and *rhiza*, a root). The stem is exogenous (q. v.), and usually branched. The leaves have branching veins, and exhibit great variety of form. They are articulated to the stem. The calyx and corolla, when both present, are usually more distinct and dissimilar than in monocotyledonous plants.

DICO'TYLES. See **PECCARY**

DI'CRANUM, a genus of mosses, having a single peristome of sixteen equidistant bifid teeth and the *calyptra* splitting up on one side (*dimidiate*). See **MOSSSES**. The species are numerous, and some of them are among the most common British mosses, growing on the ground and on moist rocks. Many of them have elongated branching stems.

DICTA'TOR, in the earliest times, was the name of the highest magistrate of the Latin Confederation, and in some of the Latin towns the title was continued long after these towns were subjected to the dominion of Rome. In the Roman Republic the dictator was an extraordinary magistrate, irresponsible and endowed with absolute authority, whose original name was *magister populi*. The frequency of crises, or critical periods, in the quick, aggressive growth of the Roman state, necessitated such an office. The first dictator (T. Larcus or M. Valerius) was appointed 501 B.C. nine years after the expulsion of the Tarquins. According to Livy, the immediate cause of this dictatorship was a formidable war with the Latins.

In general no one could be appointed dictator who had not been previously consul, and this condition was very rarely dispensed with. Niebuhr is of opinion that the dictator was originally created or elected by the curia, like the kings, but it is more probable that the senate passed a decree ordering one of the consuls to name or proclaim (*dicere*) a dictator. Originally, of course, the dictator was a patrician; the first plebeian who filled the office

being C. Marcius Rutilus, 356 B.C., who was nominated by the plebeian consul M. Popillius Lænas. The dictatorship could not lawfully be held longer than six months, nor was it ever so, except in the cases of Sulla and Cæsar, which were altogether peculiar. It must not be supposed that during a dictatorship the functions of the other magistrates were positively suspended. The consuls and other regular authorities continued to discharge their proper duties, but in subordination to the direction and command of the dictator; being for the time simply his officers. The superiority of his power, when compared with that of the consuls, appears chiefly in these three points: he was far more independent of the senate; he had a more extensive power of punishment, without any appeal; and he could not be called to account after his abdication of the dictatorship for anything he had done during the period of his office. The limits of his power were as follows: he could not touch the treasury; he could not leave Italy; and he could not ride through Rome on horseback without previously obtaining the permission of the people. While the consuls had only 12 lictors, the dictator was preceded by 24, bearing the *securæ* and *fascæ*. To him also belonged the *sellæ eburnæ* and the *toga prætexta*. The last legally elected dictator was M. Junius Pera, who entered on his office 216 B.C. From this time *nominal* dictators were frequently appointed for the purpose of holding the elections, but even these finally disappeared, 202 B.C. Henceforth, in critical times, a sort of dictatorial power was conferred on the consuls by the senate by the well-known formula: 'That the consuls should see to it, that the state should receive no damage.' This practice rendered the appointment of dictators no longer necessary.

DICTIONARY, is merely the English form of *dictionarium*, a word not to be found in classical Latin, though of frequent use in that called monkish or medieval. A dictionary is, as every one knows, a book, but in the widest sense of the word, its contents admit of no more strict definition than that they are arranged according to the order of the alphabet, and that every word within the scope professed to be embraced by the dictionary must have its proper place accordingly. It may be further said that the dictionary, in order to distinguish it from a mere list or index, must contain explanations or information about each word thus included within its scope, except in cases, of which many examples may be found in the present work, where it is sufficient to refer for a part or the whole of the account of one word to what is said under some other word. There are several other terms that are used synonymously, or nearly so, with Dictionary.

The Greek word *Lexicon*, is in common use for a dictionary of languages. It is not entirely so limited, however, in practice, as may be seen in such works as the *Lexicon Juridicum* of Calvinus or Kahl, which is just a dictionary of Roman and feudal law, of the same kind as Sir Edward Tonlin's *Law Dictionary* is of English law. The word *Encyclopædia* has generally a wider meaning; but there are often several books exactly of the same kind, of which some are called dictionaries, and others encyclopædias. Glossary and Vocabulary are nearly synonymous with a dictionary of a language; and the words *Thesaurus*, *Catalogue*, *Directory*, *Gazetteer*, and *Index*, are sometimes used as a title when Dictionary might not be inapplicable.

Dictionaries may be divided into two classes—(1) dictionaries whose object is to explain words and phrases; and (2) those that aim at giving information about things.

1. Dictionaries of language are, again, divided into various sub-classes or species. The most common kind—what, indeed, is understood by the term dictionary (and the equivalent Greek term *Lexicon*) when used by itself—is an alphabetical list of the words composing any language, either explained in the same language, or interpreted by the corresponding words of one or more other languages. To indicate that all, or nearly all, the words of the language are embraced, the name *Thesaurus* (Treasury) is sometimes used. *Special* Dictionaries contain only the words used by single authors, or classes of authors. A *Glossary* is a dictionary of unusual terms. An *Etymological* Dictionary is one in which the derivation of words is the sole or a prominent object.

2. Dictionaries of things (Ger. *Realwörterbücher*), or of information, are also of various kinds. When the whole field of human knowledge is embraced, we have an *Alphabetical Encyclopædia*. The name *Encyclopædia* or *Cyclopædia* is sometimes given to dictionaries of special departments of knowledge, as the *Cyclopædia of Anatomy and Physiology*; but in all such cases, dictionary seems the correcter term. See **ENCYCLOPÆDIA**.

There is no kind of information, within wide or narrow bounds, that may not be thrown into the dictionary form. Dictionaries of apt quotations from the classics, the Scriptures, or the fathers, were much in vogue in the 17th century. There are dictionaries of biography, of geography, of dates, of architecture, of cookery, of political economy, of fortification—in fact of every object of human knowledge and practice. As dictionaries of this class are of the same nature, except as to the restriction of their field, as



Dicranum (Polysetum): a, capsule, magnified, and with the calyptra removed, showing the peristome.

Encyclopædias properly so called, we reserve some notice of the more important of them for that head.

Dictionaries of language, in our sense of the word, are of modern origin. The Greeks and Romans had no idea of a book embracing all the words of their own or any foreign tongue. Glossaries, however, of unusual words and phrases were early current. The earliest work of the kind extant (though much interpolated) is the *Homerie Lexicon* (Gr. *Lexis Homerikai*, 'Homerie words') of Apollonius, an Alexandrine grammarian of the time of Augustus.

More extensive compilations, such as the *Lexicon* of Suidas (q. v.), and the *Etymologicum Magnum* (q. v.), were made in the middle ages. A real dictionary became first possible after the invention of printing. A broad and sure basis for Greek lexicography was laid by Henry Stephens (q. v.) in his *Thesaurus* (1572); the Latin *Thesaurus* of Robert Stephens, which did the same for Latin, had appeared in 1531. Previously to the discovery of printing, and for some time after, the explanations of Latin words were given in Latin. 'The earliest printed vocabulary with which we are acquainted in which the words of any modern language answering to the Latin are inserted, is the *Promptorium Puerorum*, published by Pynson in 1499, in which English words are followed by their supposed Latin equivalents' (*Quarterly Review*, September 1855). Some of the more important dictionaries will be noticed under the heads of the several languages.

DICTION DE KENILWORTH was an edict or award between King Henry III. and all those barons and others who had been in arms against him, and so called because it was made at Kenilworth Castle, An. 5 Henry III., containing a composition of five years' rent for the lands and estates of those who had forfeited them in rebellion.—*Cowell's Interpreter*.

DICTY'OGENS, in Botany, a class established by Lindley for the reception of a comparatively small number of natural orders, genera, and species, usually included by other botanists among *Eulogens* or *ENDOGENOUS PLANTS* (q. v.), but which, whilst they agree with endogens in the structure of the embryo, differ from them in the stem and leaves. The annual branches or aerial stems have indeed the endogenous structure, but the rhizomes or subterranean stems more resemble the structure of exogenous plants (q. v.), with pith, medullary rays, and wedge-like vascular bundles. The leaves are broad and net-veined, usually disarticulating with the stem. The most important natural orders referred by Lindley to this class are *Dioscoreaceæ* and *Smilacææ*, and the most important plants belonging to it are the different species of Yam and Sarsaparilla.

DICY'NODON, the name given by Owen to a genus of fossil reptiles, whose remains have been found in South Africa. The true age of the rock in which they occur has not been ascertained; the accompanying organisms seem to indicate that it is Triassic. Few bones of these animals, save those of the skull, have been sent to this country. A complete restoration of one would be a most valuable addition, not only to palæontology, but to systematic zoology as well; for the numerous skulls that have been examined, have been sufficient to show that this is one of those anomalous forms which unite in their structure the characteristics of widely different animals. It has affinities with the crocodile, the lizard, and the tortoise, though perhaps the completely closed orbits and the sharp compressed jaws ally it more closely to the last-named animal. Its lower jaw also is covered with a horny plate, as in the tortoise.

The most remarkable peculiarity is the existence of a pair of large sharp-pointed tusks, one from each side of the upper jaw, growing downwards as in the mammalian morse or walrus. The generic name, meaning 'two canine teeth,' has been given to them from these singular tusks, which are peculiar to this genus. The articulating surfaces of the vertebrae are both hollow—a fish-like peculiarity, from which it might be argued that these reptiles were good swimmers; probably they lived constantly in the water, but the construction of the bony passages of the nostrils proves that they must have come to the surface to breathe air. Four species have been discovered.

DIDA'CTIC PO'ETRY, that kind of poetry which aims, or seems to aim, at instruction as its object, making pleasure entirely subservient to this. It has been disputed whether or not the existence of a kind of poetry especially entitled to the name didactic, consists with the very nature and object of the poetic art. For it is held that, to point out instruction as the peculiar object of one kind of poetry, is to overlook the high aim of all poetry; and that a poem may be in the highest sense didactic, which yet is epic, dramatic, or lyric in its form; and the Book of Job, the Psalms, and other poems contained in the Sacred Scriptures, are quoted as examples. In the poems generally called didactic, the information or instruction given in verse is accompanied with poetic reflections, illustrations, episodes, &c. The *Georgics* of Virgil have been the model according to which didactic poems have very generally been composed; and the literature of all European nations

contains many productions of this kind; whilst no subject is so unpromising that it has not found some one to select it as a poetic theme.

DIDÉ'LEPHIS. See OROSSUM.

DIDEROT, DENIS, a celebrated French encyclopedist and philosophical writer, was born at Langres, in Champagne, 5th October 1713. He was educated for the church at the college of his native town, and subsequently at that of D'Harcourt, Paris; but disliking the clerical office, and after having made a trial of law, a profession which he also found uncongenial, he finally resolved, after various vicissitudes, upon becoming a *littérateur*. For some years, however, his mode of life was very precarious. On one occasion, being reduced to the greatest extremities, he seriously resolved that if the world should ever prosper with him, he, not ignorant of misfortune, would never disregard the applications of the indigent. This resolution was religiously kept; for after having attained a position of comparative affluence, he was continually surrounded by applicants desirous of obtaining assistance, which, whether in the shape of money or instruction, D. was always willing to afford them. Although very poor, D. married in 1745. Necessity now drove him to increased exertions. He translated the *History of Greece* from the English of Stanyan, receiving for this work the sum of 100 crowns.

Soon afterwards followed the *Essai sur le Mérite et la Vertu*; the *Pensées Philosophiques*, written, it is said, in the space of four days; and the *Interprétation de la Nature*. Shortly after appeared his *Lettre sur les Aveugles*, for the writing of which he was confined three months in the prison of Vincennes. Believing that it was, among other things, his vocation to regenerate the theater, he produced a melodrama (1758), entitled *Le Père de Famille*. It was unsuccessful, and was followed by others equally so, so that it was said, 'Le Père de Famille a été le père d'une famille déplorable.'

But D.'s great work was the *Encyclopédie*, of which he and D'Alembert were the joint-editors. It was commenced in 1749. D., besides revising all the articles, wrote the departments of history, of ancient philosophy, and of the mechanical arts. He also wrote art criticisms from 1765 to 1767, showing a readiness in interpreting the meaning of a picture, and a power in reproducing it vividly in words, unequalled by any writer of his time. Towards the latter portion of his life, D., who had never been able to save any money, determined to sell his library, to provide for his only daughter. The Empress Catherine of Russia, having been informed by her French ambassador of his intention, bought the library, on the condition that D. himself should be librarian, and undertake the care of it at a salary of 1000 francs yearly. In 1773, he set out for St. Petersburg to thank his imperial benefactress, returning in the following year. But his health, which was impaired by this journey, soon after gave way, and he died on the 30th July 1784.

D. had worked at the Encyclopædia for the space of about 30 years. His fitness, natural and acquired, for this species of literary labor was complete. With the advantage of an excellent education, he had a great love of truth, and a curiosity to ascertain the real relations of any subject upon which he was engaged. He was distinguished by a swiftness and dexterity of intellect, that enabled him to catch the salient points of his topic, and to present them in the best light. As regards religion, D. was an atheist, sincere even to fanaticism in his opinions, and anxious to indoctrinate his countrymen with his own scepticism. The *Encyclopédie* became a vehicle for the indirect propagation of his views. One of the last recorded sayings of D. is very characteristic; 'The first step towards philosophy is incredulity;' but unfortunately D. thought it was also the last. An edition, in 20 vols., of all D.'s works, by Assézat and Tournoux, was completed in 1877. See John Morley's monograph on *Diderot and the Encyclopedists* (2 vols. 1878).

DI'DO, or ELI'SSA, according to the legend, the foundress of Carthage, was the daughter of a king of Tyre, called by some Agenor or Belus, by others Muto or Matgenus. His successor, Pygmalion, the brother of D., murdered her husband and uncle, a priest of Hercules named Aeebas; by Virgil, Sichæus. With the treasures of Sichæus, which Pygmalion had sought for in vain, and accompanied by many Tyrians, D. escaped to sea. She landed in Africa, not far from the Phœnician colony of Utica, and built a citadel called Byrsa (from Gr. *Bursa*, the hide of a bull), on a piece of ground which she had bought from the Numidian king Hiabaras. The meaning of the word Byrsa, gave rise to the legend that D. purchased as much land as could be encompassed with a bullock's hide.

After the agreement she cut the hide into small thongs, and thus enclosed a large piece of territory. Here she built the city of Carthage. To avoid being compelled to marry Hiabaras, she stabbed herself on a funeral pile, which she had caused to be erected, and after her death was honored as a deity by her subjects. Virgil ascribes the death of D. to her unrequited passion

for Aeneas; but many of the ancient writers conceived that the poet had committed an anachronism in making her contemporary with the Trojan prince. The more general opinion was, that D. had built Carthage somewhere between 50 and 100 years before the foundation of Rome.

DIDOT, the name of a celebrated family of French printers and publishers.

D., FRANÇOIS, the first of the family that attained eminence, was born in 1689, and died in 1757. His principal professional achievement was the publication of the *Voyages* of his friend the Abbé Prévost, a work in 20 volumes, perfect as regards the text, and enriched with a great number of engravings and geographical maps. D. had eleven children, of whom two—FRANÇOIS AMBROISE D. (born 1730, died 1804) and PIERRE FRANÇOIS D. (born 1732, died 1795)—acquired considerable distinction as printers. HENRI D. (born 1765, died 1852), eldest son of Pierre François, made himself famous as an engraver, letter-founder, and mechanician. He was 66 years old when he engraved, for his well-known 'microscopic' editions of eminent authors, those characters which are the *né plus ultra* of typographical art. A daughter of the third son of Pierre François married Bernardin de Saint-Pierre, who was for some time associated with the Didots in their paper manufactory of Essonne; and in his country-house near this place wrote his *Paul et Virginie*. PIERRE D., eldest son of François Ambroise (born 1760, died 1853), still further increased the fame of the family. His Louvre editions of *Virgile*, *Horace*, *Racine*, and *La Fontaine* are magnificent. At the Exhibition of the Products of Industry in 1801, a jury declared his *Racine* to be 'la plus parfaite production typographique de tous les âges.' Besides a great number of works, not less remarkable for their typographical perfection than for their literary value, such as the *Voyages de Denon*, D. published a collection of the French *chefs-d'œuvre*, dedicated *Aux amis de l'Art Typographique*. D. was also an able *littérateur*.

D., FIRMIN, brother of the preceding, and son of François Ambroise D., was born at Paris in 1764. As a printer, and especially as an engraver and founder, he raised the family name to the pinnacle of professional eminence. The absolutely perfect Roman characters, used in the Louvre editions printed by his elder brother, were engraved and cast by him. Firmin D. applied the stereotyping process to the Logarithmic Tables of Callet, a work that required to be executed with the most rigorous accuracy, and which, through this means, is perfectly free from error or blemish. The whole of the French, as well as most of the Italian and English classics, were published by him according to the same process.

These stereotypic editions (the word *stereotypic* was invented by Firmin D.) were wonderfully correct and cheap; *Virgile* is without a blemish, is ornamented with vignettes, and was sold for 15 sous (7½d.); it was a kind of revolution in the book-trade of France. The most distinguished foreigners were accustomed to visit D.'s establishment as one of the great sights of Paris. The Emperor Alexander, when in Paris in 1814, minutely examined every department of it; and placed under D. two young Russians, to be instructed in all the branches of typography. Some of the most celebrated continental printers served their apprenticeship with him. In 1827, Firmin D. retired from business, to devote himself wholly to his duties as *député*. A sage friend of freedom, he attached himself to the moderate and constitutional opposition, headed by Royal Collard. D. also obtained considerable reputation as an author by his tragedies, *La Reine de Portugal* and *La Mort d'Annibal*, and several volumes of metrical translations from the classics. He died 24th April 1836.

D. AMBROISE FIRMIN, and HYACINTHE, sons of the preceding, born 20th December 1790, and 11th March 1794, long carried on the family business (aided by their sons, ALFRED and PAUL D.), under the firm of Firmin Didot, Frères. Ambroise died in February 1876; but in the hands of the survivors the business still retains its magnitude.

DIDYMIUM, is a very rare metal found in the minerals CERITE, ALLANITE, &c.

DIE, ST., a town of France, in the department of Vosges, is situated on the Meurthe, 25 miles north-east of Epinal. It is handsomely built; its streets clean and regular. D. is also the seat of a bishop, has an old cathedral church, and various important educational institutions. It has manufactures of cotton goods, with some trade in corn, cattle, flax, hemp, paper, ironmongery, &c. There are copper, and iron mines, ironworks, and marble quarries in the neighborhood. Pop. (1876) 12,020.

DIEFFENBACH, JOH. FRIED., a celebrated surgeon of recent times, was born in Königsberg, in Prussia, in 1792. He had begun the study of theology, when the war of liberation broke out, in which he took part as a volunteer. In 1816, he exchanged the study of theology for that of medicine, and especially surgery. After studying at Bonn and elsewhere, and traveling in France, he took his degree in 1822, and commenced practice in Berlin,

where he soon attained distinction as an operator, and in 1840 was promoted to be professor and director of clinical surgery. He died in 1847. Besides eminent skill in all the usual operations with the knife, D. introduced many improvements, particularly in the art of forming new noses, lips, eyelids, and the like, as well as in cutting the muscles for squinting and stammering. Of his writings, we may mention *Die Transfusion des Bluts und die Einspritzung der Arzneien in die Adern* (Berl. 1828); *Ueber die Durchschneidung der Sehnen und Muskeln* (Berl. 1841); *Die Heilung des Stotterns* (Berl. 1841); *Die Operative Chirurgie* (12 vols., Leip. 1844—1848), his chief work, which has been translated into several languages.

DIE'GO, SAN, the best harbor in Upper or American California, next to that of San Francisco, is in lat. 32° 45' N., and long. 117° 8' W. It is 6 miles long, and varies in breadth from 1 to 2; and it is 6 or 7 fathoms deep, even to the shore. The climate is singularly equable and salubrious. The exports of D. consist mainly of gold bullion, wool, wheat, flour, barley, hides, honey, wine, and olive oil; and in 1874 had a value of nearly £500,000. The town has two daily papers and two weeklies. Pop. (1870) 2300. North San D., a hamlet 4 miles to the north of the city, was the first place in California settled by white men.

DIELY'TRA, a genus of plants of the natural order *Fumariaceæ*, in appearance and habit much resembling fumitories of ex-



Dielytra Spectabilis.

traordinary size. *D. spectabilis*, a native of Siberia and the northern provinces of China, was introduced into Britain from the island of Chusan in 1846, and rapidly became a general favorite, on account of its long racemes of drooping, delicate, rosy-pink flowers. It is now to be seen not only in green-houses, but, as commonly as almost any flower, in cottage-windows, and even in cottage-gardens, although in the northern parts of Britain it seldom attains its full luxuriance in the open air. It is one of the favorite plants of the Chinese.

DIEPENBECK, ABRAHAM VAN, a distinguished Flemish painter, was born probably in 1607, at Hertogenbosch (Bois-le-Duc), and at first confined himself to painting on glass, in which he acquired the reputation of being the first of his time; but having conceived a disgust for this kind of painting, on account of the cracking of the glass, which he could in no way prevent, he abandoned it, and became a pupil of Rubens. He then went to Rome, and on his return to Belgium became a sort of assistant to his master. In 1641, he was elected President of the Antwerp Academy, an honor which he retained till his death, in 1675. D. painted much, and with wonderful facility, on tapestry and wainscoting. He certainly imitated Rubens, but with great freedom and force of coloring. His works consist, for the most part, of designs for title-pages, theses, devotional subjects, and the decoration of books.

They exhibit great fertility and liveliness of genius, but are in general hurriedly and imperfectly finished. His master-piece in this way is the *Tableaux du Temple des Muses* (Paris, 1655), a series of designs, 59 in number, engraved by the best artists of the time—Bloemart, Maltram, &c. Those of Bellerophon, Orpheus, the Dioscuri, Leander, &c., have been pronounced unsurpassed. His oil-paintings on canvass are few, but the churches of Antwerp have many windows painted by him. D. resided in England for some time during the reign of Charles I., and painted several landscapes and animals for William Cavendish, Duke of Newcastle.

DIEPPE, a seaport town of France, in the department of Seine-Inférieure, at the mouth of the river Arques, on the English Channel, lat. 49° 55', long. 1° 5' E. D. is situated between two high ranges of chalk cliffs, is regularly built, with tolerably wide

clean streets running parallel to the sea; and the houses—built for the most part of stone and brick, with high slanting roofs—have a picturesque appearance. It is walled, has a castle occupying a high cliff at the west end of the town, which it commands, as well as the harbor, which is situated to the north-east, and admits vessels of 500 tons burden. West of the old castle lies the little fishing suburb of Pollet, far from beautiful in appearance, but exceedingly interesting from the fact that the inhabitants differ in language, manners, and costume from the rest of Upper Normandy, and are supposed to be descendants of those Saxons who settled on the French coast during the period of the Merovingian kings. Some interesting historical associations attach to the castle of Dieppe. Here Henry IV.—the people of D. having been the first to acknowledge his right to the throne of France—retired before the forces of the league, previous to the decisive battle of Arques, fought within four miles of D.; and here the Duchess of Longueville, so noted as a leader of the party of the Fronde, sought refuge for a time from the royal power she had defied. The castle is now occupied as a barrack. The other principal buildings are the churches of St. Jacques and St. Remi, the theater, and a bathing establishment. The town has several squares, and is adorned by nearly 70 fountains, which derive their supply of water from an aqueduct about three miles long. D., being one of the principal watering-places of France, has a great accession of visitors during the summer months; and a large number of huts for the accommodation of bathers, bathing-machines being dispensed with, line the shores. The manufactures are lace, fine linen, and paper; and the carved articles of horn, bone, and ivory have long been famous. There are also ship-building yards, sugar-refineries, rope-walks, and distilleries; and the fisheries—both coast and Newfoundland—are important, almost the whole of the population of the suburb of Pollet being engaged in them. D. is a favorite landing-place of English tourists visiting France. Pop. (1876) 19,471. The rise of Havre has greatly injured the trade of Dieppe.

DIE'-SINKING, the art of engraving the die or stamp used for striking the impression on coins, &c., and for stamping thin plates of metal into various devices.

The importance of die-sinking has much increased of late on account of the great extension of the process of stamping thin metal. Many kinds of work formerly bent into shape by the hammer and punch, are now struck by a few blows between suitable dies. As examples of these, we may mention the ornamental work of gas-fittings, window-curtain cornices, common jewelry, ornamental trays, dishes, boxes, &c. For such purposes, a pair of dies is required, one in relief, the other in intaglio, and the metal is pressed between them. Not only are ornamental articles stamped in this manner, but useful articles, composed of many parts, are made entirely by cutters, and dies, each part being cut and stamped by a pair of dies, and then the parts united by another pair, the junction being effected by overlaps, which the uniting dies press into their places. See **BUTTONS**. The astonishing cheapness of many of the Birmingham products is mainly due to the use of dies for doing by a single blow the work that formerly required long and tedious manipulation. For further information on this, see **STAMPING**.

The most ancient and familiar application of dies, is in the striking of coins and medals; the method of sinking the dies used for this purpose will serve to illustrate the general method of die-sinking. Suppose the coin to be of the size of a shilling; a cylindrical piece of steel, about three or four inches in length, and two in diameter, is prepared by slightly rounding one end of the cylinder, then turning and smoothing upon the middle of this a flat face equal to the size of the coin. This blank die, which is carefully softened, is then engraved with the device of the coin in intaglio. This is a very delicate and artistic process, and is effected by a great number of careful touches with small and very hard steel tools. The face of the die is now hardened by placing it face downwards in a crucible upon a layer of bone-dust, or a mixture of charcoal and oil. In this position it is raised to a cherry-red heat, then taken out, and plunged in water. When properly tempered, it is in a state to be used for stamping the coin; but dies of superior workmanship, from which many impressions are required, are not thus directly used, as the expense of engraving is very great, and the risk of breakage considerable. This first engraved die, called the matrix, is therefore reserved only for making other dies. An impression in relief is made from this matrix on a small block of soft steel, which is called the puncheon; this is retouched and hardened, and from it the dies directly used for striking the coins or medals are impressed.

When the engraving is not very costly, a small number of impressions required, or a soft metal is to be stamped, as in livery buttons, for example, the work is stamped directly from the engraved die or matrix. When the device is in high relief, and the metal is hard, many heavy blows are required. Some of the finest large bronze medals require two or three hundred blows for each

impression, and the medal has to be annealed by heating between every two or three blows. It is on this account that the difference between the price of pewter and bronze medals of the same subject is so great, the pewter being so much softer. Copper, though harder than pewter, is much softer than bronze, and hence the reader will easily understand why the device on the new bronze coinage, manufactured at the new mint of Birmingham, is in much lower relief than the old copper coinage, as it would not pay to use repeated blows and annealing in striking common coins. An impression in high relief or deep intaglio may be obtained by a single blow by the *cliché* method. For this, a fusible alloy is used, such as type-metal, or still better, an alloy of 2 parts bismuth, 1 lead, and 1 tin, which fuses at about 212°, and becomes pasty before solidifying. The metal is poured into a box or tray a little larger than the die, and when in a pasty condition, the die is placed over it, and struck smartly with a heavy mallet or a coining press. A steel die is by no means necessary for this; sharp impressions may be obtained from bronze medals themselves, or even from wood and plaster casts. A *cliché* mould may be made in the first instance from the medal, and then a *cliché* relief from this mould, if the process is skilfully conducted. The skill required consists mainly in striking the blow with a force proportionate to the depth of the impression and the softness of the metal, and in selecting the right moment for doing so, just as the fused metal is on the point of solidifying; for, if too fluid, it will merely be driven aside; and if at all set, an imperfect impression results. The metal should be of about the consistence of melted sealing-wax, and then the surface is set by contact with the cool die or medal, while the body of the metal still yields to the pressure. *Cliché* moulds are admirably adapted for electro-depositing.

DIES IRÆ, the name generally given (from the opening words) to the famous medieval hymn on the Last Judgment. On account of the solemn grandeur of the ideas which it brings before the mind, as well as the deep and trembling emotions it is fitted to excite, it soon found its way into the liturgy of the church. The authorship of the hymn has been ascribed to Gregory the Great, St. Bernard of Clairvaux, Umberto, and Frangipani, the last two of whom were noted as church-hymnists; but in all probability it proceeded from the pen of the Franciscan, Thomas of Celano, a native of the Abruzzi, in the kingdom of Naples, who died about the year 1255. When the church adopted it, and made it a portion of the service of the mass, cannot be ascertained with any exactness, but it must have been in any case before 1385. Several alterations were then made in the text; that, however, is believed to be the original which is engraved on a marble tablet in the church of St. Francis at Mantua.

Germany has produced many translations of the hymn, such as those of Schlegel, Fiebite, and Bunsen. It was translated into English by Richard Crashaw in the 17th c., and by Lord Macaulay, Lord Lindsay, the Rev. Isaac Williams of Oxford, and others in our own day. Sir Walter Scott has introduced two or three of the opening verses into his *Lay of the Last Minstrel*. The following are the most effective stanzas of the original Latin:

Dies iræ, dies illa Solvat seculum in favilla, Teste David cum Sibylla.	Rex tremendæ majestatis, Qui salvandos salvas gratis, Salva me, fons pietatis.
Tuba mirum spargens sonum Per sepulcra regionum Coget omnes ante thronum.	Recordare, Jesu pie, Quod sum causa tuæ viæ: Ne me perdas illa die.
Mors stupebit et natura, Quum resurget creatura Judicanti responsura.	Querens me sedisti lassus, Redemisti cruce passus, Tantus labor non sit cassus.
Liber scriptus proferetur, In quo totum continetur Unde mundus judicetur.	Qui Mariam absolvisti Et latronem exaudisti, Mihi quoque spem dedisti.
Judex ergo cum sedebit, Quidquid latet apparebit, Nil inultum remanebit.	Inter oves locum præsta, Et ab hædis me sequestra, Statuens in parte dextra.
Quid sum miser tunc dicturus, Quem patronum rogaturus, Quam vix justus sit securus?	Amen.

DI'ESIS, a term used by the ancient Greeks, in the division of musical intervals, of which they had three varieties. In modern music, the *diësis* is understood to be the difference between the small and the great semitone, as from C to C sharp, and from C to D flat.

DIEST, a town of Belgium, in the province of Brabant, on the river Demer, 17 miles N.E. of Louvain. It is a walled town, and its fortifications have recently been so improved as to render it a place of great strength. D. has considerable manufactures of hosiery and woollen goods, but its chief products are beer—which is of excellent quality and largely exported—and gin. Here a great horse-fair is held annually. D., which was once a feudal

barony, under the dominion of the Princes of Orange, was taken by Marlborough in 1705. Pop. (1880) about 8000.

Dr. Prout. Man and animals generally require that their food should be of such a nature as to compensate for the wear and tear of the tissues which is perpetually going on, and as at the same time to keep up the animal heat at its proper standard. Various classifications of the food of man have been at different times proposed, but those which have been most generally accepted are that of Dr. Prout—in which the different kinds of food are grouped in definite chemical classes—and that of Liebig, which has reference solely to the ultimate destination of the food in the animal economy.

Dr. Prout classifies all kinds of food under these heads: 1. The *aqueous*; 2. The *saccharine*; 3. The *oily* or *oleaginous*; and 4. The *albuminous*; to complete which, we ought to add 5. The *gelatinous*, and 6. The *saline*—whilst Liebig makes only two classes: 1. Those consisting of nitrogenized matters, which are adapted for the formation of blood, and which he terms the *plastic elements of nutrition*; and 2. The non-nitrogenized substances, which from their large amount of carbon, serve (as fuel) to keep up the animal heat, and which he names the *elements of respiration*. Recent investigations, however, throw doubt on Liebig's views, that before food can be made available for the performance of work, it must first be turned into muscular tissue and then oxidized. Now it seems most probable that it is the oxidation of the non-nitrogenous substances, and not of muscle, that contributes chiefly to the production of muscular force. Starch, fat, and the other non-nitrogenous substances would therefore have to be regarded as force producers, and not, as formerly mere heat-givers. We shall therefore adopt Prout's classification. It was based on the consideration, that the milk (the only *single* article of natural food that serves to support the animal body) is made up of substances which may be taken as representatives of his groups; for this, our earliest natural diet, contains water, sugar (representing his saccharine group), butter (representing his oleaginous group), casein (a nitrogenous matter very similar to albumen, and representing his albuminous group), and salts; and recent researches have shown that the yolk of the egg, which serves for the nourishment of the chick or other young animal before birth, similarly contains one or more representatives of the aqueous, saccharine, oleaginous, albuminous, and saline groups.

We shall now briefly consider these individual groups, and the uses to which the substances included in them are applied in the animal economy.

1. The *aqueous* group includes water and all the fluids which we use as drinks; and we must additionally bear in mind that all the varieties of animal and vegetable food which we term solids, in reality contain it, generally in great abundance; thus, for example, uncooked beef contains from 70 to 80 per cent., and some vegetables even a larger proportion of water. The uses of water are sufficiently obvious from the abundance in which it occurs in all the most important fluids of the body, as the blood, and the various digestive fluids. See DIGESTION, ORGANS AND PROCESS OF.

2. The *saccharine* group includes the different varieties of sugar, starch, gum, and cellulose, together with vinegar. This group is chemically characterized by all its members being included in the formula $C_nH_{2n}O_n$; that is to say, they consist of carbon, together with hydrogen and oxygen in the proportions in which these elements form water. Hence (excepting vinegar) these substances have received the name of Carbo-hydrates.

Of the sugars, grape-sugar or glycose is the most important, partly from its frequent occurrence in ordinary articles of food, such as fruits of most kinds, honey, &c., and partly because it is the form of sugar into which starch (a most abundant ingredient in most kinds of vegetable food) is converted by the saliva, and pancreatic and intestinal juices, before it is fitted for absorption or any further changes. Since the sugars (which may thus be regarded as including starch) do not, in the normal condition, pass into the excretions, but are oxidized in the blood into carbonic acid and water, as ultimate products, they must contribute materially to the support of the animal heat. But they have other uses which we shall endeavor to explain, and which will, we trust, be intelligible if this article is read in conjunction with that on DIGESTION, to which we have already referred. Before becoming oxidized into their final products, they undergo various phases of less perfect oxidation, in which lactic, acetic, butyric, and other acids are evolved, of which the most important and abundant is lactic acid, which is found in considerable quantity in the small intestine, where it is doubtless of service in contributing to dissolve any nitrogenous matters which have escaped the action of the gastric juice. Another use of these acids which are developed from the sugars is, that by acidifying the albuminous intestinal contents, they greatly increase their diffusability through the intestinal membranes into the lacteals, and probably the capillaries. Here we probably have the clue to the therapeutic use of acids in various disorders of the chylopoietic viscera.

Under certain conditions, the sugars are also converted into fat in the body.*

The remaining carbo-hydrates are of little or no value as food. There has been much difference of opinion as to whether gum can be taken up and applied to any definite uses in the organism; but the great mass of the most trustworthy observations seem to show that it passes through the system unchanged. Independently of experiments on animals by Boussingault, Lehmann, and others, Dr. Hammond (an American chemist and physician) found from experiments upon himself (1) that gum is altogether incapable of assimilation, and therefore possesses no calorific or nutritive power whatever, but is, on the contrary, a source of irritation to the digestive organs; and (2) that in consequence of the above fact, the solids of the urine during a purely gum-and-water diet are entirely derived from the waste of the tissues of the body, while the carbon exhaled (as carbonic acid) from the lungs is derived from the consumption of the fat.

Cellulose, or the substance of the vegetable cell, resists the action of the digestive fluids, and reappears unchanged in the faeces.

Vinegar is probably only of use indirectly in softening animal textures which are taken as food.

3. The *oleaginous* group includes all the fats and oils, whether derived from the animal or the vegetable kingdom. The members of this extensive group are composed of carbon (ranging from 60 to 80 per cent) and hydrogen, with a little oxygen. Fat which has been taken with the food is mainly absorbed by the lacteals, although a portion of it passes directly into the capillaries of the villi, as has been shown by microscopic examination, which has revealed the presence of fat-granules amongst the blood corpuscles. The modifications which are impressed upon the fats, in order to prepare them for absorption, are explained in the article DIGESTION. Their uses in the system are various. In their oxidation in the organism, whether the process be gradual or rapid, a large amount of heat is liberated; and that they are oxidized, and for the most part ultimately resolved into carbonic acid and water, is evident, because they neither appear in any quantity in the excretions nor accumulate beyond a certain point in the organism. Moreover, in artificial, and doubtless in natural digestion, the presence of a little fat accelerates the solution of nitrogenous matters taken as food. Lastly the occurrence of fat in milk, in the egg, in all plastic exudations, and in all highly cellular organs, is a clear indication that this substance plays an important part in the process of cell-formation; hence we may probably explain the therapeutic use of such medicines as cod-liver oil.

4. The *albuminous* group contains all those substances which are chemically known as the proteine-bodies (see PROTEINE), viz., albumen, fibrine, casein, and the allied vegetable compounds of very nearly the same proportion of carbon, hydrogen, nitrogen, and oxygen; while additionally they contain a little sulphur or phosphorus, or both: they all contain on an average about 15 per cent. of nitrogen, a substance which has not occurred in the preceding groups.

All these proteine-bodies, such as occur in the fluids of the egg, in animal flesh, in the curdy matter of milk, &c., are dissolved by the gastric juice and intestinal fluid, and converted into matters termed *peptones*, which although similar in their ultimate composition to the substances from which they are derived, differ from them in their greater solubility and their more ready diffusibility through animal membranes. Like the fats, they are chiefly absorbed by the lacteals, but to some extent by the capillaries. A reference to the chemical composition of the milk and of the fluids of the egg, shows that all the nitrogenous tissues in the body of the young animal must have been primarily derived from albumen or casein; and it is established beyond all doubt, that these substances are throughout life the essential producers of blood, and consequently of the various nitrogenous structures which are built up from that fluid.

5. The *gelatinous* group (which formed a part of Prout's albuminous group) includes the different varieties of gluten, obtained by boiling, from many animal tissues; as, for example, bone-cartilage, tendons, skin, hoofs, &c. All soups and jellies which stiffen on cooling contain it, and such substances are popularly, but erroneously, regarded as highly nourishing. Unlike the preceding group, from which they only slightly differ in ultimate composition, they do not appear to form new blood, and their uses are still so questionable, that we will merely notice one function of them, which has been suggested by Liebig—viz., that these substances may go directly to the formation of such tissues as yield gluten on boiling, and which, if this food were not taken, would have to derive their nourishment from the members of the preceding group.

6. The *saline* group. With the exception of common salt (chloride of sodium), which we take instinctively in additional

* The researches of Boussingault on milch-cows, of Milne Edwards and others on bees, and of Lacaze-Duthiers on the insects inhabiting galls, distinctly show that starch and sugar are capable of being converted into fat in the animal organism.

quantity with most kinds of food, the members of this group are unconsciously taken in the different articles of solid and fluid food on which we live. Want of space prevents us from noticing the different foods which yield the individual salts; but when we invariably find phosphate and carbonate of lime in the bones, in fixed and definite proportions; when we invariably find a nearly fixed proportion of chloride of sodium, alkaline phosphates, and other soluble salts, in the blood, flesh, milk, &c.; and when, further, we find that these substances are being constantly eliminated by the urine, it is obvious that they must be replaced by the food, if we would keep the organism in its normal state. The evil consequences of a deficiency of any of these ingredients of food are well known; thus, when too little phosphate of lime (to which bone owes its firmness and hardness) is taken into the system, or when too much is again taken out (as occasionally, during pregnancy, when the foetal bones require it for their ossification), fractures do not readily unite.

It is only comparatively recently—during the last quarter of a century—that physiologists have satisfied themselves, that in order to supply the wants of the system, food must consist of a combination of these groups; and that animals which are fed exclusively on food belonging to one of the groups—as, for example, albumen or fibrin—perish under symptoms of inanition, as certainly as if they had been deprived of all nourishment. As in the infant's milk we find the albuminous, oleaginous, saccharine, and saline groups represented by the caseine, butter, sugar, and salts, so, for other periods of life, the food, whether derived from the animal or vegetable kingdom, must contain a due (although not necessarily the same) proportion of the different types. Again, in judging of the nutritive value of any kind of food, we must take into consideration its digestibility. Thus, the experiments made by Dr. Beaumont on Alexis St. Martin, a Canadian, in whom there was, in consequence of a gun-shot wound, a fistulous opening leading from the exterior to the interior of the stomach, and recent experiments made by Busch on a woman with a fistulous opening into the jejunum (see ALIMENTARY CANAL), show, for example, that hard-boiled eggs, meat that has been boiled for a long time, and hard cheese, which is poor in fat, are less easily and rapidly digested than soft-boiled or fresh eggs, meat steeped in vinegar, or moist, fat cheese, and that starch is much more readily converted into sugar when boiled than in the raw form.

As the nitrogenous constituents of the food (articles containing albumen, fibrin, &c.) are chiefly employed in the formation of the blood and the reproduction of the tissues, it was at one time thought that the quantity of nitrogen which any kind of food contained might be taken as a measure of its nutritive value; but this test is not altogether to be relied on, since the nitrogen in part depends upon the gluten-yielding matters, which probably contribute little or nothing to the formation of textures.

Both daily experience and chemico-physiological observations show us, that the best kinds of food contain both fat and carbohydrates, in addition to albuminous matters. Instinct teaches us to combine highly amylaceous foods with fats; as, for example, bread and butter, beans and fat bacon; and the increased digestibility of such mixtures proves, no less than the simultaneous occurrence of fat and sugar in the milk and in the egg-fluids, that both substances are necessary, as independent ingredients of food, although, perhaps, one may temporarily serve as a substitute for the other. Unfortunately, we have no trustworthy data for enabling us to determine the proportion in which the different nutrient groups should be combined so as to form the food best suited to the general wants of the organism. The proportions occurring in human milk are the following: 10 parts of plastic or blood-forming matter (caseine), 10 parts of fat (butter), 20 parts of a carbo-hydrate (sugar), and 0.6 of a part of salts. For the wants of adult life, a lesser ratio of plastic matter (albumen, &c.) would probably suffice.

The absolute quantity of food required for the maintenance of the human body in health varies so much with the age, sex, and habits of the individual, and with the circumstances in which he may be placed, that it is impossible to fix a standard applicable to every case; but from the consumption of food by large bodies of healthy men, such as our soldiers and sailors, we can determine with tolerable accuracy the *average* daily quantity. We extract the following remarks from Todd and Bowman's *Physiological Anatomy and Physiology of Man*. 'Each seaman in the British naval service is allowed from 31 to 35½ ounces of dry nutritious food daily, of which 26 ounces are vegetable, and the rest animal; the latter consisting of 9 ounces of salt meat, or 4½ of fresh. Sugar and cocoa are also given. The soldier is allowed a pound of bread, and three-quarters of a pound of meat. In most of the London hospitals, full diet, which is given to convalescent patients who need a liberal diet, consists generally of half a pound of meat, with from 12 to 14 ounces of bread, half a pound of potatoes, a pint of milk, and sometimes beer or porter—a pint of the former, or half a pint of the latter. The former dietary is des-

tined for men who must be in readiness for the most active athletic exercises, requiring not only great muscular strength, but also considerable power of enduring fatigue. The latter is intended to recruit the powers of those who have been suffering from disease. If, now, we compare with these a dietary which has been found sufficient for the support of health in a state of more or less confinement, with a moderate amount of daily labor, we may fairly infer that the proper allowance for persons not engaged in actual manual labor lies between these extremes. In the union workhouses of England, able-bodied men obtain 25 ounces of solid food daily, of which the quantity of meat does not exceed 5 or 6 ounces. In prisons, it has been found necessary to give a certain amount of animal food to prisoners who are subject to hard labor. Each of such prisoners, if confined for a term exceeding three months, and kept at hard labor, has a daily allowance of about 36 ounces of food, of which meat constitutes only a very small portion—namely, about 16 ounces in the week. The prisoner has obviously the advantage of the poor man, whose only crime is poverty; but there is doubtless sufficient justification for this in the fact, that the labor of the prisoner, and the mental depression which long-continued restraint and confinement induce, render a greater amount of nutriment necessary than the indigent would require, who seek in the workhouse a shelter from absolute want.' For further details on this subject, which is one of great practical importance, we may refer to a paper by Dr. Lyon Playfair, 'On the Food of Man under Different Conditions of Age and Employment,' published in 1854, in the 56th volume of the *Edinburgh New Philosophical Journal*, and to a memoir by Dr. E. Smith upon 'Prison and other Diets.' See also Dr. Pavy's *Treatise on Food and Dietetics* (2d ed. 1875).

It appears, then, that a daily amount of food, varying from 35 to 25 ounces, is sufficient to maintain health; and of this a fourth or fifth part ought to be animal food; but in special cases, much more or less may be taken without apparent injury. The smallest quantity of food upon which life is known to have been supported with health and strength, is that on which Cornaro—whose history is recorded in most books on Diet and Dietetics—states that he subsisted, in order to reduce extreme corpulence, for a period of fifty-eight years—viz., 12 ounces of food, chiefly vegetable, with 14 ounces of light wine. In contrast with Cornaro's case, we may refer to instances recorded by Parry and other arctic voyagers of the voracity of the natives of those cold regions. A young Esquimaux, who was allowed 'unlimited diet,' availed himself of the privilege to the extent of devouring, in 24 hours, 35 lbs. of various kinds of food, including tallow-candles; and the Cossacks of Siberia are reported to consume daily from 12 to 20 lbs. of animal food.

An article upon diet would be imperfect without a reference to the best mode of dressing meat, for cookery and digestibility are closely allied. Most persons find meat that has been broiled most easily digested. The first should be brisk so that the albumen on the surface of the meat may be coagulated rapidly, and thus retain the internal juices. A similar rule applies, for the same reason, to boiling and roasting. When meat is to be boiled, it should be plunged into water already boiling; while, if soup is to be made, the meat should be put into cold water, and the temperature slowly and gradually raised—the object, in the former case, being to retain, in the latter, to extract the nutritious fluids. See (BOILING and BROILING.) Fried meat and rich stews are usually very indigestible. Salted meat is not only harder and more indigestible than fresh meat, but the process of salting extracts important salts, and much of the nutrient juice from the meat; the only exception being fat pork, which is rendered more digestible by salting. On this subject, see Liebig's *Researches on Food*, 1847.

We shall conclude with a notice of certain substances which, although they are hardly entitled to be termed foods, may fairly be considered, from the universality of their use, to exert a definite influence on the organism, and to supply certain existing, although, perhaps, undefined wants. We refer to alcohol, tobacco, tea, and coffee.

From three series of observations made upon himself, Dr. Hammond arrives at the conclusion, that 'alcohol increase the weight of the body, by retarding the metamorphosis of the old, and promoting the formation of new tissues, and limiting the consumption of fat.' The respiratory and urinary excretions, and the fæces, were invariably diminished. These effects occurring when the amount of food was below the quantity required to maintain the weight of the body, were productive of no deleterious result to the system; but when the food was sufficient to balance the waste from the excretions, and still more, when an excess of aliment over the demands of the system was ingested, the health was disturbed, and disease almost induced.

Hence the laboring-man, who can hardly find bread and meat enough to preserve the balance between the formation and decay of his tissues, finds in alcohol an agent which, if taken in moderation, enables him, without disturbing his health, to dispense with a certain quantity of food, and yet keeps up the weight and

strength of his body. On the other hand, he who uses alcohol when his food is more than sufficient to supply the waste of tissue, and, at the same time, does not increase the amount of his physical exercise, or drink an additional quantity of water (by which the decay of tissue would be accelerated), retards the metamorphosis, while an increased amount of nutriment is being assimilated, and thus adds to the plethoric condition of the system which excessive food has a tendency to produce.

Tobacco, according to the experiments of the same excellent observer, resembles alcohol in these respects, that when the food is sufficient to preserve the weight of the body, it increases that weight; and when the food is not sufficient, and the body, in consequence, loses weight, it restrains that loss; but it differs from alcohol in being unattended with any unpleasant effects upon the circulation, though its action on the brain is apparent in increased nervous excitement, followed by a pleasant feeling of ease and contentment. In these experiments, Dr. Hammond, who was not in the habit of using tobacco in any form, smoked 450 grains daily.*

Tea and coffee are usually believed to have a somewhat similar effect to that which, as we have shown, is produced by alcohol and tobacco. The power of tea in arresting the waste of tissues has, however, been called in question. The value of alcohol and other stimulants is discussed in the *Alcohol Question* (1879), by Sir James Paget, Dr. Brunton, &c. See **FOOD AND DRINK**.

DIET, DESERTION OF. The proceedings under a criminal libel are in Scotland spoken of technically as a diet, and when the libel is abandoned by the public prosecutor, or where he fails to appear, he is said to desert the diet. The effect of a judgment of the court declaring that the diet has been deserted, is to free the accused from prosecution under the particular libel or writ, but not to prevent a new process being raised on the same grounds. Where a defect or informality has been discovered in the libel, the prosecutor may apply to the court to desert the diet *pro loco et tempore*, by which means he reserves his right to insist of new, which would be lost were he to allow the trial to proceed to an acquittal. If the prosecutor's motion be, that the court shall desert the diet *simpliciter*, the accused will be thereby finally discharged; and this motion is in his power to make, even after a verdict of guilty has been returned by a jury. In point of law, the Lord Advocate, or his depute who is prosecuting in his name, has it in his power at the very last to save the life of a prisoner, either by moving the court to desert the diet, or by declining to move for sentence. The power, however, is one which public opinion in the present day effectually restrains him from exercising, and which, if once exercised, would certainly be abolished.

DIETARY, MILITARY. The chief matters concerning the dietary or sustenance of the troops in the British army, and indirectly, in those of other countries, will be found noticed under **BAKERIES, ARMY; COMMISSARIAT; COOKERY, ARMY; and RATION**.

DIETARY, NAVAL. In fitting out ships for the royal navy, the quantity of victuals is calculated on two data—the established allowance or ration of certain articles, and the average experience of past years in regard to certain others. Under the first category, the ration is everywhere equal, from the admiral down to the humblest sailor; under the second, the differences are very wide. Certain articles are regarded as 'non-guaranteed' to the ordinary crew, to be given or withheld according to circumstances; such as fresh meat, preserved meat, lemon-juice, and wine.

The dietary in relation to kind and quality of food has been changed from time to time. In 1844, the daily ration was set down thus: 1 lb. biscuit, $\frac{1}{2}$ lb. salt meat, $\frac{1}{2}$ lb. vegetables, $\frac{1}{2}$ oz. sugar, 1 oz. chocolate, $\frac{1}{2}$ oz. tea, and $\frac{1}{2}$ pint rum. When the meat was beef, $\frac{1}{2}$ lb. flour was added; when pork, $\frac{1}{2}$ pint of pease in lieu of the flour. Besides these daily allowances, $\frac{1}{2}$ pint oatmeal was given weekly, and vinegar when wanted, usually also half a pint per week. Fresh vegetables being not at times obtainable, preserved vegetables may not be in store, and circumstances may render it easy to obtain supplies of fresh meat, suet, raisins, currants, loaf-bread, rice, sago, coffee, cocoa, barley-meal, butter, cheese, onions, leeks, wine, beer, &c. At such times the dietary undergoes a temporary change, very acceptable to the crew. If the sailors draw less than their rations, they receive a money equivalent at stated intervals. The cost of the dietary to the state, on the basis of 1844, was about £18 per man per annum.

The British government have never attempted the temperance system in the navy, but they offer facilities to such seamen as choose to adopt it. In 1847, a plan was introduced for giving tea

and sugar in lieu of rum. Many of the seamen have in this way abandoned spirituous liquors, but not to so great an extent as the seamen of the United States navy.

In 1859, the dietary was made more liberal in several particulars. The scale of provisions now stands thus: Daily—biscuit or soft bread, $\frac{1}{2}$ lb.; spirit, $\frac{1}{2}$ pint; sugar, 2 oz.; chocolate, 1 oz.; tea, $\frac{1}{2}$ oz. Weekly—oatmeal, $\frac{1}{2}$ pint; mustard, $\frac{1}{2}$ oz.; pepper, $\frac{1}{2}$ oz.; vinegar, $\frac{1}{2}$ pint. Daily when procurable—fresh meat, 1 lb.; vegetables, $\frac{1}{2}$ lb. Daily when these are not procurable—salt pork or salt beef, 1 lb.; split peas, $\frac{1}{2}$ pint; or 9 oz. flour, $\frac{1}{2}$ oz. suet, $\frac{1}{2}$ oz. currants or raisins.

The dietary for emigrants is regulated by law. Every emigrant ship is bound to be provided with certain kinds and quantities of provisions, according to the number of emigrants and the length of the voyage. The chief owners of passenger-ships engaged in the Australian and other distant trades, now pay great attention to this subject, as one which affects the good name of the several firms.

DIETERICH, JOACHIM FREDERICK CHRISTIAN, an eminent veterinary surgeon, was born on the 1st of March 1792, at Stendel, in Prussia. In 1818, he undertook, at the instance and expense of the Prussian government, a tour through France, Würtemberg, Bavaria, Austria, and Hungary. On his return, he was appointed to a chair in the Veterinary College of Berlin, which he held for four years. In 1830, he accepted a post in the General Military School of Berlin, where, in 1841, he was appointed Professor in Ordinary. His publications, which are widely known, and have been translated from the German into various languages, include *Pulmonary Consumption in Cattle* (Berlin, 1821); *Manual of Veterinary Surgery* (1822); *Manual of Special Pathology and Therapeutics for the Use of Veterinary Surgeons* (1828); *Manual of the Practical Knowledge of Horses* (1834); *Manual of Obstetrics* (1845); *Manual of the Education of Domestic Animals* (1848); *The Principal Defects of Horses, and the Mode of Diagnosing them* (1853).

DIETRICH OF BERN, the name under which the Ostrogoth king, Theodoric (q. v.) the Great, appears in the German heroic legends; in which by Bern, his capital, Verona, is to be understood. As early as the 7th c., he would seem to have become the center of a distinct cycle of legends. A little later, he was, with a not unusual disregard of all historical truth, brought into connection with the traditions of Attila, or Etzel. According to these legends, D. is said to have fled from Italy before Ottacher (Odoacer), or Ermanarich; to have met, along with his attendant vassals, with a hospitable reception from Etzel; but after many years, to have again got possession of his kingdom. The extermination of the royal House of Burgundy by Attila, which is an historical event, was the cause that D., as well as Etzel himself, was woven into the Burgundian and Frankish Siegfriedssage; and thus he appears, in the second part of the *Nibelungen*, at Etzel's court, and is handled by the poet with special predilection. There have been numerous poems, besides, of which D. was the center and principal hero. It is very probable that the *Hildebrandslied*, of the 8th c., is the fragment of such a poem. Except this, we have only late versions of these legends; for example, *Schlacht vor Raben* (Ravenna) of the 13th c., *Alphart's Tod* (13th c.), *Zwerg Laurin, oder der kleine Rosengarten* (15th c.), *Dietrich's Ahnen*, *Dietrich's Flucht*, &c.

DIETS OF COMPEARANCE, in the law of Scotland, are the days on which a party to a civil or criminal process is cited to appear in court. Formerly, there were two diets, because there were two summonses; but by the Judicature Act, in 1825, it was enacted that all summonses should henceforth proceed on one diet. By 13 and 14 Vict. c. 36, s. 21, the period allowed to the defender (see **INDUCE**) was shortened from 20 to 14 days for persons within Scotland; and for persons in Orkney, or in Shetland, or forth of Scotland, from 40 and 60 days respectively, to 21 days in both cases. In the sheriff-courts, the period is six days (16 and 17 Vict. c. 80). See **SUMMONS, INDICTMENT, INDUCE**.

DIEZ, FRIEDRICH CHRISTIAN, the founder of the philology of the Romanic languages, was born at Giessen, 15th March 1794, and educated at Giessen and Göttingen. During the greater part of the years 1819 and 1820, he lived at Utrecht as a domestic tutor. In 1822, he went to Bonn as a *privat-docent*, and in 1830 was there appointed Professor of Modern Literature. His first work, *Altspan. Romanzen*, was issued in 1821. He afterwards published a great number of valuable works on the Romanic languages, two of which are worthy of special mention—the *Grammatik der Romanischen Sprachen* (Grammar of the Romanic Languages, 3 vols., Bonn, 1836–1842), and the *Etymologisches Wörterbuch der Romanischen Sprachen* (Etymological Dictionary of the Romanic Languages, Bonn, 1853). The last of these works, in particular, is recognized not only by Germans, but by the scholars of all the Romanic nations, to be the basis for the scientific study of all the Romanic languages. He was actively engaged in work till his death, May 29, 1876.

*Dr. Brinton, in his excellent article on 'The Stomach and Intestine,' in the *Cyclopedia of Anatomy and Physiology*, refers to an instance of the partial starvation of a large ship's crew on a long voyage, in which the *chewers* of tobacco were alleged to have endured hunger far better than the other sufferers, while the *smokers* did not enjoy the same advantage. This fact, however, does not invalidate our statement, and only shows, as we might *a priori* have expected, that the effects of chewing are more powerful than those of smoking. When the system receives its due supply of food, tobacco, if used at all, should be used in moderation.

DIFFERENCE; DIFFERENCES; CALCULUS OF FINITE DIFFERENCES. The word difference means usually the excess of one quantity over another of the same kind, and this is its meaning in arithmetic. In the higher branches of mathematics, however, it has a peculiar meaning, which we shall briefly explain. When we have a series of numbers connected by a regular though not obvious law, the character of that law may be detected by forming a new series of the *differences* between each term of the original series and the next, and then treating the new series (which we may call the series of 'first differences') in the same way; and so on, till we reach a series of differences the law of which is manifest. Thus,

Given series,	4	7	11	18	31	54	92	151
First differences,	3	4	7	13	23	38	59	
Second differences,	1	3	6	10	15	21		
Third differences,		2	3	4	5	6		

The law of the series of third differences is manifest; we see that its next term must be 7, which gives 28 as the next term of the series of second differences, 87 as the next of the first differences, and so 238 for that of the original series, which we can thus continue to any number of terms. To take a simpler case. Let the series be

	43	47	53	61	71
First differences,		4	6	8	10
Second differences,			2	2	2

Here the law is manifest in the first differences, and we should be able to calculate the series if we knew the first terms of the three series; viz., 43, 4, 2. It is on this principle that calculating machines (q. v.) can be constructed to compute tables of logarithms, &c. Out of the method of Differences sprung the Calculus of Finite Differences, first treated by Dr. Brook Taylor, under the name of the Method of Increments. This calculus has nothing to do with the Transcendental Analysis. See **CALCULUS DIFFERENTIAL**, &c. It deals with the changes of functions when *definite* increments are made to the variables; while the Transcendental Analysis considers only their changes when indefinitely small or infinitesimal additions are made to the variables. It would be out of place here to attempt an account of the Calculus of Finite Differences. See **FUNCTIONS**.

DIFFERENCES, in Heraldry, though often, or indeed generally, confounded with marks of Cadency (q. v.), have, in strict usage, a totally different function—the former being employed to distinguish brothers and their descendants after the death of the father, the latter while he is still alive. Differences in this limited sense may consist either of a chief added to or a bordure placed round the plain shield borne by the head of the house; or should the shield exhibit any of the Ordinaries (q. v.), as the bend, fess, pale, &c., the difference may be indicated by an alteration on the lines. The proximity of the bearer to the head of the house is indicated by the character of the line by which the differencing chief, or bordure, or ordinary is marked off from the field, the following being the order usually observed: the first or eldest brother, on the death of his father, inherits the pure arms of the house; the second brother, if the difference is to consist of a bordure, carries it plain; the third, ingrailed; the fourth, inverted; the fifth, embattled; &c. Other modes of differencing have been invented by heralds, and are not unknown to practice; such, for example, as changing the tinctures either of the field or of the principal figures, of which Nisbet gives many famous examples—altering the position or number of the figures on the shield, adding different figures from the mother's coat or from lands, and the like. Where the cadet is far removed from the principal family, if the field be of one tincture, it is sometimes divided into two, the charge or charges being counter-charged, so that metal may not lie on metal, or color on color. The confusion between differences and marks of cadency, above referred to, is by no means peculiar to the heraldic usage of England, though there it is more prevalent than in Scotland. In France, the cadets of the House of Bourbon have been in the habit of continuing these marks, and at the present day, as in Mackenzie's time, the label or lambel is to be seen on the arms of all the members of the Orleans family. That no distinction between what we call marks of cadency and differences was there observed, is further apparent from the fact that, whilst such was the practice of the House of Orleans, the House of Anjou carried a bordure gules, and that of Alençon a bordure gules charged with eight bezants.

In Germany, Sir George Mackenzie says that the several branches of great families distinguish themselves only by different crests (*Precedency*—Works, ii. 616); and he gives as the reason, that all the sons succeed equally to the honors of the family. In Britain, and in France, some change is always made on the shield as carried by the head of the house; but the practice even of good heralds has been so irregular, as to bring the rule very nearly to what Mackenzie holds to be the correct one—viz., that every private person should be allowed, with the sanction of the proper authorities, to make what marks of distinction can suit best with the coat which his chief bears.

DIFFERENCES, CALCULUS OF. See **DIFFERENCE**.

DIFFERENTIAL CALCULUS. See **CALCULUS**.

DIFFERENTIAL THERMOMETER. See **THERMOMETER**.

DIFFRACTION, or **INFLECTION**, of the rays of light. It was observed by Grimaldi, that if a beam of the sun's light be let into a dark room through a very small hole, the shadows of things in this light will be larger than they ought to be if the rays passed the bodies in straight lines, and that these shadows have three parallel fringes, bands, or ranks of colored light adjacent to them.

This phenomenon was originally known under the name of diffraction, and was supposed to arise from the refraction of the atmosphere. This explanation was disproved by the observations of Newton, who, from the conception which he was led to form of it, called the phenomenon the 'inflection of the rays of light.' It is now identified with a larger class of phenomena, which have been much more completely explained in the later development of the theory of light, and are assigned, on the hypotheses of Fresnel, to the interference of undulations. See **INTERFERENCE**. The observations and experiments of Newton on the subject, as detailed in the third book of his work on Optics, are, however, extremely interesting and instructive, and with regard to accurate observation and description, apart from the imperfect state of the theory, leave nothing to be desired.

Having made in a piece of lead a small hole with a pin, whose breadth was the 42d part of an inch, Newton let into the darkened chamber a beam of the sun's light. In this light, the shadows of all bodies were bordered with three parallel fringes or bands of colored light. The shadow of a hair, too, was found to be much broader than the hair itself, and fringes of light were observed within it.

Again admitting light into the darkened apartment by a hole a quarter of an inch wide, he allowed it to pass between two knife-edges parallel to one another. In this case, owing to the breadth of the hole by which the light was admitted, the fringes did not appear within the shadows of the knives until the knife-edges were brought to approach one another, when they appeared.

By making the hole smaller through which the light was admitted, they became more distinct. As the knife-edges continually approached one another, the fringes grew distincter and larger, until they vanished. The outmost fringe vanished first, and the middlemost next, and the innermost last; and after they were all vanished, and the line of light which was in the middle between them was grown very broad, a shadow began to appear in the middle of this line, and divide it along the middle into two lines of light, and increased until the whole light vanished. This enlargement of the fringes was so great, that the rays which go to the innermost fringe seemed to be bent above twenty times more when this fringe was ready to vanish, than when one of the knives was taken away.

The order of these phenomena is then made clear by the following experiment: 'I caused the edges of two knives to be ground truly straight, and pricking their points into a board, so that their edges might look towards one another, and meeting near their points, contain a rectilinear angle, I fastened their handles together with pitch, to make this angle invariable. The distance of the edges of the knives from one another at the distance of four inches from the angular point, where the edges of the knives met, was the eighth of an inch; and therefore the angle contained by the edges was about $1^{\circ} 54'$. The knives thus fixed together I placed in a beam of the sun's light, let into my darkened chamber through a hole the 42d part of an inch wide, at the distance of 10 or 15 feet from the hole.' When the fringes of the shadows of the knives fell perpendicularly upon a paper at a great distance from the knives, they were in the form of hyperbolas, and are represented in the following figure.

In the diagram, CA, CB, are lines drawn upon the paper parallel to the edges of the knives, and between which all the

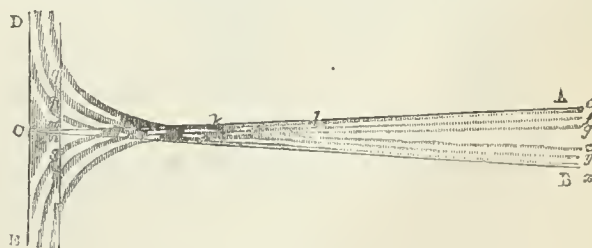


Fig. 1.

light would fall, if it passed between the edges of the knives without inflection. The lines *eis*, *fht*, and *qlw*, represent the terminus of the shadow of one of the knives, the dark line between the first and second fringes of that shadow, and the dark line between the second and third fringes of the same shadow. The lines *xip*,

ykg , and zlr , represent the same lines corresponding to the other knife-edge. These lines are hyperbolas, having for asymptotes the line DE , and lines parallel to CA , CB , respectively.

It will be seen that in this experiment the fringes become wider towards the narrow end of the opening, just as in the former case they become wider as the knife-edges approached one another.

The best mode for exhibiting the phenomena of diffraction, and that now generally adopted for that purpose is as follows: The rays of sunlight being reflected horizontally through an aperture into a darkened apartment, are concentrated by a combination of lenses, to a very small focus. By this means the light is made to diverge from a very small circle, with the advantage of a greater concentration of light than is obtained by simply admitting the sunlight through a small aperture. The edges of the shadows of every object placed within the cone of light diverging from this focus, will exhibit the fringes above described.

By means of metal-leaf arranged upon a plate of glass, as in the accompanying diagram (fig. 2), shadows can now be thrown

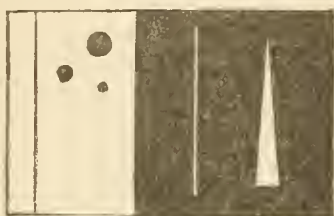


Fig. 2.

upon a screen, so as to exhibit at once all the most peculiar phenomena of this class.

The figures b , c , in the accompanying diagram (figs. 3 and 4),

Fig. 3.

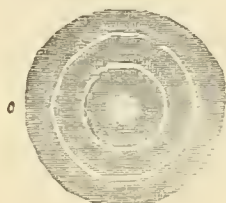
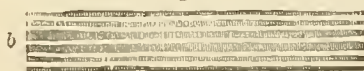


Fig. 4.

represent the appearance presented by the shadow of a wire and of a small circular disc.

The following is a popular explanation of the phenomenon above described as now understood. Supposing light to be propagated by undulations proceeding from a single small source or focus at A (fig 5): let Bb be a section of the front of a wave of this light, that is, a section of a surface passing through all the particles which are at the same instant at the same phase of vibration. Let Cc represent the front of the same wave, when it has passed through the additional space BC . The vibrations of the particles in Cc are the consequence of the vibrations previously existing along the space Bb . But then, the motion of the particle at C is determined not alone by the previous motion of the point B , immediately opposite it, but is affected more or less by the motions of every point in the surface Bb .

If, therefore, the vibrations over a portion of the space Bb , be intercepted by a dark object de , placed there, the circumstances which determine the motion of the point C , may be totally changed; and taking into account the united effect of these vibrations, it may be found that the result, instead of light, will be darkness. Again, if a point f be taken directly behind the dark body de , although the vibrations over the space de , which would otherwise affect it, are stopped, it may still be affected by the vibrations in the remainder of the surface Bb ; and if the combined effects of these be such as to cause in it a sufficient vibration, there will be light at the point f , though it is properly within the shadow of ed . It is impossible here to go further into detail, and it can only be said that, on the assumption of Fresnel, the explanation of the whole phenomena above described is most complete and satisfactory, the

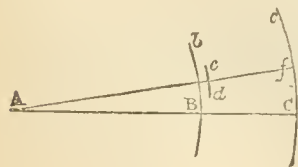


Fig. 5.

fringes and dark lines being produced by the undulations alternately strengthening or destroying each other. A very beautiful experiment, devised by Fresnel for the purpose, is found to furnish a complete verification of the theory. See INTERFERENCE.

DIFFUSION, the gradual dispersion of particles of one liquid or gas among those of another—or of the particles of a solid in a liquid holding it in solution. It is of the greatest importance in terrestrial physics, being the cause of the uniform composition of the atmosphere at all elevations, and one of the causes of the speedy dissipation of noxious gases and vapors in the open air, and of the nearly uniform saltiness of the sea, &c., so necessary to animal and vegetable life.

We shall consider the above cases in detail, and in addition the transfusion, as it has been called, which occurs when different gases or liquids are separated from each other by a porous plate or membrane. The principal experiments on this subject are those of Graham and Bunsen—to be found in the *Philosophical Transactions* or Graham's *Chemistry*, and in Bunsen's *Gasometry*.

1. *Diffusion of Gases*.—If two flasks be filled, one with hydrogen, the other with chlorine, and connected by a long tube fitted into their necks by corks—in whatever position the compound apparatus be placed it will be found that the gases mutually interpenetrate—in this particular case the color of the chlorine enables us to follow by the eye the course of the diffusion. When the mixture has attained its permanent state, each of the gases is found to be uniformly diffused through the whole containing space, precisely as it would have been had the other not been present.

In fact, the presence of a second gas seems merely to affect the time which the first takes to distribute itself equably throughout the vessel, and in no other way to influence the final result. (Dalton, long ago, suggested the analogy of the passage of water among stones in the bed of a river.) The pressure of the mixture is the sum of the pressures corresponding to each of the gases, if separately occupying the space which they jointly fill; and the same is true of a mixture in any proportions of any number of gases, so long, at all events, as they do not act chemically upon each other.

Precisely the same is true of vapors. If, for instance, a few drops of ether be injected into an exhausted receiver, there will be an almost instantaneous conversion of a definite quantity into vapor, so that its tension shall have a certain value depending on the temperature alone. If air be present in any quantity whatever, the vaporization will proceed more slowly, but the final amount converted into vapor will be the same as in the former case. A familiar illustration of this is afforded by the dew-point, which is a temperature merely, having no connection with the height of the barometer.

Next let us take the case of a gas forced by difference of pressures from one vessel to another through a very small hole in a thin metallic plate—one of the vessels, for instance, being full of the gas, and the other connected with an air-pump kept continually in action. Experiment, and theory such as it is, agree in giving in this case, for the velocity with which the different gases pass through the orifice, under similar circumstances as to pressure, a result inversely proportional to the square root of the density of each gas. Now, if, instead of the plate with the small hole, we substitute a thin layer of bladder or other membrane, or a thin disc of plaster of Paris, it appears from experiment that the results are sensibly the same. Thus, if we have the same gas at different pressures on opposite sides of such a layer or disc, the rate of passage of the gas through it, from greater to less pressure, will, for the same pressures, but different gases, vary according to the above law; and, moreover, the presence of a second gas will in no degree modify the rate of transfusion of the first. If, therefore, a glass tube, say an inch in diameter, and two or three feet long, have a diaphragm of plaster of Paris formed near one end, and that end ground flat, so as to be perfectly closed by a glass plate, it may be filled with hydrogen by displacement, its other and lower extremity being plunged into water, and care being taken not to wet the diaphragm. If the glass plate be now removed, transfusion will take place—hydrogen passing out as if into a vacuum, and the constituent gases of air entering also as if into a vacuum. On account of the comparative lightness of hydrogen, the velocity with which it escapes will be considerably greater than that with which the others enter; so that the immediate effect will be a rise of the water in the tube. After a short time, the whole of the hydrogen escapes, and the tube will contain only air.

The proportion of the volume of the latter to that of the hydrogen may be calculated from the above law—remembering that the hydrogen is practically diffusing into a vacuum all along, and the air entering by the pressure of the atmosphere in excess over that of the air in the tube. Allowing for the unavoidable errors of experiment, the verifications of these results are very satis-

factory. It has been attempted to deduce these laws as consequences of the dynamical theory of gases. See a remarkable paper by Maxwell in the *Philosophical Magazine* for 1860.

Bunsen has suggested the application of the method of diffusion to the very important question in gas analysis—whether the constituents of a gas, as determined by the usual methods, are merely *mixed*, or are chemically united. It is evident that, in general, the diffusion rate of a mixture of two gases will differ from that of a compound of the same.

2. *Diffusion of Saline Matters in Solution.*—If a strong brine be placed in the bottom of a tall glass jar, pure water may be carefully introduced above it, so that no immediate mixture takes place. If the whole be allowed to stand, the salt is gradually diffused through the vessel, which, after a sufficient time, will be found to contain a brine of uniform strength. Experiments have been carefully made to determine, in such a case as the above, the distribution of the salt through the vessel at various periods before the permanent state has been arrived at. They have been compared with the results of the theory now to be explained, and the coincidence has been found very satisfactory. The theory assumes that the rate of diffusion between contiguous layers of the water in the cylinder is proportional to the excess of salt in one layer above that in the next—the co-efficient of proportionality involving a special constant of diffusion for the particular salt experimented upon. This is precisely the assumption that is made about the linear conduction of heat in a homogeneous solid, or the propagation of electricity in a wire. The partial differential equation to which all of these cases are reducible, ($C \frac{du}{dt} = \frac{d^2u}{dx^2}$), was obtained, and its complete solution exhibited in various forms long ago by Fourier, in his *Théorie de la Chaleur*, one of the most remarkable mathematical investigations of last generation. See HEAT, CONDUCTION OF, and ELECTRICITY, THEORY OF. It is curious to consider the heating of a metallic rod, or the solution of a few crystals of salt in a tall glass jar full of water, as problems thus directly allied to the signaling through the Atlantic cable.

Graham's method of determining the diffusion co-efficient of a salt in water was simple, and yet admitted of great precision in the determinations. A number of glass bottles, cast in the same mould, had their mouths ground flat, so as to be accurately closed by a plate of glass, which—when the bottle, filled with a solution of known strength, had been carefully placed in one of a series of equal glass jars, and covered with a constant amount of water—could be slipped off without producing any considerable disturbance in the fluid. After a measured time, the glass plate was replaced, and the amount of salt which had left the bottle accurately determined.

The following are the most important of the laws thus obtained; they are quite consistent with the theory above mentioned. For solutions of the same substance, or different degrees of strength, the rate of diffusion is proportional to the strength of the solution. Different salts seem to arrange themselves in groups as regards their diffusion co-efficients, the latter having simple numerical relations to each other. Analogy of chemical composition and of crystalline form appear to be the principal elements in the arrangement of the groups. The quantity diffused increases with the temperature, and at the same rate for all salts. The presence of a second salt in the solution, or in the water into which the diffusion takes place, if not in large quantity, appears not to affect the result, supposing of course, that no chemical action takes place. It is evident that by this process a partial separation may be effected of salts which have different rates of diffusion, and do not act chemically on each other; and it is found that in certain cases even chemical compounds, such as alum, may be partially decomposed by the same means.

3. *Diffusion of Liquids. Osmose.*—If sulphuric acid be carefully poured through a tube into the bottom of a vessel filled with water, colored by an infusion of litmus, or red cabbage, the change of color, of the vegetable dye will enable us to trace the gradual diffusion of the acid in the water. Here, the process, though probably on the whole quite analogous to the case of gases, occupies more time; but the final result is, as in the former case, an almost uniform mixture of the two fluids. There is no necessity for any special remark on this part of the subject, particularly as we have already adverted to the theory of this process. But if different fluids be separated by a membrane or diaphragm, some extremely remarkable results are obtained, which were first carefully examined by Dutrochet. These have been attributed to the action of osmotic force, something of the same kind as capillary force, and probably a closely connected, if not identical form of molecular action. The theory of these actions is not yet well understood, but we shall endeavor to give from analogy a few attempts at explanation.

If an inverted funnel, with a very long stem, have a bladder tied over its mouth, and, being filled to the neck with syrup of sugar, be suspended so that the bladder is entirely under the surface of water in a dish, the syrup will pass through the bladder into the water, and the water will pass through in the opposite direction,

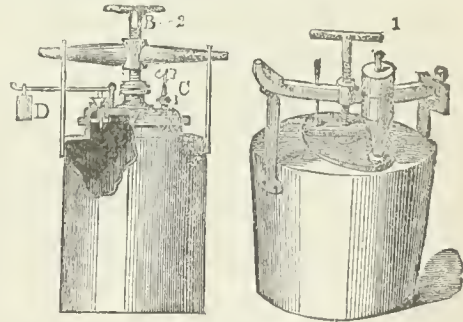
but in far greater quantity—producing the extraordinary effect of a rise in the level of the fluid in the tube, which can with precaution be made to amount to a yard or two in the course of a few days. The points of the attempted explanation of this phenomenon are somewhat as follows: The bladder has more capacity for, or will absorb more of, water than of syrup. The first effect, then, is to saturate the bladder with water, very slightly mixed with syrup. On the lower side of the bladder, water, with a small quantity of sugar in solution, is diffusing into pure, or nearly pure water, this process will be a slow one; at the upper side, water (nearly pure) is diffusing into a strong syrup. Here, then, the effect is much greater, and thus a greater quantity of water passes upwards than of syrup downwards.

Similar effects may be produced with a vast number of other liquids. Combined with capillarity, it is believed that these experiments explain the motion of the sap in vegetables, and various other phenomena in the vegetable and animal kingdom. See OSMOSE.

DIGBY, SIR KENELME, the son of Sir Everard Digby, noted as one of the Gunpowder Plot conspirators, was born in 1603, three years before the execution of his father. He was brought up in the Protestant faith, and at the age of 15 was entered at Gloucester Hall, Oxford. After leaving the university, where he had acquired the reputation of great ability, he spent two years in continental travel. He returned to England in 1623, and was knighted in Lord Montague's House. Under Charles I., he was a gentleman of the bedchamber, and held several public offices. In 1628, he equipped a squadron at his own expense, and sailed first against the Algerines, and subsequently against the Venetians. In 1632, on the death of Dr. Allen, of Gloucester Hall, D. inherited his collection of books and manuscripts. In 1636, when in France, he was converted to the Roman Catholic faith. He returned to England in 1638, and on the breaking out of the Civil War, he was imprisoned as a royalist in Winchester House, but in 1643 he was allowed to retire to France. At Paris, he was received with favor by the court, and made the acquaintance of Descartes. After Charles I. had fallen, D. returned to England, but the parliament forbade him the kingdom, under penalty of death. Retiring to the continent, he traveled in France and Italy; but in 1655, he was again in England, and was in frequent attendance at the court of the Protector. He went again to France, and busied himself with the preparation of philosophical papers. He returned to England in 1661, and died there in 1665. D. married a daughter of Sir Edward Stanley of Tongue Castle, in Shropshire, by whom he had one son.

His works are numerous, and on a great variety of subjects, comprising *A Conference with a Lady about the Choice of a Religion* (Par. 1638), *Observations on Spenser's Fairy Queen* (Lond. 1644), *A Treatise on the Soul, proving its Immortality* (Par. 1644), *Of the Cure of Wounds by the Power of Sympathy* (Lond. 1658), and *Discourse on Vegetation* (Lond. 1661, &c.). The *Private Memoirs of Sir K. Digby, &c.*, written by himself, were published in London in 1827. D.'s library, which was removed to France when the Civil War broke out in England, became, on his death, the property of the French king.

DIGESTER, PAPIN'S, is a strong boiler with a closely fitting cover, in which articles of food may be boiled at a higher tem-



Papin's Digester.

perature than 212° F. As its name implies, it was invented by Papin, and a common form is the *Autoclave*, fig. 1, where the lid can be turned round under clamps or ears, and thus be rendered steam-tight. Another form is given in fig. 2, where a portion of the side is removed, to exhibit the interior. The lid A is fastened down by screw B, and the steam generated in the boiler is allowed to escape at a stop-cock C, or by raising the weighted valve D. The increased pressure to which the contents of the boiler are exposed, causes the boiling-point of the water to rise to 400° F., and occasionally higher. The digester is of great value as a means of preparing soups of various kinds, and especially in the extraction of gelatine from bones.

DIGESTION, ORGANS AND PROCESS OF. The function or process of digestion is one of the chief of those organic functions which are directly concerned in maintaining the life of the individual, inasmuch as it is that through which the animal is enabled to receive aliment, and to prepare or modify it for being assimilated to, and appropriated by, the various organs of the body, or, in other words, for being converted into blood.

The general expression, 'function of digestion,' includes several minor or subordinate processes.

According to Milne Edwards, the acts of the digestive function may be classed as follows: 1. There is the Prehension of the Food; 2. Its Mastication; 3. Its Insalivation; 4. Its Deglutition; 5. Its Chymification or Stomachal Digestion; 6. Its Chylification or Intestinal Digestion; 7. Defæcation; 8. The Absorption of the Chyle.

Before examining these acts in succession, and the mechanism by which each is effected, we must have clear conceptions regarding the classification of food, the quantity of food, and other allied subjects, which are discussed in the article **DIET**; and we should likewise have some knowledge of the causes of those sensations which we call *hunger* and *thirst*, which are, or ought to be, our natural guides regarding the periods for taking food, and the quantity to be taken. The immediate cause of ordinary hunger cannot be explained; but that it is due to some peculiar condition of the gastric mucous membrane, seems probable from the fact, that the sensation continues after division of the pneumogastric nerves, from which the stomach mainly derives its nervous fibres, if we correctly interpret the feelings of the animals on which the experiments were made. In extreme hunger, the sufferer complains of a sense of sinking, which is referred to the region of the stomach, while general faintness and sometimes considerable pain are present. Hunger, or the want of food which occasions it, may be diminished by rest, sleep, or any cause that retards the general change which is perpetually going on in all the tissues of the body. We have shown in the article **DIET**, that tobacco and alcohol have a power of limiting the disintegration of the tissues, and thus of keeping off or diminishing hunger. When the sensations of extreme hunger are not relieved by food, the body begins to feed upon its own tissues, and the symptoms of Starvation (q. v.) begin to manifest themselves. The period at which death occurs from abstinence, varies greatly in different animals—young animals always dying sooner than older ones. In man, total privation of food usually causes death in about a week; but if a little drink be allowed, life is considerably prolonged.

Thirst is dependent upon a peculiar condition (probably undue dryness) of the mucous membrane of the upper part of the digestive tube. The thirst in febrile affections is, however, probably due to the morbid state of the blood.

We now proceed to the consideration of the different acts of which the digestive function is made up.

1. In the act of prehension, man and many of the lower animals (monkeys, squirrels, &c) employ the hands or anterior extremities and mouth; the lips and anterior teeth, and, to a certain extent, the tongue, being also employed in this function. In the lower animals, however, the modes of prehension are various. Some (like the giraffe) twist the tongue around the leaves and young branches of trees; others (the ant-eaters) have a remarkably long tongue, covered with a viscid secretion, and by thrusting this organ into ant-hills, &c., secure their prey; and in the chameleon among reptiles, and the woodpecker among birds, the tongue seems specially developed for prehensile purposes.

In the elephant, this act is accomplished by the prolongation of the nostrils into the organ popularly known as the trunk. In other mammals (the Ruminants and Solipeds), the large pendulous lips are the organs employed. In birds, the bill (which is a modification of the lips) is always the prehensile organ of that class.

The prehension of fluids is effected in two ways: sometimes the liquid is poured into the mouth, and is allowed to fall into it by its own weight; in other cases, the tongue is used after the fashion of a piston, being drawn within the mouth so as to exhaust the anterior part of that cavity, and fluids are thus forced to enter by atmospheric pressure.

2. Mastication is effected in the cavity of the mouth by means of the teeth. This cavity is bounded superiorly by the palate or roof of the mouth, and in other directions by the cheeks, lips and tongue. Projecting into its interior, above and below, is an arched series of teeth, which are firmly fixed by roots into corresponding sockets in the upper and lower jawbones. The upper jaw (and consequently the dental arch imbedded in it) is immovable, or only movable with the entire head; but the lower jaw, with its teeth, is capable of moving upwards, downwards, backwards, forwards, and laterally, by means of the powerful muscles of mastication. It is by the varied movements of the lower teeth against the upper, through the action of these muscles, that the food is broken down or masticated. For information regarding the structure, &c., of the teeth, see **TEETH**; see also **DENTITION**.

The operation of mastication is very important, since the more the food is broken down the more easily will it mix with the saliva and other fluids which participate in the digestive process.

3. Insalivation is effected by the admixture of the secretions of the three pairs of salivary glands (the parotids, the submaxillaries, and the sublinguals) and of the buccal mucus with the triturated food. A brief description of these structures is given in the article **GLAND**. The common saliva, formed by the combined secretion of these various secreting organs, is a colorless, turbid, viscid, inodorous, and tasteless fluid, which, after standing for some time, deposits a layer of pavement epithelium (see **EPITHELIUM**) and mucus corpuscles. In the normal state its reaction is alkaline, but the degree of alkalinity varies, and is greatest during and after meals. Saliva does not contain more than five or six parts of solid constituents to 995 or 994 parts of water, the most important ingredients being an organic matter termed *ptygaline*, and sulphocyanide of potassium, neither of which substances occurs in any other solid or fluid of the body. The daily quantity of saliva secreted by an adult man is estimated at about 48 ounces, but determinations of this kind must be regarded only as approximations to the truth, since the activity of the salivary glands is dependent upon various influences and conditions. Thus movement of the lower jaw, as in masticating, speaking, or singing, increases the secretion; as also do acrid and aromatic substances, and dry hard food; while the use of moist and soft food is accompanied by a scanty secretion.

The uses of the saliva in reference to digestion are partly mechanical and partly chemical. The mechanical uses are almost too apparent to require notice. The moistening of the dry food by the saliva serves the double purpose of adapting it for deglutition and of separating the particles, and thus allowing them to be more freely acted on by the other digestive fluids; moreover, from its viscosity, it lubricates the bolus of food, and thus facilitates deglutition; and it is probably also subservient to the sense of taste. The great chemical use of the saliva, is to convert the amylaceous (or starchy) portion of the food into glucose or grape sugar, and thus to promote its absorption.

4. Deglutition is the act by which the food is transferred from the mouth to the stomach. The pharynx, or cavity into which the mouth leads, takes so slight a part in the digestive process, that we need scarcely allude to any anatomical details connected with it. It is sufficient to observe that between it and the mouth is the pendulous or soft palate, which is a movable muscular partition that separates the two cavities during mastication. As soon, however, as the latter act is accomplished, and the bolus is pressed backwards by the tongue, the soft palate is drawn upwards and backwards, so as to permit the passage of the food into the pharynx. The bolus or pellet of food having arrived near the œsophagus or gullet (which is continuous inferiorly and posteriorly with the pharynx), is driven into it by the action of certain muscles, which almost surround the pharynx, and are termed its *constrictor* muscles. All voluntary action ceases as soon as the food is pressed backwards by the tongue into the pharynx. It is impossible to recall the pellet, and it is necessarily carried on (without even our cognizance) into the stomach. On receiving the food forced into its upper extremity by the action of the constrictor muscles of the pharynx, the œsophagus is dilated (for it usually lies in a collapsed state, with its walls in contact, or nearly so); this contact of the pellet with its mucous membrane causes its muscular walls to contract, and the food is thus driven, by a series of these contractions, into the stomach. The act of deglutition is now completed.

5. Stomachal digestion or chymification is the next process to be considered. The whole of the Alimentary Canal (q. v.) (fig. 1) below the Diaphragm (q. v.), or great muscular partition which separates the cavity of the chest from that of the abdomen or belly, possesses the following points in common, in relation to structure: The stomach, the small intestine, and the large intestine, are all lined by mucous membrane, have a muscular coat, consisting of two sets of distinct fibres—namely, circular fibres, which surround the tube or viscus after the manner of a series of rings, and longitudinal fibres running in

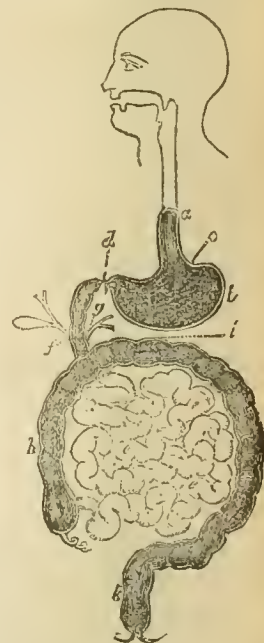


Fig. 1.

Human Alimentary Canal.

a, œsophagus; b, stomach; c, cardiac orifice; d, pylorus; e, small intestine; f, biliary duct; g, pancreatic duct; h, ascending colon; i, transverse colon; j, descending colon; k, rectum.

the same direction as the intestine itself—and are invested with a serous membrane, the peritoneum (see **SEROUS MEMBRANES**), which at the same time retains the viscera in their proper position, and permits their necessary movements.

The human stomach is an elongated curved pouch, lying almost immediately below the diaphragm, and having the form of a bag-pipe. It is very dilatable and contractile, and, its function is to retain the food until it is duly acted upon and dissolved by the gastric juice, which is secreted by glands lying in its inner or

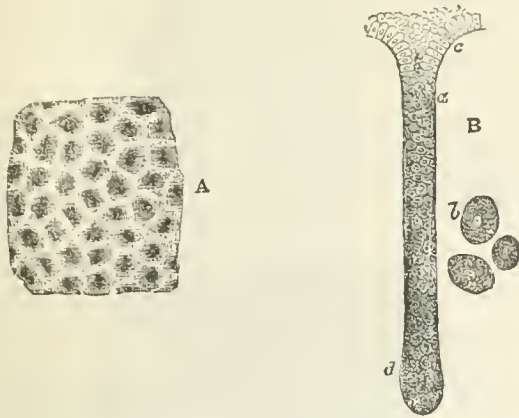


Fig. 2.

A, inner surface of the stomach, showing the cells after the mucus has been washed out, magnified 25 diameters. B, stomach-tube from the middle of the human stomach, magnified about 150 diameters: *a*, wall of the tube, lined with large oval nucleated cells; *b*, the same cells isolated; *c*, nucleated cells of columnar epithelium, occupying the upper parts of the tubes; *d*, blind extremity of the tube.

mucous coat, and then to transmit it, in a semi-fluid or pulpy state, into the duodenum. Its average capacity is about five pints. The parts of it which have received special names are the greater curvature (fig. 1) *b*, the lesser curvature, upon its upper border, and the cardiac, *c*, and pyloric *d*, extremities.

The mucous membrane, or living coat of the stomach, is thick and soft, and lies in irregular folds, in consequence of the contraction of the muscular coat, unless when the organ is distended with food. On opening the stomach, and stretching it so as to remove the appearance of folds, we perceive even with the naked eye, but better with a lens, numerous irregular pits or depressions, irregular in shape, and averaging about $\frac{1}{16}$ th of an inch in diameter. To see them properly, the mucus with which they are filled must be washed out (fig. 2, A). These pits are so shallow as not to dip into the mucous membrane to a greater extent than $\frac{1}{4}$ th or $\frac{1}{8}$ th of the thickness. The rest of the thickness is chiefly made up of minute tubes, running parallel to one another, and vertically to the surface of the stomach (fig. 2, B). These are the gastric tubes or glands which secrete the gastric juice from the blood in the capillaries which abound in the mucous membrane. They pass in twos, threes, or fours from the bottom of each pit, and usually subdivide into several tubes, which, after running a more or less tortuous course, terminate in blind or closed extremities. These tubes are filled with epithelial cells, whose contents are composed of granules, with which oil-globules are often mixed, and each tube is invested with capillaries, which usually run in the direction of its long axis.

In the pyloric or duodenal end of the stomach, these tubes (at least in the dog and several other animals whose stomachs have been carefully examined in a perfectly fresh state) are considerably wider than those which we have described, and differ from them also in other respects; and hence some physiologists believe that while they collectively secrete the gastric juice, one set may secrete the acid fluid and the organic matter termed pepsine, and the other mucus; the free acid and the pepsine are, as we shall shortly see, the two essential constituents of the gastric juice.

When food is introduced into the stomach, three special phenomena are induced in that viscus: 1. There are certain movements induced which are dependent on its muscular coat; 2. The mucous membrane is altered in appearance; and 3. There is the secretion of the gastric juice. Each of these phenomena requires a brief notice.

On killing an animal while the act of digestion is going on, and at once laying open its abdomen, we find that the stomach is in a contracted state, firmly embracing its contents, and with both its orifices so closed as to prevent the escape of the food, this contraction being due to the stimulation of the muscular coat by the food. If we examine the movements of the stomach during digestion, which we can do either by exposing the stomach of a living animal, or by sending a magneto-electric current through this organ in an animal just killed, we perceive that, in the cardiac half or

two-thirds, the movements are extremely slow, the muscular coat apparently contracting on the food, and progressively sending it towards the pylorus; whilst in the pyloric end of the stomach the movements are more energetic and rapid, resembling the peristaltic or vermicular movement, which we shall presently describe as occurring in the intestinal canal. When the transverse constriction has reached the firmly shut pylorus, a relaxation lasting about a minute ensues, followed by a repetition of the circular contractions. The movements with which these contractions impress upon the food are described by Dr. Beaumont in the following terms: 'The food entering the cardiac end of the stomach, *c*, turns to the left, descends into the splenic extremity, *s*, and follows the great curvature towards the pyloric end, *d*. It then returns in the course of the smaller curvature, and makes its appearance again at the cardiac aperture in its descent into the great curvature to perform similar revolutions. These revolutions are effected in from one to three minutes.' This account, given by Dr. Beaumont, is based on the observations which he made in the stomach of Alexis St. Martin, a Canadian, with a fistulous opening into the stomach, whose case is referred to in the article **DIET**.

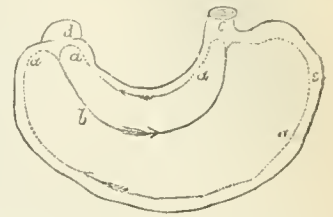


Fig. 3.

Diagram to show the general direction of movement impressed on the semi-fluid food in the stomach.

aa, the hemispherical or surface current, carrying the semi-fluid food towards the closed pylorus, where it is reflected into *b*, the central current, which unites the cardiac (*c*) and pyloric (*d*) openings.

Dr. Brinton, however, adopts a modified view, which is probably the correct one. He supposes that the semi-fluid food entering at *c* (fig. 3), the cardiac orifice, goes in the directions marked *a*, partly along the greater, and partly along the lesser curvature; and that these two currents of food meet at the closed pylorus, when they are both reflected into the direction *b*, forming a central or axial current, occupying the real axis of the stomach which unites the two apertures.

The mutual interference of these currents at their borders causes a uniform admixture of the various substances composing them, while the reflection of the upper and lower currents into one another insures an equal contact of all the mass with the secreting surface of the mucous membrane.

The changes in the mucous membrane are mainly the following: The inner surface of the healthy fasting stomach is of a paler pink tint than after the introduction of food and while in the latter case the reaction of the moisture on the surface is very acid, in the former it is neutral, or even alkaline. Dr. Beaumont found (in the case of Alexis St. Martin) that, on the introduction of food into the stomach, the vessels of the mucous membrane became more injected, and that its color became changed from a pale pink to a deep red. A pure colorless and slightly viscid fluid, with a well-marked reaction, was then observed to distil from the surface of the membrane, and to collect in drops, which trickled down the walls, and mixed with the food.

That the *gastric juice*, which is the term applied to the acid fluid which Dr. Beaumont saw exuding from the mucous membrane, and which is secreted or formed in the gastric tubes which we have already described, is capable of exerting a solvent action on food, is proved by numerous experiments. It was first ascertained by Reaumur (1752), who obtained some of this fluid by making animals swallow sponges with a string attached, by which he could withdraw them. He thus showed that alimentary substances out of the body were altered by this fluid in the same manner as they are changed in the stomach, and disproved the favorite theory of that period, which ascribed all the changes which the food underwent in the stomach to a species of trituration. The subject of *artificial digestion*, or digestion out of the body, has, since that period, been carefully investigated by many observers, and there is now no doubt that the changes which the food undergoes in the stomach are essentially chemical, and not mechanical.

Two years before Beaumont's experiments, Dr. Prout had ascertained not only that an acid fluid is secreted by the gastric mucous membrane of rabbits, hares, horses, dogs, &c., during digestion, but that the acid is the muriatic or hydrochloric acid, and it was supposed that the solvent action of the gastric juice was due to this source. But experiments showed that the solvent action is not due simply to the acid of the gastric juice, and that the latter must contain some other ingredient which, either alone or in combination with the acid, can exercise this power. It was then discovered that the addition of a portion of the gastric mucous membrane to water acidified with hydrochloric acid produced a perfect digestive fluid, due attention being paid to the temperature, which should be kept at about 100°, or about the normal temperature of the interior of the animal body.

Later observations showed that we can obtain from the gastric

mucous membrane the special organic matter on which its digestive power depends, and to this substance the name of *pepsine* has been given. The two essential elements of the gastric juice are then: 1. A free acid, which in some cases seems to be hydrochloric alone, and in others a mixture of hydrochloric and lactic acids; and 2. An organic matter, which is found on analysis to be highly nitrogenous, and to be allied to the albuminates, and which we term *pepsine*. The best analysis of human gastric juice is that made by Schmidt of Dorpat, who, in 1853, had an excellent and rare opportunity of examining it in the case of an Estonian peasant, Catharine Kütt, aged 35 years, and weighing about 118 lbs., in whom there had existed for three years a gastric fistula or opening, three or four lines in diameter, under the left breast, between the cartilages of the ninth and tenth ribs. The introduction of dry pease and a little water into the stomach, through the opening, occasioned (even in the morning, on an empty stomach) the secretion of from five to seven ounces of a clear limpid fluid with an acid reaction, which, however, was much less strong than Schmidt had observed in previous experiments on the gastric juice of dogs and sheep, in which he had artificially established similar fistulous openings. The following table gives the mean of two analyses of the gastric juice of Catharine Kütt, with corresponding mean results of the same fluid in the sheep, a purely herbivorous animal, and in the dog, a purely carnivorous animal.

	Human Gastric Juice.	Sheep's Gastric Juice.	Dog's Gastric Juice.
Water	994.40	986.15	971.17
Solid constituents	5.60	13.85	28.83
Pepsine	3.20	4.20	17.51
Hydrochloric acid	0.20	1.56	2.70
Chlorides of sodium, &c.	2.08	6.00	5.88
Phosphates	0.12	2.09	2.74

The only impurity that could affect these analyses, is the saliva that possibly might have been swallowed.

The quantity of the gastric juice secreted in 24 hours was determined by Bidder and Schmidt (*Die Verdauungs-säfte*, &c.) in the sheep to be $\frac{1}{10}$ th, and in the dog $\frac{1}{10}$ th of the weight of the body. If the latter ratio were true for men, a man of ten stone weight would secrete about 14 lbs. of this fluid daily. In the case of Catharine Kütt, the mean daily quantity amounted to no less than 31 lbs., or to more than a fourth part of the weight of her body. On this calculation, a man of ten stone would daily secrete 37 lbs. of gastric juice.

The uses of this fluid in reference to digestion are clear. It serves not only to dissolve, but also to modify the nitrogenous elements of the food (such as albumen, fibrin, casein, and, in short, all animal food except fat, and the blood-forming portion of vegetable food), converting them into new substances, termed *peptones*, which, although they coincide in their chemical composition, and in many of their physical properties, with the substances from which they are derived, differ essentially from them in their more ready solubility in water, and in various chemical relations.

Thus, albumen is converted by the gastric juice into albumen-peptone, fibrin into fibrin-peptone, &c. According to the investigations of Meissner, the albuminates are simultaneously decomposed or broken up into peptones and substances which he terms *parapeptones*, which latter are not further changed by the action of the gastric juice, but are converted into peptones by the action of the pancreatic juice, with which they come in contact in the duodenum.

All the best observers agree that the gastric juice exerts no apparent action on the non-nitrogenous articles of food—namely, the fats and the carbohydrates (sugar, starch, &c.); as, however, the fats exert a favorable influence on the digestion of nitrogenous matters, it is probable that they undergo some slight, although not appreciable, modification. Gelatine and the gelatinous tissues are, as far as is known, the only nitrogenous articles of food which are not converted into peptones and parapeptones by the action of the gastric juice.

Although the main object of the gastric juice is to dissolve the albuminates, &c. (e. g., the contents of the egg, flesh, cheese, &c.), it appears from experiments of Lehmann, Schmidt, and others, that it cannot dissolve the quantity necessary for the due nutrition of the organism. According to Lehmann, gastric juice can only dissolve $\frac{1}{10}$ th of its weight of coagulated albumen, while Schmidt makes the quantity as low as $\frac{1}{10}$ th. Now, since a dog secretes about $\frac{1}{10}$ th of its weight of gastric juice daily, it would only be able—even taking Lehmann's estimate, which is more than twice as high as Schmidt's—to digest 5 parts of dry or coagulated albumen for every 1000 parts of its weight; but a dog, in order to keep in condition on an exclusive flesh diet—and this is its natural food—should take 50 parts of flesh, containing 10 parts of dry albuminates, for every 1000 parts of its weight. Hence its gastric juice only suffices for the digestion of half the albuminates necessary for nutrition—a result which is in accordance with the observed

fact, that a considerable portion of the albuminates enters the duodenum in an undissolved state, and which will be explained when we consider the part which the intestinal juice—the fluid secreted by the various glands lying in the mucous membrane of the small intestine—takes in the digestive process. On comparing the experiments made on dogs with those made on Catharine Kütt, it appears that in the human subject the gastric digestion of the albuminates is much more imperfect than even in the dog.

The process of gastric digestion is slow. According to Beaumont's researches on Alexis St. Martin, the mean time required for the digestion of ordinary animal food, such as butcher's meat, fowl, and game, was from two hours and three-quarters to four hours.

The next point to be considered is: What becomes of the matters that are thoroughly dissolved in the stomach? Are they absorbed, without passing further down the canal? or do they pass through the pyloric valve into the duodenum, and are they finally taken up by the lacteals? Two of our highest authorities in physiological chemistry, Frerichs and Donders, maintain that



Fig. 4.

The under surface of the stomach and liver, which are raised to show the duodenum and pancreas.

st, stomach; p, its pyloric end; l, liver; g, gall bladder; d, duodenum; extending from the pyloric end of the stomach to the front, where the superior mesenteric artery (sm) crosses the intestines; pa, pancreas; sp, spleen; a, abdominal aorta.

absorption of the peptones commences in the stomach; but the view generally adopted is, that the albuminates, &c., which are converted into peptones, are for the most part taken up by the lacteals. The rapidity with which aqueous solutions of iodide of potassium, the alkaline carbonates, lactates, citrates, &c., pass into the blood, and thence into the urine, saliva, &c., shows that the absorption of fluids must take place very shortly after they are swallowed, and there is little doubt that the blood-vessels (capillaries) of the stomach constitute the principal channel through which they pass out of the intestinal tract into the blood. As the veins of the stomach, which are formed by the union of these capillaries, contribute to form the portal vein (see CIRCULATION, ORGANS OF), the absorbed matters pass directly to the liver, and probably stimulate it to increased secretion (fig. 4).

6. We must now follow the progress of the semi-fluid mass known as the *chyme*, from the stomach into the small intestine, and notice the changes which are collectively impressed upon it, and are known as *chylification* or intestinal digestion. But before we can satisfactorily do this, we must say a few words regarding the intestinal mucous membrane, with its various glands, &c., and on the changes which take place in it, during digestion.

The mucous membrane of the small intestine resembles that of the stomach in so far as it is of considerable thickness, and consists in a great measure of laterally grouped tubes. The reader is referred to fig. 5, which exhibits a section of the mucous membrane of the small intestine in the dog. These tubes, which form the great mass of the middle portion of the section marked *b*, are commonly called the *follicles of Lieberkuhn*, although they were first described by Brunner. They are straight, nearly uniform in diameter throughout their entire length, and are parallel to one another, and perpendicular to the inner surface of the small intestine on which they open. Nothing is known of the exact nature of their secretion; but in association with the secretions of other glands, they combine to yield the intestinal juice whose characters and uses will shortly come under our notice.

The projecting bodies marked *a* in the figure are termed the *villi*; they are minute processes of the mucous membrane of the small intestine, and obviously serve to increase to a great extent the amount of absorbing mucous membrane. They first appear in the duodenum, where they seem to develop themselves as elongations of the partitions between the cells or pits into which the tubes open. Comparatively scanty in number at first, they become very numerous (covering the whole surface) in the further part of the duodenum and the rest of the small intestines, giving to the mucous membrane a velvet-like or pilous appearance; they finally cease at the ileo-cæcal valve, which forms the boundary between the small and large intestine. In man, they are conical

in shape, and measure from $\frac{1}{4}$ th to $\frac{1}{6}$ th of an inch in length. They vary much in shape and size in the lower mammals and birds. (In carnivorous animals, as the dog, they are longer and more filiform than in man).

The structure of a villus (fig. 6) is somewhat complicated, but we must endeavor to explain it, because, without tolerably ac-

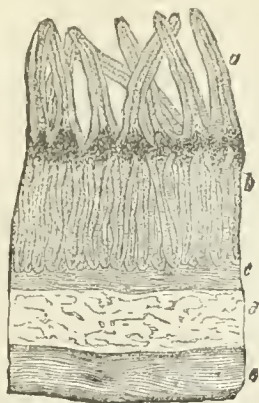


Fig. 5.

Vertical and longitudinal section of the small intestine in the lower part of the jejunum, showing the general arrangement of its coats.

a, villi; b, intestinal tubes or follicles of Lieberkuhn; c, submucous areolar tissue; d, circular muscular fibres; e, longitudinal muscular fibres.

curate knowledge on this point, no one can understand how most of the essential elements of food (the albuminates and fatty matters) make their way from the intestine to the blood. Each villus is provided with an abundant set of capillaries, which doubtless absorb fluid matters, which thus find their way directly from the bowels into the blood (fig. 7). A single artery enters its base, and



Fig. 6.

Two villi, denuded of epithelium, with the lateral vessels in their interior.

a, limiting membrane of the villus; b, basis of the same; c, dilated blind extremity of the central lacteal; d, trunk of the same.

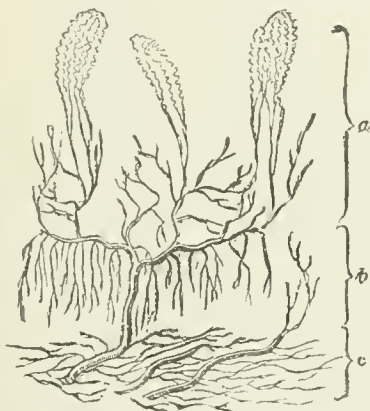


Fig. 7.

Vertical section of the coats of the small intestine, showing the capillaries and the beginnings of the portal vein. The arteries are not seen, not having been penetrated by the injection which has been thrown into the portal vein.

a, vessels of the villi; b, those of the tubes or follicles of Lieberkuhn; c, those of the muscular coat.

passing up its center, divides into a capillary plexus, which almost surrounds the villus immediately beneath the mucous membrane. From these arise small veins, which usually pass out of the villus in two, three, or more trunks, and contribute to form the portal vein. See CIRCULATION.

The villus also contains in its interior one or more *lacteals*, which are vessels with club-shaped closed extremities, which absorb the chyle from the intestine. Their milk-white appearance, when they are filled with chyle, suggests the origin of their name. The tissue which occupies the cavity of the villus, in which the lacteals are imbedded, and which supports the capillary plexus, is in a great measure made up of nuclei and granules, except at the free extremity, where a vesicular structure, resembling very minute fat globules, is apparent.

There is abundant evidence that the function of the villi is connected with absorption, and mainly with the absorption of chyle. 1. The villi exist only in the small intestine, where the absorption of food goes chiefly on. 2. They are most developed in that part of the intestine where chyle is first formed. 3. They are

turgid, enlarged, and opaque during the process of chylification, and small and shrunken in animals that have been kept fasting for some time before death.

In addition to the villi, the mucous membrane of the small intestine presents numerous transverse folds, which are termed the *valvulae conniventes*, from their valvular form and from their movements under water resembling the winking motion of the eyelids (fig. 8). Each fold passes round three-fourths or more of the gut; and in the lower part of the duodenum, and in the jejunum (the parts in which they are most fully developed), they are often more than half an inch in depth; further on, they diminish in depth, length, and number, and in the lowest part of the ileum they can scarcely be traced. Their object clearly is to increase the extent of the absorbent mucous membrane.



Fig. 8.

Small intestine distended by alcohol, and laid open to show the valvulae conniventes.

In addition to Lieberkuhn's follicles or tubes, which exist in the whole of the small intestine, there are other glandular or secreting structures, imbedded in the sub-mucous tissue of certain portions of the intestinal tract, which require consideration. These are: 1. Brunner's glands, which occur only in the duodenum; 2. Solitary glands, which seem to occur in all parts of the intestine, both small and large; and 3. Peyer's glands, which are usually confined to the ileum.

Brunner's glands are most abundant at the pyloric end of the duodenum. In structure, they resemble the pancreas, their ultimate elements being bunches of vesicles, from which minute ducts arise, which coalesce and form larger ducts, through which the secretion is poured into the duodenum. It is believed that they secrete a fluid similar to the pancreatic juice. The solitary glands occur in all parts of the intestine, but are perhaps more numerous in the jejunum than elsewhere. Each gland is a simple membranous flask-shaped vesicle, the neck corresponding to the surface of the intestine, while the rounded base lies in the submucous tissue. The neck presents no opening, and how the contents, which consist of nuclei and granular particles, are discharged into the intestine, is not clearly known.

As we never see them larger than a mustard-seed, we may presume that, on attaining that size, they burst. Peyer's Glands (fig. 9) are apparently mere aggregations of solitary glands, forming oval patches in the ileum. These patches vary in size and number, being largest towards the cæcum, where their long diameter sometimes measures three or four inches, and smallest towards the jejunum; while their number varies from fifteen to twenty, or even more. Nothing certain is known regarding the uses of these solitary or aggregated glands; but as they are largest during the digestive process, we must infer that they are in some way connected with that function. Possibly, the peculiar odor of the fæces may be due to their secretion. In typhoid or enteric fever,

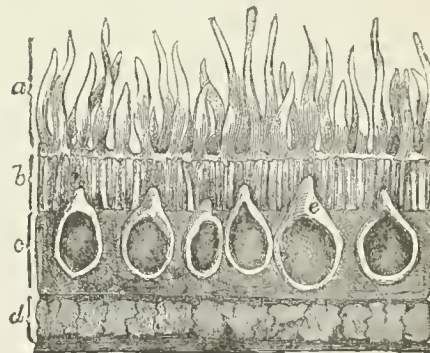


Fig. 9.

Vertical section through a patch of Peyer's glands in the dog.

a, villi; b, tubes of Lieberkuhn; c, submucous tissue, with the glands of Peyer imbedded in it; d, muscular and peritoneal coats; e, apex of one of the glands projecting among the tubes.

and in phthisis, these glands become ulcerated, which probably occasions the diarrhœa so common in these diseases.

Brunner's glands are much more developed in the herbivora than in the carnivora; Peyer's, on the other hand, are most developed in the latter.

We have endeavored, in the preceding sentences, to give the reader some idea of the complicated structure of the mucous and submucous coat of the small intestines; we now proceed to notice the chief uses of the muscular coat of the intestine. This coat, as has been already mentioned, consists of two layers of muscular fibres—namely, circular and longitudinal fibres, of which the for-

mer lie next to the submucous coat. The peristaltic or vermicular action by which the substances which enter the duodenum from the stomach are moved onwards, is due to this muscular coat. A person who has once seen the abdomen of an animal laid open immediately after death, will have a better idea of the nature of this movement than can be afforded by any description. It commences about the pyloric third of the stomach, from whence successive wave-like movements are propagated through the entire length of the intestinal canal. It is the rapid succession of these alternate contractions and relaxations that impels the intestinal contents onwards, and occasion those movements which, from their resemblance to the writhings of a worm, have been termed *vermicular*. It is very probable that the rapidity of this movement varies in different individuals—those persons, for example, whose bowels act twice daily have a more rapid vermicular motion than those in whom the act of defæcation occurs only once in twenty-four hours.

We have now to consider the effects produced on the chyme by the different fluids with which it becomes mixed in the small intestine. These fluids are: 1. The bile; 2. The pancreatic juice; and, 3. The intestinal juice.

The bile (see BILE) is a faintly alkaline or neutral fluid, containing two essential constituents, one of which is of a resinous nature, while the other is a pigment. The resinous constituent is not precisely identical in all kinds of bile, but it generally consists of a soda-salt whose acid is either glyco-cholic or taurocholic acid (q. v.), or of a mixture of these salts. Strecker, to whom we are mainly indebted for our knowledge of the chemistry of the bile, states that in most mammals the resinous constituent merely differs in the varying proportions in which the taurocholates and glycocholates are intermixed, the former usually preponderating. According to Lehmann, the resinous constituent amounts to at least 75 per cent. of the solid residue. The bile-pigment occurs in the bile of different animals under two forms—namely, as a brown and as a green pigment, the latter probably only differing from the former in being more highly oxidized. There has never been a case in which physiologists have had an opportunity of directly observing the quantity of bile that is secreted by the human subject, and all our information on this subject is derived from observations on animals, in which the *ductus choledochus communis* (see LIVER) has been tied, and a fistulous opening established into the gall-bladder. If the same proportion of bile to bodily weight holds good in man as in the dog, a man weighing ten stone would secrete daily about five pounds of bile. All observers agree, that the amount of the biliary secretion varies directly with the quantity of food; and as animals with biliary fistulæ (in whom all the bile escapes externally, instead of making its way into the duodenum) usually have voracious appetites, experiments on this point are easily made. There is great discrepancy of opinion as to how soon after a meal the bile flows most abundantly into the intestine. According to Kölliker and Müller, whose experiments were made on dogs fed only once a day, very little bile is secreted in the first and second hour after a meal; more in the third, fourth, and fifth; the maximum being sometimes attained in the fifth, sometimes not till the eighth hour.

Numerous and somewhat discrepant views have at different times been advanced regarding the functions of this fluid; we shall here only notice those functions which are connected with digestion. One use that has been ascribed to it, is to neutralize in the small intestine the acid chyme which emerges from the stomach. But the bile can contribute little or nothing to the neutralization of the free acid, because, in the first place, the bile is very slightly alkaline, and often perfectly neutral; and secondly, because the chyme in the intestine is still acid after the admixture of the bile. Again, the bile has been asserted to possess a special solvent action on the chyme; but none of the ordinary constituents of the latter seem to be essentially changed, even when digested for a long time with fresh bile.

Again, much importance has been attached to the antiseptic action of the bile on the contents of the intestinal canal, in favor of which view it is alleged that when no bile is poured into the intestine, the feces have a putrid odor, as is sometimes observed in patients with jaundice, and as was noticed by Frerichs in animals in which the *ductus choledochus* had been tied. Another use that has been assigned to the bile is, that it exerts a stimulating action on the intestinal walls, and thus acts as a natural purgative; and in support of this view, it may be mentioned that jaundice (in which the bile does not flow into the intestine) is often accompanied by extreme constipation, and that putridified ox-gall, taken either in the form of pill or enema, produces an undoubted purgative action. But the main use of the bile seems to be to promote the digestion of fatty matters, and it accomplishes this end not so much by any solvent chemical action on the fats (which at most is extremely slight), as by a peculiar physical action both on the fats and on the intestinal walls, disintegrating the former, and impressing on the latter (by moistening the villi) a peculiar condi-

tion which singularly facilitates the absorption of fatty matters. This view is fully confirmed both by direct experiments out of the body, and by comparing the relative qualities of fat that are retained in the body and applied to the purposes of life by animals with biliary fistulous openings, and by healthy animals.

The pancreatic fluid which is poured into the duodenum at the same spot with the bile (see fig. 1.), is a colorless, clear, somewhat viscid and ropy fluid, devoid of any special odor, and exhibiting a strong alkaline reaction. This fluid, as yielded by different dogs with permanent fistulous openings, varies considerably in chemical composition; the collective solid constituents ranging from 1.5 to 2.3 per cent., the organic matters from 0.9 to 1.6, and the mineral matters from 0.62 to 0.75.

The most abundant and important of the solid constituents is a peculiar substance termed *pancreatine*, or pancreatic diastase or ferment, in combination with soda, to which this fluid owes its principal chemical and physiological properties. Calculating from the quantity of pancreatic juice secreted by dogs of known weight, we may infer that a man weighing ten stone secretes daily about ten ounces of this fluid.

One of the chief uses of the pancreatic juice in relation to digestion, is to convert into sugar the amylaceous of starchy matters which have escaped the action of the saliva, and have passed unchanged into the duodenum. It possesses this property in a far higher degree than the saliva; and, as might be expected in reference to this use, the pancreas is found to be much more developed in herbivorous than in carnivorous animals. Bernard, the representative of the modern school of physiology in France, claims for this fluid another important function; he believes that he has proved that it is solely by the action of this secretion that the fat is reduced to a condition in which it can be absorbed and digested; that is to say, that it is decomposed into glycerine and a fatty acid. See FATS. This view has, however, not been generally accepted, and it seems probable that although the change described by Bernard takes place when fat and pancreatic juice are simply mixed together in a test-tube, it does not actually take place in the intestine, the acid gastric juice probably acting as an interfering agent. An attempt has lately been made by Corvisart and Meissner to prove that, like the gastric juice, this fluid can dissolve albuminous matters; but this view cannot be substantiated. Considering the large quantity of pancreatic fluid which is yielded in 24 hours, Schmidt, who has made the digestive juices the subject of his special study, is of opinion that the function of this fluid is not so much to promote the conversion of starch into sugar, as for the purpose of diluting the chyme, and for reconvert- ing the soda (which in the pancreas has been separated from the chlorine of the chloride of sodium, and has combined with the pancreatine) into chloride of sodium. He shows, from numerical calculations, that more than half of the chloride of sodium existing in the blood which circulates through the pancreas, is broken up into hydrochloric acid and soda, of which the former is separated by the gastric glands, while the latter unites with the pancreatine. Meeting again in the duodenum, the hydrochloric acid and the soda reunite, and re-form chloride of sodium, which is again absorbed, and re-enters the circulation. This is perhaps one of the most singular decompositions and reunions occurring in the animal body.

Of the last of the fluids poured into the intestine, and co-operating in the digestive process, the *intestinal juice*, we know comparatively little. It is the aggregate secretion of the various glands which we have described as occurring in the walls of the small intestine. It is a colorless, or sometimes yellowish, ropy, viscid fluid, which is invariably alkaline. We are not aware of any special or characteristic constituent in it, such as occurs in the other chylipoietic fluids. Its daily quantity is probably nine or ten ounces. It seems to unite in itself the leading properties of the pancreatic and gastric juices; that is to say, it resembles the former in converting starch into sugar, and the latter in dissolving flesh and other albuminous bodies.

We shall conclude this part of the subject with a few remarks on the chemical composition of the contents of the small intestine. On laying open the gut, we usually find a semi-solid admixture of imperfectly digested and indigestible substances and of the constituents of the digestive fluids in a more or less changed condition. The reaction of this mass varies in different parts of the canal, and in some measure with the nature of the food. Thus, the contents of the stomach always redden litmus paper, whatever kind of food has been taken; the duodenal contents are also always acid, but in a far less intense degree; in the jejunum we meet only with a faint acid reaction, which altogether disappears in the ileum; while in the cæcum, and sometimes in the lower part of the ileum, an alkaline reaction occurs. After a purely flesh diet the acid reaction disappears shortly below the duodenum, while after the sole use of vegetable food, it may sometimes be traced even to the cæcum. As a general rule, the contents of the large intestine are alkaline.

In consequence of the rapid absorption that goes on along the

intestinal surface, we meet with a comparatively small amount of soluble matters in these contents. Among these soluble matters we often find glycose (or grape-sugar), which seems to owe its origin to the metamorphosis of starch, and not to sugar having been present in the food; for after saccharine food has been taken, we rarely meet with it in any quantity in the small intestine, its absorption taking place with great rapidity. In the alcoholic extract of these contents we can almost always find evidence of the presence of biliary constituents. In the duodenum, and for a little way beyond it, we find glyco-cholic and tauro-cholic acid; descending a little further, they rapidly diminish, till we find the products of their disintegration; while in the large intestine, little more than a trace of these products can be detected. These chemical observations confirm the experiments of Schmidt, which show that nearly half the bile which is poured into the duodenum is decomposed before it reaches the middle of the small intestine.

7. We have now arrived at the seventh stage of the digestive process, that of *defecation*. The line of demarcation between the small and large intestine is very obvious, and by the peculiar arrangement of the ileo-cæcal valve (see fig. 10), matters are allowed to pass forward with facility, while regurgitation is impossible. For anatomical details regarding the large intestine, we may refer to the articles ALIMENTARY CANAL, CÆCUM, and COLON.



Fig. 10.

Cæcum inflated, dried, and opened to show the arrangement of the valve.

a, termination of the ileum; *b*, ascending colon; *c*, cæcum; *d*, a transverse construction projecting into the cæcum; *e*, lips of the valve separating the small from the large intestine; *f*, the vermiform appendix of the cæcum.

The contents of the large intestine differ very materially from those which we have been considering in the last paragraph, and constitute the *faeces*. They are more solid and homogeneous, and are often moulded into a definite shape by the cells of the colon. The only essential change which the contents undergo in this part of their course is, that they increase as they pass onward in solidity, in consequence of the absorption of fluid from them by the mucous membrane. They are propelled forward into the rectum by the vermicular action which has been already described. Here they accumulate, being prevented from escaping by the contraction of the sphincter muscle—a band of strong muscular fibres surrounding and closing the gut at its lower extremity. The act of defecation, or of expulsion of the faeces from the rectum, is effected partly by the muscular fibres of that part of the intestine which are stimulated to contraction by a certain degree of distension, and which are to a certain extent under the influence of the will, and partly by the simultaneous contrac-

tions of the abdominal muscles and of the diaphragm, which by reducing the antero-posterior and transverse diameters of the abdominal cavity, compress the intestinal canal in such a manner as greatly to assist the expulsive action of the rectum. These forces, or some of them (for usually the detrusive action of the muscular fibres of the rectum is sufficient), overcome the passive contraction of the sphincter, and the act of defecation is the result.

The faeces consist of a mixture composed of undigested particles of food (such as vegetable cellular tissue, fragments of tendon skin, and half-digested muscular fibre), of epithelium and mucus (derived from the intestinal walls), and of traces of decomposed biliary matters. Their peculiar odor is ascribed by some to the secretion of Peyer's glands, and by others to decomposed bile; while Liebig refers it to a decomposition of albuminous matters, founding his view upon the fact, that by burning albumen with potash, he could manufacture in the laboratory odors of a fecal character. The last is the least probable view. Their color varies with the food. On a mixed diet, they are of a yellowish-brown tint; on a flesh diet, much darker; and on a milk diet, quite yellow—and they become darker on exposure to the air. Their reaction is most commonly but not invariably alkaline. Their daily quantity is very variable; the mean of 17 observations made by a German physiologist, Wehsarg, was about 4.6 ounces, of which very nearly one ounce was solid matter, the rest being water; the largest and the smallest quantities being ten, and rather more than two ounces. Liebig, many years ago, made the observation that the insoluble salts of the food are mainly carried off by the faeces while the soluble salts are for the most part eliminated by the urine. For further details on the chemistry of this subject, we must refer to the elaborate Memoirs of Dr. Marcet, published in the *Philosophical Transactions*.

8. The absorption of the chyle forms the completion of the digestive act. The coats of the intestines contain two perfectly distinct sets of vessels—one through which blood circulates, and

the other containing a milky or transparent fluid, chyle or lymph, which, after a somewhat circuitous route, is poured into the blood. We have already referred to the fact, that fluids are absorbed from the stomach and intestine by the veins and capillaries of the mucous membrane; we now proceed to notice the mode in which the vessels of the second kind, the lacteals, act as absorbing agents. The lacteals are merely a portion of the great lymphatic system of the body, which will be described in a future article. See LYMPHATICS. They commence, as has been previously mentioned, in the villi, and possibly also in the intervening mucous membrane; and when an animal is killed while the digestive process is going on, they have, in consequence of their being distended with chyle, the peculiar white or milky appearance which procured for them their name of *vasa lactea*, from their discoverer, Asellius, in 1622. They pass in great numbers, and in a reticulated arrangement, between the layers of the mesentery, the portion of Peritoneum (q. v.) which surrounds the gut, and retains it in its proper position. After passing through the mesenteric glands, where their contents seem to become more highly organized, they make their way to the right side of the aorta in the lumbar region, where they finally discharge themselves into an elongated pouch, termed the *receptaculum chyli*. From this pouch, the thoracic duct, containing the chyle, passes upward along the vertebral column till it reaches the level of the arch of the aorta, behind which it runs to the left side, and discharges its contents into the subclavian vein, close to its origin with the internal jugular, its orifice being protected by two valves. The nature of these contents has been already described in the article CHYLE. This chyle is, in reality, incipient blood, which has been formed, as we have already seen, from the food, and has been absorbed from the intestine by the lacteals. We have now traced it to its entrance into the general circulation, and it only remains for it to pass, in conjunction with the venous blood with which it is mixed, through the lungs, in order to be converted into new and perfect arterial blood, fit for the highest processes of organization.

We shall conclude this article with a notice of some of the most striking peculiarities presented by the digestive organs in the lower animals.

In the mammalia, we have three different forms of stomach—the *simple*, the *complex*, and the *compound*. In the *simple* form, the organ consists of a single cavity, as in man, but the form may vary to a great extent. It is most simple and relatively smallest in carnivorous animals. This is the most common form of mammalian stomach. In the *complex* stomach, that viscus is made up of two or more compartments communicating with one another, but often without presenting any marked difference of structure. The kangaroo, the porcupine, and the squirrel, afford good examples of this form of stomach.

In the cetacea, the stomach consists of from five to seven cavities, that communicate with each other; but whether their functions are similar or different is not known. The *compound* stomach occurs in the ruminants (the cow, sheep, camel, &c.); it consists of four distinct cavities, differing very materially in their size, and in the arrangement and structure of the lining mucous membrane (see fig. 11). The first, and by far the largest cavity, is the paunch or *rumen*; it occupies a great part of the abdominal cavity, and is the receptacle into which the food is received when first swallowed. The second cavity is termed (from the peculiar arrangement of the lining membrane, which forms deep polygonal cells) the *honey-comb* or *reticulum*, *c*. The third cavity presents a foliated appearance internally, and is hence popularly known as the *manyplies*, *d*. In anatomical works, it is sometimes termed the *psalterium*, and sometimes the *omasum*. The fourth division, termed the *reed* or *abomasum*, *e*, is somewhat of a pyriform shape, and is the true digestive stomach, in which alone gastric juice is secreted, all the preceding cavities being merely for the purpose of preparing the food for the more essential changes which it is here destined to undergo. The food first passes in a crude unmastered state into the paunch, which, like the crop of birds which we shall presently notice, serves as a receptacle for the food until the act of feeding is concluded, and moistens it with the fluid secreted from its walls. The water, however, which the animal drinks, seems to pass directly into the second stomach. During rumination, small portions of the food pass from the paunch into this second stomach, from whence they are returned in the form of pellets, to the mouth, where they undergo thorough mastication, and are then returned, as a pulp, by the oesophagus directly into the third stomach. The direction of the food into one or other of these cavities is altogether independent of the will, and results from a peculiar arrangement and property of the lower end of the oesophagus, which does not terminate at its opening into the paunch on one side, and the second stomach on the other, but is continued onwards as a deep groove or semi-canal with two lips. If these lips come in contact, they form a perfect canal, leading directly to the third stomach; while if they remain open, the food passes into the first or second stomach.

The dry food first swallowed opens the lips and escapes into the paunch, while the masticated food, being soft and pulpy, passes along the groove, without opening its lips, into the third stomach. Here it is diffused over a large surface of mucous membrane, and doubtless undergoes certain changes before entering the fourth or true stomach. In the camel, the dromedary, and the llama, numerous rows of large quadrangular deep water-cells are developed on the parietes of the second stomach, and on the part of the paunch next to that cavity. These cells are surrounded by muscular fibres, which, by their contraction, exclude the food from their interior, and by their gradual opening, the water is

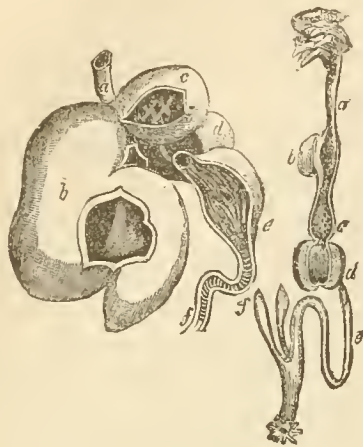


Fig 11.
Compound stomach of ox.

a, œsophagus; b, rumen, or paunch; c, reticulum, or second stomach; d, omasum, or third stomach; e, abomasum, or fourth stomach; f, the duodenum.



Fig. 12.
Alimentary canal of fowl.

a, œsophagus; b, crop; c, proventriculus, or secreting stomach; d, gizzard, or triturating stomach; e, intestinal canal; f, two long cæcal tubes indicating the theoretical commencement of large intestine.

allowed to mix in successive small quantities with the food. It is by this arrangement that these animals only require to drink at comparatively long intervals. The intestinal canal of the ruminants is of great length, being sometimes, as in the sheep, more than thirty times the length of the body of the animal; and in herbivorous animals generally, as compared with carnivorous, the canal is very long.

It is in the large intestine that, next to the stomach, we find most varieties of structure. Cuvier has given the following *résumé* of the principal facts connected with this subject, to which, however, there are numerous exceptions. 1. In man, the oranges, and the wombats, there are both cæcum and vermiform appendix. 2. In the other quadrumania, the digitate carnivora, the marsupialia, the rodentia, the pachydermata, the ruminantia, the solipeds, and the amphibious mammals, there is a cæcum (often in vegetable-feeders larger than the stomach, and probably subservient to the digestive process), but no vermiform appendix. 3. In the edentata, the plantigrade carnivora, and the cetacea, there is neither cæcum nor vermiform appendix.

In birds, as in all other classes of animals, the alimentary canal varies according to the nature of the food, being long and capacious, and in some parts highly muscular, in the granivorous tribes, while it is much more simple in those which live on fish and other animal food. We take the common fowl as a good example of the former class (see fig. 12). The œsophagus, about the middle of its course, and a little above the union of the clavicles (the furculum), presents an enlargement termed the crop or *ingluvies*, which varies in form and structure according to the food, and is provided with numerous glandular follicles. Just before terminating in the gizzard, the œsophagus again dilates to form a second but smaller cavity, known as the glandular stomach, *proventriculus*, or *ventriculus succenturiatus*, e, from whence a copious secretion of gastric juice is poured out and mixed with the food, which, having previously been macerated by the secretion of the crop, now passes on to the gizzard, d, which is a muscular organ of immense strength, which grinds and crushes whatever is placed in its central cavity—a process that is facilitated by the presence of hard pebbles, which are instinctively swallowed by the bird, and act the part of millstones. There is no very marked division in birds between the large and small intestine, the theoretical limit being indicated by the presence of two (sometimes only one) cæcal appendages, f.

There are no special points that we need notice regarding the digestive organs of reptiles, except that as the ophidians (serpents) and saurians (lizards) are mostly carnivorous, and most of

the chelonians (tortoises) are herbivorous, the apparatus in question is more simple in the former than in the latter.

The amphibia afford us an excellent illustration of the close connection between the nature of the food and the development of the intestinal canal. In the young tadpole of the common frog, which lives upon the soft vegetable matter of our fresh-water ponds and ditches, the stomach is narrow and elongated, and the intestine is of extraordinary length, and of nearly equal diameter throughout, being coiled up in a spiral manner, and distending the capacious abdomen. As the tadpole becomes metamorphosed into a frog, it changes its vegetable food for slugs, worms, grubs, flies, &c., and, at the same time, the alimentary canal becomes very much shortened, and its divisions into stomach, &c., more distinctly marked.

In osseous fishes, the alimentary canal is generally shorter and more simple than in the higher vertebrata, in many—as, for example, the herring—being shorter than the body, and, excepting the stomach, running in nearly a straight line through it. In the cartilaginous fishes, as the sharks, rays, &c., a spiral valve winds in close turns from the pyloric to the anal extremity, leaving merely a small central aperture, along which the contents slowly progress. By this singular arrangement, the intestine, although short in proportion to the length of the animal, presents an enormous absorbing surface.

The limits within which we must confine this article, preclude us from noticing the various modifications which the digestive organs present in the various departments of the invertebrate animals; and we shall conclude with a few remarks upon the mode in which digestion is carried on in some of the lowest and simplest animals. The *hydra* or fresh-water polype is a minute animal, consisting of nothing but a bag or stomach, with tentacles surrounding its single orifice. The animalcules, &c., which the hydra catches by these lasso-like tentacles (see HYDRA), are drawn into the interior, where they are digested, and applied to the nutrition of the organism, the insoluble portions being rejected by the aperture through which they entered. In the *actinophrys sol*, or sun-animalcule, there is no persistent aperture; but when its radiating filaments—from which it derives its name—have secured a particle of organized matter fit for its nourishment, they twist over it, compress it against the globular body, which first yields, and becomes concave at the point, and finally closes over it, the prey being distinctly visible in the interior. This astomatous animalcule can thus form a mouth and stomach when it requires them. The indigestible remains are ejected by a corresponding reversed process. The *amaba* or *sponge-proteus* neither has a mouth and stomach, nor can it construct these organs: it simply folds itself around the solid particles from which it derives its nourishment, and imbibes their nutritious fluids through its cell-wall.

We might adduce various other examples of animals devoid of a stomach, but we have brought forward sufficient evidence to show that the old doctrine, that this organ is a necessary constituent of an animal, cannot be sustained, when we approach that debatable-land which separates the two great organized kingdoms of nature.

DIGGING. The operation of digging is performed with a spade or pronged fork. The spade or fork is thrust in with the foot, and the mass of earth is first loosened by the lever-power of the handle, then lifted and inverted. When this operation is performed in spring or summer, the ground should be dry, so as to obtain pulverization as easily and to as great extent as possible. In stronger soils, which are dug in autumn, a little moisture is desirable, as the land lies fallow, and the frosts of winter afterwards pulverize and reduce it to a proper degree for receiving the crops in the spring. Digging is almost entirely confined to the cultivation of gardens, for though a most efficient means of cultivating the soil, it is too expensive for field-crops. It is almost always resorted to, however, in this country for digging over or trenching land which has been in timber, or full of stones or boulders. Until recently, the spade was the only implement used for digging in gardens, but steel forks are coming rapidly into use, being lighter and more easily driven into the soil. Besides preparing the land for plants, the spade and the fork, chiefly the latter, are used for taking crops, such as potatoes and carrots, out of the ground.

DI'GIT (Lat. *digitus*, the finger), a term applied to the ten symbols of number, 0, 1, 2, &c., to 9; thus, 305 is said to be a number of three digits. Numbers were originally indicated by the fingers, and hence the name. Astronomers use digit to signify a twelfth-part of the diameter of the sun or moon, and speak of an eclipse of seven digits, meaning that seven-twelfths of the diameter is covered.

DIGITA'LINE is an active principle present in *Digitalis purpurea*, or foxglove.

DIGITA'LIS, a genus of plants of the natural order *Scrophulariaceæ*, natives chiefly of the south of Europe and temperate

parts of Asia. One only, the common FOXGLOVE (*D. purpurea*), is a native of Britain, and is very abundant in some parts of the country, its large purple flowers often giving a gay appearance to dry banks and steep hills. It is not unfrequently admitted into flower-gardens, particularly a white-flowered variety. Its English name, and the botanical name *D.* (Lat. *digitale*, the finger of a glove), both refer to the form of its flowers. The central and southern parts of Europe produce several species with yellow flowers, one of which, *D. grandiflora*, is not an uncommon ornament of gardens. *D. purpurea* is much valued in medicine. It was first brought into repute by Dr. Withering. Its leaves and seeds are the parts used, generally the former. They are narcotic and poisonous.

The leaves have a disagreeable smell when fresh, and a bitter nauseous taste, and are violently emetic and cathartic; but when dried and administered in small and repeated doses, they are diuretic, and therefore sometimes useful in dropsy; and are still more valuable on account of their sedative power over the action of the heart and the circulation of the blood, and are used in diseases of the heart, aneurisms, hæmorrhages, &c. They appear also to possess some peculiar power over the brain and nervous system, and have been employed in insanity, epilepsy, and other diseases. They are administered generally in the form either of tincture or infusion. They ought to be collected before the flowers expand. They owe their active properties to a peculiar crystalline principle, called *Digitaline* (q. v.). The use of *D.* as a medicine requires great caution on account of a property which it possesses—very remarkable in a vegetable medicine—of cumulative action on the system. Many, if not all of the species of *D.* appear to possess similar properties with *D. purpurea*, and to be capable of being substituted for it.



Foxglove.
(*Digitalis purpurea*).

DIGITA'RIA. See MILLET.

DIGITIGRA'DA (Lat. finger-walking), in the zoological system of Cuvier, one of the tribes of the *Carnivora* (q. v.), distinguished by walking on the toes alone, the heel not touching the ground. Among the digitigrade quadrupeds are included the most carnivorous of the *Carnivora*, the feline and canine families, hyænas, civets, weasels, &c. The Weasel family (*Mustelidae*), however, forms a connecting link, in respect to the character derived from the mode of walking, between the tribe *D.* and the tribe *Plantigrada* (q. v.) being, in fact, semi-plantigrade, and not walking on the mere tips of the toes, like the other digitigrada.

DIGNE (Lat. *Dinia*), a town in the department of the Basses-Alpes, on the Bléonne, 60 miles north-east of Marseille, occupies a picturesque situation upon a mountain slope, and is encircled by walls, but its streets are narrow, crooked, and steep, and the houses mean and squalid. Its chief building is the Préfecture, once the bishop's palace, a very ordinary edifice. The principal manufactures of *D.* are articles of leather, and it has a trade in dried fruits, honey, wax, woollen and linen cloth, kidskins, &c. In the neighborhood there are several hot saline springs, temperature 104° F. Pop. (1876) 5540. Of *Dinia*, which is mentioned by Pliny, nothing remains. It is known that it embraced Christianity at an early period, and has given title to a bishop since the year 340. In the year 1629, a plague reduced the population of *D.* from 10,000 to 1500.

DI'HONG, or SANPO', the largest feeder of the Brahmaputra, rises on the north side of the Himalayas, near the sources of the Sutlej and the Indus, in lat. 30° 25' N., and long. 82° 5' E., and bursts through that great mountain-chain near lat. 28° 15' N., and long. 95° 10' E., having pursued through Tibet an easterly course of about 1000 miles. Finally, it joins the more easterly branch of the Brahmaputra, near the north-east angle of Assam.

DIJON, a town of France, in the department of Côte d'Or, formerly capital of the old duchy of Burgundy, in lat. 47° 20' N., and long. 5° 2' E., and about 195 miles south-east of Paris by railway. *D.* occupies a most delightful situation in a fertile plain on the right bank of the Ouche, and at the base of the vine-clad hills which produce the famous Burgundy wines. The environs are exceedingly beautiful. *D.* is surrounded by old walls, originally having but five gates, and the ramparts being tastefully planted with fine trees, furnish very agreeable promenades. The town is for the most part well and regularly built, and the streets spacious and clean. Among the public buildings, which are numerous and imposing, the chief are the cathedral, a massive Gothic structure,

dating from the 13th c., with a tall wooden spire, above 300 feet high; the church of Notre Dame, a noble specimen of the purest Gothic architecture; the church of St. Michael, with a splendid renaissance front; the theater, a handsome building, with a fine Corinthian portico; and the palace of the Dukes of Burgundy, now used as the town-hall, and much modernized externally, but possessing interiorly some of its earlier features, and containing a museum very rich in monuments of the middle ages, besides a library of 50,000 volumes, and several hundreds of manuscripts. *D.* is also the seat of a university academy with three faculties—law, science, and letters—and possesses, in addition, a royal college, a theological seminary, a botanic garden, and an academy of art. The manufactures of *D.* consist of woollen cloth, blankets, hosiery, leather, vinegar, chemical products, &c.; and there are salt refineries, distilleries, and breweries; but the town is mainly dependent on its trade in the wines of Burgundy. Pop. (1881) 53,899. *D.* dates from Roman times, its ancient name being *Dibio*. It came into the possession of the Burgundians in the 5th c., and from them passed to the Franks. In the 9th c., it was ruled by counts of its own, under the suzerainty of the bishops of Langres. In the 11th c., it was united to the duchy of Burgundy, of which it became the capital, and the usual residence of the dukes, who rebuilt and greatly enlarged and improved it. In October 1870, after a sharp engagement before the city, *D.* capitulated to a German force. There was again severe fighting here in January 1871.

DIKAMA'LLI, a gum-resin which exudes, in amber-colored transparent drops, from the ends of young shoots of *Gardenia* (q. v.) *lucida*, an Indian tree. It has a very powerful fragrance, and has been found extremely useful in hospitals, in keeping away flies, and especially as a dressing for wounds and running sores.

DIKOWA, or DEEGO, a large town of Bornu, Central Africa, about 30 m. S.W. of Lake Tchad. It is in a great cotton-growing district, and is a place of considerable trade. The spinning and weaving of cotton are also extensively carried on. The houses are mostly of clay, but each has its court-yard. Pop. supposed about 30,000.

DILAPIDATION, in English law, is where an incumbent suffers his parsonage-house or outhouses to fall down, or be in decay, for want of necessary reparation; or pulls down or destroys any of the outhouses or buildings belonging to his living; or destroys woods, trees, &c.; for it is said to extend to committing or suffering any wilful waste on the inheritance of the church.—Stephens's *Eccl. Law*. Dilapidation is a species of the legal injury known as Waste (q. v.). A rector or vicar is bound to keep his residence and the chancel of the church in repair, but not to supply or maintain anything in the way of ornament, as painting, white-washing, or papering. An ecclesiastical person suffering the church-property to get out of repair, is subject to an action for dilapidation at the instance of his successor (13 Eliz. c. 10, s. 2); and by 14 Eliz. c. 11, s. 18, the money so recovered must be applied to the repairs. By 5 and 6 Vict. c. 108, s. 19, being an act to empower ecclesiastical corporations to grant long leases, it is provided that the incumbent shall not be liable for dilapidation occurring during such leases.

DILATORY PLEAS. See PLEA.

DILEMMA. A true dilemma is defined by Whately as 'a conditional syllogism with two or more antecedents in the major, and a disjunctive minor.' The following dilemma, of the kind called destructive, will perhaps convey a clearer notion than any definition. 'If this man were wise, he would not speak irreverently of Scripture in jest; and if he were good, he would not do so in earnest; but he does it, either in jest or earnest; therefore, he is either not wise, or not good.' There being two conclusions, one or other of which your opponent must admit, he is in a manner caught between them; hence we speak of the *horns* of a dilemma.

DILETTANTÉ (pl. *dilettanti*, Ital.), in its original sense, is synonymous with an *amateur*, or lover of the fine arts. It is often used as a term of reproach, to signify an amateur whose taste lies in the direction of what is trivial and vulgar, or of a critic or connoisseur whose knowledge is mere affectation and pretense. It is sometimes assumed, in a spirit of self-depreciation, by those who are unwilling that their critical acquirements, or artistic productions, should be judged by the rules which would be applied to those of persons who had made a professional study of art. It was in this sense that it was assumed by the Dilettanti Society (q. v.).

DILETTANTI SOCIETY, a body of noblemen and gentlemen by whose exertions the study of antique art in England has been largely promoted. The Society was founded in 1734, and held its meetings at the Thatched House Tavern in St. James's Street. It was in its beginning simply an amateur club, its object being to combine social and friendly intercourse with the cultivation of artistic knowledge and the gratification of artistic tastes. But its

funds having accumulated to a large amount, its members resolved, in 1764, to fit out an expedition for the purpose of collecting details and drawings of the most remarkable artistic monuments of antiquity. The persons selected for carrying out this important undertaking were Mr. Chandler of Magdalen College, Oxford, the editor of the *Marmora Oxoniensis*; Mr. Revett and Mr. Stewart, the authors of the magnificent work on Athenian Antiquities; and Mr. Pars, a talented young artist. Having spent two years in Greece, they returned in 1766, bringing with them the materials for the two splendid volumes on the Antiquities of Ionia, which were published at the expense of the Society. Architecture had been the first object of their inquiries, but their attention was now turned to sculpture, which was then at its lowest ebb in England. A series of the finest antique statues, bas-reliefs, and busts, were selected and engraved with the greatest care. This work appeared in 1809, with dissertations by Payne Knight. In 1811, a second architectural exploring-party was despatched by the Society to Asia Minor, consisting of Mr. (afterwards Sir William) Gell, Mr. Bedford, and Mr. Grandy. Two volumes were issued, one in 1817, entitled *The Unedited Antiquities of Attica*, and a second on *Antique Sculpture* in 1835. For these spirited exertions in their behalf, the public have been indebted to a club of some sixty private gentlemen.

DILIGENCE, in the Law of Scotland, is a term used in various significations. 1. It means the care incumbent on the parties to a contract with regard to the preservation of the subject matter. 2. The warrants issued by courts for enforcing the attendance of witnesses and the production of writings. 3. The process of law by which person, lands, or effects are attached either on Execution (q. v.) or in security for debt. In the second of these senses, it corresponds to the English *subpoena*; and in the third, generally to execution. The first can scarcely be regarded as a technical meaning.

DILIGENCE, the name given in France to a public conveyance of the nature of a stage-coach. It is a huge strong built vehicle, with four broad wheels, weighing about five tons, and is drawn by four stout horses, at the rate of about six miles an hour. It consists of three chief compartments: the front, called the *coupé*, for three persons; the second, called the *intérieur*, for six persons; and, lastly, the *rotonde*, entered from behind, for six persons. Aloft, in front, is the *banquette*, where the *conducteur* is seated; and behind this, underneath a thick leather covering, passengers are sometimes huddled among luggage and goods, with little regard to their comfort. All the places in the body of the vehicle are numbered, assigned in the order of booking. Usually an effort is made to be booked early, in order to secure corner-places. In booking, it is customary to pay only a portion of the fare, called *arrhes*; the remainder being paid at the end of the journey. For the *arrhes*, a receipt or bulletin ought to be given. Without this security, a traveler may be put down half-way and cheated out of his fare, or he may be compelled to pay it over again. The driver being concerned only with the horses, the entire management of the vehicle, including the charge of the drag or break, devolves on the *conducteur*, a trustworthy but most dictatorial personage, dressed in a blue cloth jacket and cap, and having a badge on his breast indicative of his dignity. The greater number of the diligences in France belong to two companies in Paris—the *Messageries Impériales* and the *Messageries Générales*. The system of diligences, however, has been latterly much broken up by railway transit.

DILL (*Anethum*), a genus of plants of the natural order *Umbellifera*, having compound umbels without general or partial involucre, the border of the calyx minute but 5-toothed, yellow involute petals, and dorsally compressed lenticular fruit. The COMMON D. (*A. graveolens*) is an annual or biennial plant, which grows wild in cornfields in the East and in the countries around the Mediterranean, but is quite hardy in Britain. It has from a very early period been in general cultivation as an aromatic, stimulant, and carminative. It has a stem 1–4 feet high, bearing at top a flat umbel of 10–30 rays; the leaves much divided, and the final segments thread-like. It has a strong peculiar aromatic smell and taste; the leaves are sometimes used for flavoring pickles, sauces, &c. The fruit (*Dill seed*) is used in medicine, chiefly for relief of flatulence and griping in infants, and is administered in the form of *Dill Water*, in the preparation of which *Oil of Dill* is employed; a pale-yellow essential oil, on which the properties of the plant depend, and which is obtained by distillation.—**SOWA D.** (*A. Sowa*) is a native of Bengal, and is much cultivated in the East Indies for its fruit, which is variously used in medicine and flavoring. It is a common ingredient in curries. The plant much resembles Common D., but its flavor is stronger.

DILLENIA'CEÆ, a natural order of exogenous plants, consisting chiefly of trees, shrubs, or half-shrubby plants, natives of tropical and subtropical regions, allied to the natural order *Ranunculaceæ* (q. v.), but very different in general habit, and also to *Magnoliaceæ*, which in habit they more resemble. They have

usually alternate leathery leaves, without stipules. The flowers are sometimes solitary, sometimes in racemes or panicles; the calyx of 5 persistent sepals; the corolla of 5 deciduous petals. The stamens are numerous. The fruit consists of 2–5 distinct or coherent, dry or succulent, carpels.

The seeds have an aril. Astringency is a general property of the order; and a number of species are used as vulneraries and for other medicinal purposes in their native countries. Some species of *Dillenia* are large trees, and afford excellent timber. The young calyces of *D. scabrella* and *D. speciosa* have a pleasant acid taste, and are used in curries, and the fruit of *D. speciosa*, although very acid, is eaten with sugar; the juice, mixed with water, is employed in India as a cooling beverage in fevers. The fruit of *D. elliptica* is used to make a sauce for fish in Amboyna. Many of the plants of this order are remarkable for the magnificence both of their foliage and their flowers. It contains about 200 known species.

DILMA'N, a town of Northern Persia, in the province of Azerbaijan, 50 miles north-north-west of Urumiyah, and 10 miles west of the northern extremity of the lake of that name. It is of considerable extent, has clean streets, and is surrounded by gardens and orchards. D. is a new town, the former town of the same name, distant about 4 miles, is now in ruins. It is described by St. Martin as a very ancient Armenian city, and the large plain in which it was situated is still inhabited by Armenians, Catholics, Nestorians, &c. Pop. of D. estimated at 15,000.

DILUENTS (Lat. *diluo*, I dilute) medicines whose purpose is to dilute the blood, and increase the quantity of the excretions generally. The simplest and best of diluents is water; but all watery fluids, such as lemonade, soda-water, beer, infusions or pilsans, tea, &c., may be regarded as coming under this designation. See **DEMULCENTS**.

DILUVIUM, a term formerly given by geologists to those strata which they believed to have been formed by the Deluge, and more particularly to the boulder clay. The altered opinions as to the origin of these beds have caused the word to fall into disuse. When the adjective—*diluvial*—is employed by modern writers, it is to characterize those accumulations of gravel or angular stones which have been produced by sudden or extraordinary currents of water.

DILMA, a large town of Abyssinia, in the state of Amhara, on an affluent of the Abai, 150 m. S.S.E. of Gondar. The houses are mostly of stone, and the church is one of the largest edifices in Abyssinia. The town is divided into many quarters by stone walls.

DIME, the tenth part of a United States dollar (see **DOLLAR**), and equal to about fivepence English.

DIMENSION. In Geometry, a line, whether straight or curved, has only one dimension, or measurement—namely, length; a surface has two—length and breadth; and a solid has three dimensions—length, breadth, and thickness, or depth. These three dimensions determine all forms of extension.—In Algebra, the term dimension is applied in much the same sense as *degree*, to express the number of literal factors that enter into a term. Thus, x^2 , xy , $2ab$, are all of two dimensions, or of the second degree; x^3 , x^2y , abc , $\frac{a^2bc}{d}$, are of three dimensions, &c.

DIMIDIA'TION, in Heraldry, a mode of marshalling arms, adopted chiefly before quartering and impaling according to the modern practice came into use, and subsequently retained to some extent in continental though not in English heraldry. It consists in cutting two coats of arms in half by a vertical line, and uniting the dexter half of the one to the sinister half of the other. Coats of husband and wife were often so marshalled in England in the 13th and 14th centuries. Mr. Planché traces the double-headed eagle of the German Empire to a dimidiated coat, with half an eagle for the eastern, and another half for the western empire.

DIMINUENDO (Ital. *diminishing*), a term in Music, having reference only to the power of the sound, and in no way affecting the *tempo*, as many think. Diminuendo can be applied to a single note, when it is a long note, as well as to a passage of many notes. Diminuendo is so nearly of the same meaning as *decrecendo*, that it is frequently marked with the same sign.

DIMINUTIONS, a word sometimes used in Heraldry for differences, marks of cadency, and brisures, indifferently.

DIMINUTIVES are forms of words, chiefly of substantives, in which the primitive notion has become lessened or diminished, as *hillock* = a little hill. With littleness is associated the idea of meanness, and also of needing protection; hence diminutives are used as terms of endearment; sometimes they imply contempt. There is perhaps no language without diminutives; and the most common method of formation is by the addition of a syllable. This, however, is not the only method; *tip* from *top*, by attenuating the vowel, and *kid* from *goat*, are as genuine diminutives as *hillock*—

The commonest of the English diminutive affixes are *ock*, *kin*, *el* or *le*, which are of Gothic origin, and *et* or *let*, of classical origin; as in *bullock*, *lambkin*, *kernel* (little corn), *lanect*. According to Dr. Latham, the termination *ling*, or rather *ing*, was originally patronymic; 'Ida was the son of Eoppa,' was expressed in Anglo-Saxon by *Ida was Eopping*. From the notion of the filial relation, the transition is easy to that of littleness and endearment, as in *darling*, *duckling*. Contempt predominates in *shaveling* (a monk) and others.

Diminutives often occur in proper names; *Perkin* is the diminutive of *Peter*, *Jenkin* of *John*. These have settled down into permanent and distinct names; but in the language of fondness and familiarity, *Charles* become *Charley*, *John*, *Johnny*, &c. In Lowland Scotch, this form of diminutive is not confined to proper names, but is applied to every object, animate or inanimate—*laddie*, *horsie*, *wifie*, *firie*. Sometimes one diminutive affix is joined to another, as *lassock*, *lassockie*; and in expressions like *a wee, wee bit horsikie*, the diminution is carried to the fifth degree. It is principally in the mouths of the people and in friendly familiarity that these diminutive forms are most common; and some languages and dialects are rich in them beyond others.

Italian is remarkable in this respect, especially the Tuscan dialect; *casa*, house, becomes *casarella*, little house, and *casarellina*, pretty little house; from *fratello*, brother, which is itself a diminutive of the Lat. *frater*, children, it is said, may be heard forming such fond names as *fratellinuciettinetto*. The affectionateness and bonhomie of the Germans expresses itself largely in this form; *vater*, father, becomes *väterchen*, dear father; and even the pronoun *du*, thou, is made into *duchen*, and *duli*.

Diminutives are not confined to nouns: *whitish* is the diminutive of the adjective *white*; and *tippie*, *scribble*, *dandle* are examples of diminutive verbs. Opposed to diminutives are AUGMENTATIVES, which abound in the Romance languages, especially in Italian, and express not only largeness, but coarseness and vulgarity; *casotta* is a large house; *cavallaccio*, a worthless horse. Our word *balloon*, which is of foreign origin, is of this form, and means a large ball. Such words as *drunkard*, *braggart*, *buzzard*, seem to be genuine English augmentatives.

DI'MITY, a stout figured cotton-fabric, used chiefly for bed-hangings. The figure or stripe is raised on one side, and depressed on the other, so that the two faces present reversed patterns. Dimity is commonly white, or of a single color; but variegated dimities are now made, the pattern and the ground being of different colors.

DIMORPHOUS (Gr. *dis*, twice; *morphe*, shape or form) is the term applied to a substance when it exhibits the property of crystallizing in two distinct forms or systems. See CRYSTALLOGRAPHY. Thus, sulphur, as found crystallized naturally, and as obtained by the spontaneous evaporation of its solution in bisulphuret of carbon, or in chloride of sulphur, presents itself in crystals of the form of octohedra, with a rhombic base, and thus belongs to the *prismatic system*; but when sulphur is heated to fusion, and then slowly cooled, prismatic crystals of an amber color are obtained, which belong to the *oblique system*. The latter form of sulphur is not permanent, and the crystals gradually become opaque, and pass into the form of numberless octohedra. In their turn, the octohedral crystals, when kept at a temperature of 230° F. for some time, pass into the prismatic form. Carbon is another illustration of *dimorphism*. Thus carbon crystallizes in the diamond in the regular system as the octohedron and allied forms; while in the condition of graphite or Black Lead (q. v.), as obtained by the cooling of its solution in fused cast iron, it is in the form of hexagonal crystals belonging to the rhombohedral system. Carbonate of lime and iodide of mercury are also good examples of dimorphism; and some substances, such as the sulphate of nickel, sulphate of zinc, seleniate of nickel, and the seleniate of zinc, crystallize in three different systems, and are thus *trimorphous*.

DINAGEPO'RE, a city of the province of Bengal, with (1871) 13,042 inhabitants, stands 261 miles to the north of Calcutta, in lat. 25° 34' N., and long. 88° 38' E. It is watered by an offset of the Atree, called the Purnabada, which, through the Mahanunda, enters the Lower Ganges from the left. The place is devoid of architectural pretensions.

DINAGEPORE, the district of the above-mentioned city, stretches in N. lat. from 24° 53' to 26° 38', and in E. long. from 88° 2' to 89° 16', containing 4126 sq. m., and (1871) 1,501,924 inhabitants. The country is flat, its only eminences being mere undulations; and, from the proximity of the Himalayas, the whole tract is little but a net-work of water-courses, many of the channels, however, becoming periodically dry. The winds are more variable than is usual elsewhere in India, and hailstones are occasionally of such weight as to kill men and cattle. Rice is the principal crop, and fish are singularly plentiful.

DINAN, a very old town of France, in the department of Côtes-du-Nord, on the Rance, 30 miles north-west of Rennes, and

14 south of St. Malo. The situation of D., on the summit of a steep hill of granite, and with the Rance flowing through a valley 250 feet below, is romantic in a high degree. It is surrounded by old walls, pierced by four gates, and was formerly defended by a strong castle, part of which has been converted into a prison. In the older district, the streets are crooked, narrow, and steep, many of the buildings being crazy constructions of wood; but in some parts, its overhanging houses, and arcades resting on carved granite pillars, present many picturesque architectural features, attractive to the antiquary and the artist. The cathedral of St. Sauveur is a beautiful ornate edifice, built in the Romanesque style, containing the heart of the famous French warrior Bertrand de Guesclin. D. has manufactures of fine linen and of sail-cloth, of cotton and woollen goods, beet-root-sugar, &c. It has also some large-building yards, and, owing to its position near the mouth of the Rance, has a good coasting and inland trade. Pop. (1876) 7978. A few miles off lies the village of Corseult, built on the ruins of the capital of the ancient Curiosolite. In the fields round about the village are still occasionally found ancient utensils, Roman coins, and traces of a temple dedicated to Mars.

DINA'NT, a town of Belgium, in the province of Namur, 14 miles south of the city of that name. It is situated on the Meuse, in the midst of extremely picturesque scenery. The most noteworthy buildings of D. are the church of Notre Dame, an ancient and richly decorated Gothic structure, and the town-house, once the palace of the princes of Liège. D. has several salt-refineries, mills for sawing marble, some quarries of which are worked in the vicinity, paper-mills, breweries, and tanneries. It has also manufactures of woollen stuffs, paper, hats, cards, and cutlery. The gingerbread of D., composed of rye-flour and honey, is famous, and has an extensive sale. Pop. (1870) 6100. D., which dates from the 6th c., has suffered greatly from frequent sieges. In 1466, Philip Duke of Burgundy attacked it with a strong force, and, when the town was taken, in retaliation for the hanging of the messengers whom he had sent to summon the town to surrender, he ordered 800 of the inhabitants to be tied in couples, back to back, and cast into the Meuse. At this time, also, the town was burned, and the walls levelled.

DINAPO'RE, an important military station in the Indian province of Behar, stands on the right bank of the Ganges, ten miles above Patna, in lat. 25° 37' N., and long. 85° 7' E. The barracks are spacious and elegant; and the population—exclusive of a garrison of between 14,000 and 15,000—numbers (1871) 27,914. In the mutiny of 1857, D. acquired an unenviable notoriety. On 25th July, nearly eleven weeks after the commencement of the outbreak, the native troops, consisting of three regiments rose against their officers, and that in the presence of a European force, which, if well handled, was as able, as it was ready, to crush them. After escaping with comparatively little loss, the insurgents clinging instinctively together, carried on a desultory warfare on their own account with various success. See ARRAH.

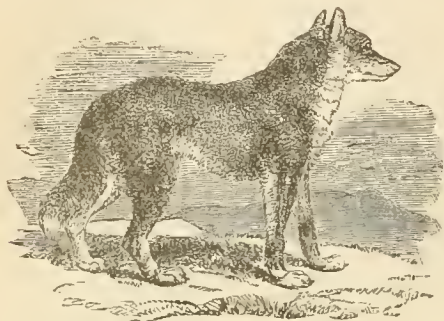
DINA'RIC ALPS, that branch of the Alpine system which connects the Julian Alps with the western ranges of the Balkan. It extends in a south-easterly direction, from Mount Klek, east of Fiume, to the mouth of the Narenta; and stretching along the borders of the Adriatic, it spreads its ramifications through the greater part of Croatia, Dalmatia, and Herzegovina. The D. A., the highest summits of which are Mount Dinara and Mount Prolok, seldom exceed 7000 feet in height. The range is principally calcareous.

DINDIGU'L, a town of India, in the British district of Madura, presidency of Madras, at the extremity of a valley of the same name, on a feeder of the Cauvery, 247 miles south-west of Madras city. It is 880 feet above the level of the sea, and built on a gentle declivity; the streets are wide, the houses well built, and the bazaar plentifully supplied. Pop. (1871) 12,818, of whom 11,503 were Hindus, 1279 Mohammedans, and 36 Christians. Since 1875 it has been connected by rail with the other chief towns of the presidency. The fort is situated on a wedge-shaped mass of gneiss which rises to a height of 280 feet. The ascent is on the eastern side by a flight of stone steps, the other sides being nearly perpendicular. Near the summit there is a well of great depth, popularly reputed unfathomable, which yields excellent water.

DINGLE, a seaport, the most westerly town in Ireland, is situated in county Kerry, in a hollow on the north side of Dingle Bay, near the west end of a mountainous peninsula (30 miles by 7), 39 miles west-north-west of Killarney. It chiefly consists of one street, has an antique aspect, some of the present houses having been built in the 16th c., in the Spanish style, with stone balconies, &c. Pop. (1871) 2117. The chief exports are corn and butter to Liverpool. D. was incorporated in 1585. In the 17th c., it had much trade with Spain, exchanging tanned hides, Irish friezes, woollen stockings, salt beef, salmon, and butter, for wines and spices. Dingle Bay is an indentation of the sea, on

the west of Kerry, between Brae Head, Valentia Isle, on the south, and Dunmore Head and Blasket Isles on the north, from which points, which are 18 miles apart, it runs 24 miles east-north-east, narrowing to 7 miles. The harbor is a landlocked creek in the bay, admitting ships of 300 tons up to the town of D., and forming a pretty safe retreat from the prevalent west winds of Dingle Bay.

DI'NGO (*Canis Dingo*), the native dog of Australia, regarded by some naturalists as a distinct species, by others as a mere variety of *Canis familiaris*. It exists both in a wild and in a domesticated state; but there is no good reason for thinking that the wild race has originated from dogs introduced from some other country by man. The domesticated D. is about the size of a shepherd's dog, the wild one is larger. The wild D. is found in



Dingo, or Australian Dog (*Canis Dingo*).

all parts of Australia. It is of a tawny color, has a large head, with muzzle somewhat fuller than the shepherd's dog. The ears are short and erect, the tail bushy, but not so bushy as that of a fox. In running, the D., unlike dogs in general, carries the head high, the ears erect, and turned forward. In a wild state, it does not bark. It is very destructive to the sheep of the colonists, and its delight is to kill as many as possible before proceeding to eat. It is very fierce and courageous, but capable of strong attachments.

DI'NKELSBUEHL, a town of Bavaria, situated on the Wernitz, 44 miles south-west of Nuremberg. It is an ancient walled town, and was formerly a free city of the empire. It has important manufactures of hosiery, coarse linen, straw-hats, paper, &c.; and a dye-work, brewery, and mills. D. suffered much during the Thirty Years' War. Pop. (1880) 5186.

DI'NNER. See MEALS.

DINO'RNIS (Gr. *deinos*, terrible or wonderful, and *ornis*, a bird), a genus of large birds of the tribe *Brevipennes* (q. v.), of which no species is now known to exist, but of which the bones have been found in New Zealand, in the most recent deposits, in the sand of the sea-shore, in swamps, in the soil of forests, in river-beds, and in caves; and concerning which, along with other large birds nearly allied to them (*Palapteryx* and *Aptornis*), traditions are still current among the natives, rendering it probable that they continued to inhabit New Zealand, if not to the 18th, at least to the 17th century. The name by which these birds are known in the traditions of New Zealand is *Moa*. They are said to have been decked in gaudy plumage, for the sake of which they were objects of pursuit, as well as for their flesh, which was much esteemed. They are also described as having been stupid, fat, and indolent birds, incapable of flying, living in forests and mountain-fastnesses, and feeding on vegetable food. With all this, the inferences deduced from their bones by comparative anatomists perfectly agree. These bones are not properly fossil or mineralized, but retain great part of their animal matter. It is even thought not impossible that some of the smaller species of D. may yet be found alive; of the larger ones, this can no longer be hoped. And these much exceeded in size any existing bird, some of the bones being at least twice the size of those of the ostrich; but the body seems to have been more bulky in proportion, and to have more resembled that of the dodo, although the legs were long, and *D. giganteus* must have stood at least ten feet and a half in height. The framework



Dinornis Elephantopus.

of the leg is the most massive of any in the class of birds, and the bones are remarkable for the solidity of their structure. The toe-bones of *D. elephantopus* almost rival those of the elephant.

The number of bones of D. which have been found is great; several species have been distinguished, and an almost complete restoration of skeleton has been effected. The first bone ever seen by a naturalist—a bone of the leg—was brought under the notice of Professor Owen in 1839; and it is worthy of being borne in mind, that from that one bone he assigned to the D. its true place in the system of nature, and pointed out some of the most important characters which are now most fully proved to have belonged to it.

DI'NGWALL, a royal and parliamentary burgh, the county town of the united counties of Ross and Cromarty, in the south-east of Ross-shire, at the head or south-west end of the Cromarty Firth, 11 miles north-west of Inverness. In Scandinavian, D. means Law or Court Hill; and in Gaelic, it is called Inverpheoran. It consists chiefly of a long street, and lies low, on what was formerly a swamp, amid rich, fertile, and well-wooded ground, at the entrance to the beautiful valley of Strathpeffer, the famous sulphureous springs of which are five miles to the west. A short canal brings vessels drawing nine feet of water up to the town, where there is a station of the Highland Railway, and also of the Dingwall and Skye Railway. Its prosperity depends on agriculture. Pop. (1881) 1932, many speaking Gaelic, though all understand, and usually speak, English. It unites with Tain, Dornoch, Wick, Kirkwall, and Cromarty in sending one member to parliament. Near to D. is a vitrified fort, on a conical hill, and there are traces of an ancient castle, where the earls of Ross held their courts.

DINOSAURIA (Gr. terrible or wonderful lizards), an order of extinct lizards, which are found in the lias, oolite, and wealden, and disappear in the lower cretaceous beds. They were gigantic reptiles, with a structure approaching nearer to the mammalian type than any other of their class. Their bodies were supported, at a considerable height, on four strong limbs, and the sacrum was composed of five amalgamated vertebrae. The principal genera are *Megalosaurus* (q. v.), *Iguanodon* (q. v.), and *Hylæosaurus* (q. v.).

DINOTHE'RIMUM (Gr. terrible or wonderful beast), a remarkable extinct animal, the cranial bones of which are found in the Miocene formations of Germany, France, &c. The animal was provided, like the elephant and the walrus, with a pair of long tusks; but these projected from the end of the lower jaw, which is deflected downwards at a right angle to the body of the jaw. In addition to the two tusks, there were five double-ridged grinders on each side of both jaws. The nasal cavity is large, apparently supplying attachment for a trunk, as in the elephant. No body or limb bones have yet been found so associated with those of the skull, as to show that they belonged to the same animal. Hence the true position of the D. has not been satisfactorily determined. Cuvier and Kaup have referred it to the neighborhood of the tapir, supposing it to have been an inhabitant of large lakes. We give a fig. of Kaup's restoration. De Blainville, on the other hand, makes it a herbivorous cetacean, like the manatee.



Restored Form of Dinotherium.

DIO'CESAN is a bishop viewed in relation to his own clergy or flock.

DIOCESAN COURTS. See CONSISTORY and COMMISSARY.

DIOCESE (Fr., from Gr. *dioikesis*, administration; and *dioikeo*, to govern), the territory over which a bishop exercises ecclesiastical jurisdiction. The term occurs as early as the time of Cicero, as the special designation of districts in Asia Minor. In the organization of the Roman Empire introduced by Constantine the Great, the designation diocese was applied to the larger divisions, which were subdivided into provinces. About the middle of the 5th c., the dioceses of the empire were: the East, Egypt, Asia, Pontus, Thrace, Macedonia, Dacia, Illyria, Italy, Africa, Gaul, Spain, and Britain. The dioceses were governed some by Prefects, some by Proconsuls, and others by Vicars. The provinces were under Rectors. The government of the Christian religion, as established by Constantine, was in so far adapted to this division, and the term diocese and others passed over to ecclesiastical matters. At first, a diocese meant the collection of churches or congregations under the charge of an archbishop. The name came afterwards to be applied to the charge of a bishop, which

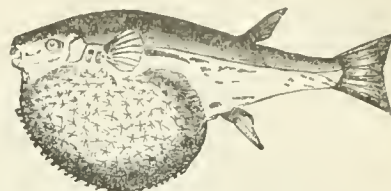
had previously been called a parish. England and Wales are divided ecclesiastically into two provinces, viz., Canterbury and York, the former being presided over by the Primate of All England, and the latter by the Primate of England. Each of which is subdivided into dioceses, and these again into archdeaconries, rural deaneries, and parishes. A diocese is synonymous with the see of a suffragan bishop.

DIOCLETIANUS, VALERIUS, born in humble life near Salona, in Dalmatia, 245 A.D., inherited from his mother, Dioclea, the name of Diocles, which he afterwards enlarged into D., and attached as a cognomen to Valerius, a name of the most patrician associations. He adopted a military career, and served with distinction under Probus and Aurelian, accompanied Carus on his Persian campaign, and finally, on the murder of Numerianus having been discovered at Chalcedon, he was proclaimed emperor in 284 by the army on its homeward march. The suspected assassin of Numerianus, the prefect Arrius Aper, he slew with his own hands, in order, it is alleged, to fulfil a prophecy communicated to him, while still a lad, by a Druidess of Gaul, that he should accede to a throne as soon as he had killed an *aper* (wild-boar). In 285, D. commenced hostilities against Carinus (the joint-emperor along with the deceased Numerianus), who, although victorious in the decisive battle that ensued, was murdered by his own officers, thus leaving to D. the undisputed supremacy. His first years of government were so molested by the incursions of barbarians, that, in order to repel their growing aggressiveness, he took to himself a colleague—namely, Maximianus—who, under the title of Augustus, became joint-emperor in 286. D. reserved for himself the charge of the eastern empire, and gave the western to Maximian. Still the attacks of the barbarians continued as formidable as ever. The empire was menaced by the Persians in the east, by the Germans and other barbarians in the west; and in order to provide for its permanent security, D. subjected it to a still further division. In 293, Constantius Chlorus and Galerius were proclaimed as Cæsars, and the distribution of the Roman Empire was now fourfold: D. taking the East, with Nicomedia as his seat of government; Maximian, Italy and Africa, with Milan as his residence; Constantius, Britain, Gaul, and Spain, with Trêves as his headquarters; Galerius, Illyricum, and the entire valley of the Danube, with Sirmium as his imperial abode. It was upon his colleagues that most of the burden of engaging actively in hostilities fell, as D. seldom took the field in person. Among the conquests, or rather re-conquests, that were made under his rule, may be enumerated that of Britain, which, after maintaining independence under Carausius and Allectus, was, in 296, restored to the empire; that of the Persians, who were defeated, and compelled to capitulate in 298; and that of the Marcomanni, and others of the northern barbarians, who were driven beyond the Roman frontier. D., after 21 years' harassing tenure of government, desired to pass the residue of his days in tranquillity. On the 1st of May 305, accordingly, he abdicated the imperial throne at Nicomedia, and compelled his colleague, Maximian (much against the latter's will), to do likewise at Milan. D. sought retirement in his native province of Dalmatia, and for 8 years resided at Salona (see SPALATO), devoting himself to philosophic reflection, to rural recreation, and to horticultural pursuits. Two years before his abdication, he was instigated by his colleague, Galerius, to that determined and sanguinary persecution of the Christians for which his reign is chiefly memorable. He died in 313.

DIODATI, JEAN, a Swiss theologian, was born in Geneva in 1576. He belonged to a noble Italian family, originally of Lucca. His progress in letters was so rapid, that Beza caused him to be appointed professor of Hebrew at the age of 21. In 1608, he became a pastor of the Reformed Church, and in the following year, professor of theology. About this period, he endeavored to spread the doctrines of the reformation in Venice and other cities of Italy, but without success. In 1614, he went to Nîmes, where he preached for three years; and in 1618, he was sent to the synod of Dort, to represent the Genevese Church. Here his talents were so highly estimated that he was one of the divines appointed to draw up the articles of the synod. He died at Geneva in 1649. D. was a somewhat intolerant Calvinist; but as a preacher, he was eloquent, persuasive, and conscientious. His Italian translation of the Bible appeared in 1607; his French, in 1644. Among his other works may be mentioned his *Annotations in Biblia* (1607), *De Fictitio Pontificiorum Purgatorio* (1619), and *De Justa Secessione Reformatorum ab Ecclesia Romana* (1628).

DI'ODON (Gr. two-toothed), a Linnean genus of fishes, now giving its name to a family, *Diodontidae* (*Gymnodontes* of Cuvier), of the order *Plectognathi*. The fishes of this family have no distinct teeth, but their jaws, which are shaped like the beak of a parrot, are covered with a substance like ivory, formed of the teeth consolidated together. This is reproduced as fast as it is worn away by use, and the mouth is admirably adapted for grinding down the crustaceans and sea-weeds on which these fishes feed.

Their flesh is mucous, and that of some is regarded as poisonous. None of them are used for human food. Some of them, particularly of the genera *D.* and *Tetraodon*, have a remarkable power of inflating their bodies by filling their stomachs with air, the stomach being extremely dilatible, and assuming a globular form when distended, whence they have received the name **GLOBE-FISH**, whilst from the spines, which stand out in all directions, like those of a hedge-hog when rolled up, as if for defence of the inflated body, some of them have been designated **PORCUPINE**.



Globe-fish (*Tetraodon lineatus*).

FISH. When distended with air, they float in the water with the back downwards, but are not incapable of swimming in this position, as was formerly supposed. The *Diodontidae* are fishes of warm seas; one or two species, occasionally wafted by the currents to more northern shores, are among the rarest of British fishes.—The **SUNFISH** belongs to this family. The name *D.* has recently—with the effect only of confusion—been given to a new genus of cetaceous animals, of which one very rare species has occurred on the British coast.

DIODORUS SICULUS, a Greek historian, was born at Agrigum, in Sicily. Little is known of his life beyond what is told by himself. He lived in the times of Julius and Augustus Cæsar, traveled in Asia and Europe, and lived a long time in Rome, collecting the materials of his great work, the compilation of which occupied thirty years. This work, the *Bibliotheca* or Library, was a history of the world, in forty books, from the creation to the Gallic wars of Julius Cæsar. It was divided by the author into three parts—the first of which, in six books, comprises all the Greek and foreign myths down to the Trojan war; the second, in eleven books, contains the history from the year 1184 B.C. to the death of Alexander the Great; the third, in 23 books, continues the narrative of events from that date to the year 60 B.C. Of the *Bibliotheca*, the first five books are extant entire; the next five books are wholly lost; the next ten are complete; and of the remainder of the work, considerable fragments have been preserved. Had D. possessed any powers either of criticism or of arrangement, his work would have been of the greatest importance; but he was in both respects so deficient, that his history has no practical value beyond what belongs to an immense mass of raw, and now scarcely available material. His narrative is colorless and monotonous, and his diction, generally clear and simple, holds a sort of middle place between the pure Attic and the colloquial Greek of his time. The best editions of D. are Wesseling's (Amst. 1746), the Deux-points (1793—1801), and Dindorf's (Leip. 1828—1831).

DICE'CIUS (Gr. *dis*, twice; and *oikos*, a habitation), in Botany, a term applied either to plants or flowers, when not only the flowers but the individual plants are unisexual—i. e., when male and female flowers are produced upon separate plants. *D.* plants form a distinct class in the Linnean sexual system; but in thus placing them apart, if the principle of arrangement had been strictly maintained, great violence would often have been done to natural affinities; *D.* species frequently occurring in genera and families usually *Monœcious* (q. v.) or *hermaphrodite*, and also monœcious and hermaphrodite species in those which are usually diœcious. Familiar examples of *D.* plants may be seen in most species of willow. Amongst cultivated plants, hemp, spinach, and the date-palm may be instanced.

DIO'GENES, the Cynic philosopher, was a native of Sinope, in Pontus, where he was born about 412 B.C. His father, Icesias, or Icetas, by name, and a banker by occupation, was convicted of having swindled, and so the young D. had to leave Sinope. His youth had been that of a spendthrift and a rake; but on coming from Sinope to Athens he became interested in the character of Antisthenes, by whom, however, his first advances were repelled. In spite of his inhospitable reception, D. renewed the attempt to find favor with Antisthenes; but though often driven away by blows, his perseverance at last prevailed; and Antisthenes, moved with compassion, consented to admit him as a pupil. D., from being an extravagant debauchee, plunged into the opposite extreme of austerity and self-mortification. He would roll in hot sand during the heat of summer; in winter he would embrace a statue covered with snow. His clothing was of the coarsest, his food of the plainest. His bed was the bare ground, whether in the open street or under the porticoes.

His permanent residence (if such it could be called) was a tub

which belonged to the Metroum, or the temple of the Mother of the Gods. His eccentric life did not, however, cost him the respect of the Athenians, who admired his contempt for comfort, and allowed him a wide latitude of comment and rebuke. Practical good was the chief aim of his philosophy; for literature and the fine arts he did not conceal his disdain. He laughed at men of letters for reading the sufferings of Ulysses, while neglecting their own; at musicians who spent in stringing their lyres the time which would have been much better employed in making their own discordant natures harmonious; at savans for gazing at the heavenly bodies, while sublimely incognizant of earthly ones; at orators who studied how to enforce truth, but not how to practise it. He was seized by pirates on a voyage to Egina, and carried to Crete, where he was sold as a slave. When asked what business he was proficient in, he answered: 'To command men.' His purchaser was Xenias of Corinth; but the slave soon came to rule the master, acquired his freedom, was appointed tutor to the children, and spent his old age as one of the household. It was here that he had his interview with Alexander the Great. The king opened the conversation with: 'I am Alexander the Great,' to which the philosopher answered: 'And I am Diogenes the Cynic.' Alexander then asked him in what way he could serve him, to which D. rejoined: 'You can stand out of the sunshine.' Alexander is said to have been so struck with the Cynic's self-possession, that he went away, remarking: 'If I were not Alexander, I should be Diogenes.' In spite of his early excesses and his subsequent privations, D. lived at Corinth till 323 B.C., when he died, at the age of 90.

DIO'GENÉS LAE'RTIUS, the author of a biographical history of the Greek philosophers, seems to have been born at Laerta, in Cilicia, and to have taken his surname from that town. So little is known of his personal history, that the very age in which he flourished is a matter of doubt. By some it is assigned to the end of the 2d, and by others to the middle of the 3d c. after Christ. His name has been kept alive by his *Lives of the Philosophers*, a work which contains a great mass of interesting information regarding the private lives and habits of the most eminent philosophers of antiquity. Though the work is utterly worthless in respect of plan, coherence, or criticism, it yet contains so many piquant anecdotes, and so many valuable quotations from lost works, that Montaigne's wish was perhaps a justifiable one—that instead of one Laertius, we had had a dozen. The best edition of Laertius is that of Hübner, 2 vols. 8vo (Leip. 1828—1831).

DI'OMEDE ISLANDS, a group about the middle of Behring's Strait, form, as it were, a number of stepping-stones between the most easterly point of Asia and the most westerly of America. Their names are Fairway, Crusenstern, and Ratamanow; and their central point is in lat. 65° 46' N., and long. 165° 55' W.

DIOME DEA. See ALBATHOS.

DIOME'DES, the bravest, after Achilles, of all the Greeks who took part in the Trojan war. His exploits occupy a prominent place in the record of the heroic deeds sung by Homer in the *Iliad*. He vanquished in fight Hector and Aeneas, the most valiant of the Trojans; and even Mars and Venus, when they took the field on the Trojan side, were attacked and wounded by him. In the games instituted by Achilles in honor of Patroclus, he gained the prize in the chariot-race, and worsted the mighty Ajax in single combat. Along with Ulysses, he carried off the Palladium, on which the fate of Troy depended. On returning to Argos (to the crown of which he had succeeded after the death of Adrastus), he found that his wife had proved unfaithful in his absence. Leaving home, he went, according to one tradition, to Italy, where he took part with the Trojans against Turnus. Several cities on the southern shores of that country claimed to have been founded by him.

DI'ON CA'SSIUS COCCEIA'NUS, a celebrated Greek historian, was born at Nicæa, in Bithynia, 155 A.D. He held various high offices of state under the Roman emperors, was twice consul, and enjoyed the intimate friendship of Septimius Severus. He is best known by his *History of Rome*, in 80 books, of which only 18 (from the 36th to the 54th) have reached us complete. The others are only known to us from fragments and abridgments. His high position gave him free access to the national archives, and as an authority on some points, especially on the imperial epoch of Roman history, his work is not without very considerable value. He wrote on the model of Thucydides, to whom, indeed, he is far inferior, both in vigor of judgment and acuteness of criticism; yet many passages of his *History* might be quoted as among the best samples of the rhetoric of the age in which he lived. D. died at Nicæa, but the date of his death is not known. The best edition of his *History* is that of Sturz (Leip. 1824—1843).

DI'ON CHRYSO'STOMUS (Golden-mouthed), an eminent Greek rhetorician, was born at Prusa, in Bithynia, towards the middle of the 1st century. His father, Pasierates, paid great at-

tention to his education, which was also enriched by travel. D., after residing for some time in his native town, came to Rome, where, however, he had the misfortune to excite the suspicion of the Emperor Domitian, and was in consequence obliged to flee. On the accession of Nerva, 96 A.D., he returned to Rome, and was honorably received. Nerva's successor, Trajan, held D. in the highest estimation, even permitting him to ride beside himself in the imperial chariot. His excellent disposition procured him many friends, while his remarkable powers of oratory excited universal admiration. He died at Rome about 117 A.D. D. left a very great number of orations, of which 80 are still extant in whole, with fragments of 15 others. They discuss questions in politics, morals, and philosophy, and are written in pure Attic Greek. According to Niebuhr, he was 'the first writer after Tiberius that greatly contributed towards the revival of Greek literature.' Good editions of D.'s orations are those of Reiske (Leip. 1784), Emperius (1844), and L. Dindorf (1857).

DIONE'A, a very curious and interesting genus of plants of the natural order *Droseraceæ*, having a 5-partite calyx, 5 petals, 10—20 stamens, and one style, with 5 closely united stigmata. Only one species is known, *D. muscipula*, sometimes called VEXUS'S FLY-TRAP and the CAROLINA CATCHFLY PLANT. It grows in marshy places in the warmer parts of North America, as far as North Carolina, and is a perennial plant, with a rosette of root-leaves, from the midst of which arises a leafless stem (scape) about 6 inches high, terminating in a corymb of white flowers. It is remarkable for the irritability of its leaves. The leaf-stalk is elongated, winged, and leaf-like, and bears at its extremity an obicular leaf, set round at the margin with stiff hair-like 'spines,' and having on its upper surface many small glands, and three delicate irritable hairs on each side, so placed that an insect can hardly traverse the leaf without touching one of them, when the two sides of the leaf immediately fold together upon it, and lay hold of it, the marginal bristles crossing one another, and preventing the possibility of escape. The leaf does not open again till the whole substance of the insect has been absorbed by the plant, and nothing but the skeleton of the captive remains. For this purpose, the plant exudes a secretion of a character somewhat similar in its digestive properties to pepsine; and under the influence of this, the material of the insect capable of yielding nourishment to the plant, is digested, and ultimately absorbed by the same glands that secreted the fluid. This process of digestion and absorption sometimes occupies three weeks.—See *Insectivorous Plants*, by Charles Darwin (1875).



Venus's Fly-trap (*Dionaea muscipula*).

DIONY'SIUS, THE AREOPAGITE, is mentioned in the Acts of the Apostles (chap. xvii., verse 34) as one of the few persons in Athens converted to Christianity by Paul. A history has been invented for him by the church. It is said that he was in Egypt when the Crucifixion happened, and observing the eclipse that accompanied it, exclaimed: 'Either God himself is suffering, or he sympathizes with some one who is suffering.' At the time when Paul visited the metropolis of Greece, D. was a member of the council of the Areopagus, whence his name. Tradition also declares that the apostle installed him as the first Bishop of Athens, and that he suffered the fate of a martyr. The writings which are falsely current under his name treat of such topics as the heavenly hierarchy, the names of God, the ecclesiastical hierarchy, &c. Their theology is of the mystical kind. The style, contents, and historic allusions clearly indicate that the author of these writings could not have flourished before the close of the 5th c., and, in fact, the writings first made their appearance in the 6th century.

Dazzling neoplatonic phantasies concerning the divine essence, angels, and holy spirits, splendid descriptions of the ceremonies of the Catholic worship, glorifications of the priestly hierarchy, panegyrics on monastic life, and mystical interpretations of church doctrine, made the works immensely attractive, especially to the Greek monks, whose manner of life was pre-eminently contemplative. According to a recent hypothesis, the so-called writings of D. are the composition of some Christian Platonist, who, in opposition to the not yet wholly extinguished Gnosticism, sought to incorporate with Christianity the forms, ideas, and ceremonies of the Dionysian (Bacchic) mysteries. The translation of the work into Latin by Scotus Erigena, in the dawn of the middle ages, gave a new impulse to monasticism in the Western Church, and may be almost said to have created its mystic theology. The

Areopagitie Theology was, in fact, the name given during the middle ages, and even as late as the 18th c., to that mystical method of apprehending religious truth made current by the writings ascribed to D. and afterwards formally introduced into Latin Christianity by Hugo St. Victor in the 12th century. This theology proceeds upon the principle, that the Divine Spirit is indispensable even to the understanding of man.

DIONYSIUS, THE ELDER. tyrant of Syracuse, was born 431 or 430 B.C. He was originally a clerk in a public office, but manifested an early period a passion for political and military distinction. When the Agrigentines, after the conquest of their city by the Carthaginians, accused the Syracusan generals who had failed to relieve them of treachery, D. supported their accusations before the people of Syracuse, and induced the latter to appoint new commanders, of whom he himself was one. But in a very short time he supplanted his colleagues also, and, when only 25 years of age, made himself, by the help of his mercenaries, absolute ruler of the city. To strengthen his 'tyranny' (the name given by the Greeks to any *usurped* authority, however wisely and beneficently exercised), he married the daughter of Hermocrates, the late head of the aristocratic party, and thus attached the followers of that leader to himself. After he had fiercely suppressed several insurrections, and conquered some of the Greek towns of Sicily, he made preparations for a great war with the Carthaginians. It broke out 397 B.C. At first, fortune favored D., but after a short time he suffered a series of reverses, so calamitous, that all his allies abandoned him, and he was shut up in the city of Syracuse, apparently without hope of escape. When he was about to fall a victim to despair, a pestilence broke out in the Carthaginian fleet. D. took courage, and suddenly attacking his enemies by land and sea, obtained a complete victory.

In the years 393 and 392 B.C., the Carthaginians renewed hostilities, but were defeated on both occasions, and D. was enabled to conclude a most advantageous peace. He now turned his arms against Lower Italy, and in 387 B.C., after a siege of 11 months, captured Rhegium. From this time he continued to exercise the greatest influence over the Greek cities of Lower Italy, while his fleets swept the Tyrrhenian and Adriatic Seas. But D. was not contented with the reputation of being the first warrior and statesman of his age; he wished to shine as a poet also. He even ventured so far as to contend for the prize at the Olympic games, and about the end of 388 B.C., sent thither a splendid embassy, comprising the best reciters of the time, whose utmost skill, however, could not induce the judges to decide in his favor. D. was more successful at Athens, where he several times obtained the second and third prizes for tragedy, his last production even obtaining the first. He also invited many poets and philosophers to his court, his treatment of whom, however, was not always courteous. In 368 B.C., he renewed the war with the Carthaginians, whom he wished to drive out of Sicily altogether, but died in the following year, before he could accomplish his design. It was rumored that his death was hastened by his physician, at the instigation of his son. D. was unquestionably a most vigorous ruler, but unscrupulous as to the means he employed to secure his ends, and tormented in his last years by the suspicion that he was surrounded with traitors.

DIONYSIUS, THE YOUNGER. son of the preceding, celebrated his entrance into public life, 367 B.C., by a splendid festival, which lasted ninety days. His political education had been designedly neglected by his father, and in consequence he grew up an indolent, pleasure-loving, and dissolute prince. Dion, a relative of his father, sought to improve him by the instructions of Plato, but his endeavors were frustrated by Philistus, the historian, who disgracefully encouraged the excesses of the youth. Dion was banished, but afterwards returning to Sicily, expelled D. from Syracuse. The latter fled to Locri, the birthplace of his mother, Doris, where he was hospitably received. He repaid the kindness of the Locrians by making himself master of their city, which he ruled despotically for several years. In 346 B.C., the course of events enabled him to return to Syracuse, but he could not firmly re-establish himself. His cruelties drove the citizens to ask the aid of the Corinthians against him. Timoleon was sent to their assistance, and D., shut up in the citadel of Syracuse, was compelled to surrender, 343 B.C. He was brought to Corinth, where he soon squandered the wealth which he had carried away from Sicily, sunk into obscurity, and died in extreme poverty.

DIONYSIUS, OF HALICARNASSUS, a learned critic, historian, and rhetorician, was the son of one Alexander of Halicarnassus, and was born probably about the middle of the century before Christ. He came to Rome at the termination of the civil wars, 29 B.C., and resided there for 22 years, familiarizing himself with the language, literature, and antiquities of the Romans. His death occurred shortly after 7 B.C. D.'s most valuable work is unquestionably his *History of Rome*, although it does not exhibit the finest qualities of his mind. The author was an admirable rhetorician, but had very little political discrimination, and no

perception of the difference between a myth and a historic fact. Yet, inasmuch as it contains a mine of information about the constitution, religion, history, laws, and private life of the Romans, it will always command the regard of scholars. Of the 20 books of which it originally consisted, we possess only the first 9 in a complete form, the 10th and 11th nearly so; and of the rest, only a few fragments. The first edition of the Greek original was that by Stephens (Paris, 1546), but a very good Latin version was published as early as 1480. Angelo Mai published (Milan 1816) a collection of the fragments of the lost books from a MS. in the library at Milan, the genuineness of which has been doubted by Niebuhr. The rhetorical and critical works of D. are of the highest literary merit. The principal are his *Censura Veterum Scriptorum* his *Ars Rhetorica*, and his *De Compositione Verborum*. The first complete edition of the History (or *Archæologia*, as D. called it) and rhetorical works was that of Fr. Sylburg (Frankfort 1586); one of the best is that of Reiske (6 vols., Leip. 1774-1777).

DIOPHANTINE ANALYSIS is that section of the theory of unlimited or indeterminate problems which attempts to find rational and commensurable values answering to certain equations between squares and cubes. This class of problems was first and chiefly treated of by Diophantus (q. v.), who has given his name to the theory of their solution. We shall not here attempt to explain the nature of the analysis, which is very subtle, and guided by few general rules. The difficulties of the solution of diophantine problems in most cases fail to be overcome by the skill and ingenuity of the analyst. We confine ourselves to stating the following examples of the problems solved by the Diophantine analysis: To find two whole numbers the sum of whose squares is a square. 2. To find three square numbers in arithmetical progression. 3. To find a number from which two given squares being severally subtracted, each of the remainders may be a square.

DIOPHANTUS, a distinguished Greek mathematician, lived at Alexandria, according to some, about the middle of the 4th c.; according to others, about the close of the 5th. His name first occurs in the life of Johannes Damascenus, written by John, patriarch of Jerusalem, in the 8th century. He is commonly represented as the inventor of algebra, but he himself speaks of that science as known before his time.

It is possible he may have been acquainted with Hindualgebra; at all events, according to De Morgan, there is a very great similarity between the Hindu algebra and that of Diophantus. He occupied himself chiefly with the class of problems characterized in the preceding article. Of his valuable work, the MS. of which was discovered in the 16th c., *Arithmetica*, consisting originally of 13 books, only six have been preserved. Besides this we possess a book on polygonal numbers. The best edition is that of Fermat (Toulouse, 1670); there is a German translation by Schulz (Berl. 1821).

DIO'PSIS, a genus of dipterous insects of the same great family with the house-fly, remarkable for the prodigious prolongation of the sides of the head, so as to form stalks for the eyes, which are thus removed to a distance from the body of the insect, almost equalling in some species the length of its wings. All the species are found in warm parts of the Old World.

DIO'PTRICS is that branch of geometrical optics (see OPTICS) which treats of the transmission of rays of light from one medium into another, differing in kind. It consists of the results of the application of geometry to ascertain in particular cases the action of what are called the laws of refraction. When a ray of homogeneous light is incident upon a surface, the angle which its direction makes with the normal or perpendicular to the surface at the point of incidence is in dioptrics, as in catoptrics, called the angle of incidence. The angle which the refracted ray makes with the same line is called the angle of refraction. This being premised, we may state the laws of refraction. 1. The incident and refracted ray lie in the same plane with the normal, at the point of incidence, and on opposite sides of it. 2. The sine of the angle of incidence, whatever that angle may be, bears to the sine of the angle of refraction a constant ratio dependent only on the nature of the media between which the refraction takes place, and on the nature of the light. According to the second law, if we call the angle of incidence i , and that of refraction r , we shall have $\sin i = \mu \sin r$, where μ is a quantity depending upon the nature of the media and of the light. It will have, for instance, a certain value for refraction from vacuum into glass, another from glass into water, and so on; also it will have one value for red light, another for green, and so on. The quantity μ is called the refractive index, and is greater than 1 when refraction takes place from vacuum into a me-



Diopsichneumonid :
1, magnified; 2, natural size.

dium, and in general is greater than 1 when the refraction is from a rarer into a denser medium, and less than 1 when the opposite is the case. In dioptrics, the laws of refraction may be considered as depending for their truth upon experiment; in physical optics, they are deductions from an hypothesis respecting the constitution of light. They are not merely approximately true; they are absolute physical laws.

Before proceeding to consider the simpler leading cases of refraction, one or two interesting propositions in dioptrics require to be explained.—1. If the refractive index for a medium, when light is incident upon it from vacuum, be μ , and the index for another medium, under the same circumstances, be μ' , then, when light proceeds from the second medium into the first, the refractive index is $\frac{\mu}{\mu'}$. The proof of this proposition depends upon the

two following experimental laws: (1.) If a ray of light proceed from a point P, to another Q, suffering any reflections or refractions in its course, then, if it be incident in the reverse direction from Q, it will follow the exactly reverse course to P. This is proved by experiment, but may be accepted as axiomatic. (2.) If a ray pass from vacuum through any number of media, having their faces plane and parallel, when the ray emerges into vacuum its direction will be parallel to that which it had before incidence. To deduce the proposition from these laws, let i be the angle of incidence from vacuum upon the medium B (fig. 1), r the angle of refraction, which will also be the angle of incidence upon the medium A. Also let r' be the angle of refraction into A, which will also be the angle of incidence upon the second bounding surface of A. By the second of the preceding experimental laws, the angle of

emergence into vacuum will be i . Hence we shall have by the first of these laws, $\sin i = \mu' \sin r$ at the first surface, and $\sin i = \mu \sin r'$ at the second. From these equations, we have $\sin r = \frac{\mu}{\mu'} \sin r'$, which proves the proposition. It follows that if μ be the refractive index from vacuum into a medium, that from the

medium into vacuum will be $\frac{1}{\mu}$.—2. Our second proposition relates to what is called the *critical angle*. If i be the angle of incidence of a ray within a medium, the refractive index of which is μ , and r the angle of refraction into vacuum, then we have from the former proposition $\sin i = \frac{1}{\mu} \sin r$. From this formula, if i be given, r may be found, and a real value will be given to r so long as $\sin i$ is $\leq \frac{1}{\mu}$; but when i has a value greater than that de-

termined by the equation $\sin i = \frac{1}{\mu}$, the formula fails to give us a value of r , for the sine of an angle cannot be greater than 1. And experiment shows that, in fact there is no refracted ray when the angle of incidence is greater than that above assigned, the ray being wholly reflected within the medium. The angle of which the sine is $\frac{1}{\mu}$ is called the *critical angle*. For glass, it is about $41^\circ 45'$;

for water, about $48^\circ 30'$. This angle is sometimes called the angle of *total reflection*. In internal reflection at the surfaces of media, the reflected light is more nearly equal in intensity to the incident than in any other case of reflection. While it thus appears that refraction from a denser into a rarer medium is not always possible, it may be added that it is always possible from a rarer into a denser.

We shall now investigate some simple cases of refraction. 1. And first of refraction at a plane surface. Let DIMN (fig. 2) be

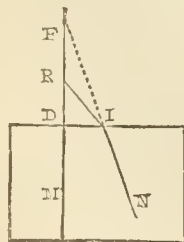


Fig. 2.

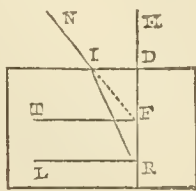


Fig. 3.

any medium bounded by a plane DI, and let R be a radiant point, and RD and RI two incident rays of a divergent pencil proceeding from R to the surface of the medium; then RD being perpendicular to the surface, suffers no refraction, but proceeds along

DM within the medium; but RI is refracted in the direction IN, which, produced outwards, meets the normal DF in F. Therefore, a small pencil of rays proceeding from R, and having RD, perpendicular to the surface, for axis, will be refracted into another pencil diverging from the imaginary focus F; for all the rays intermediate between RD and RI will converge very near F when the pencil is small. An eye within the medium, and between N and M, would thus, the pencil being small, see the luminous point R, as if it were at F, or further off than it really is. In the opposite case, represented in fig. 3, R being within the refracting medium, similar reasoning shows that after the rays emerge from the plane surface into the air, they will, if the pencil be small, appear to proceed from an imaginary focus F, nearer to the surface than R, the luminous point.

2. The case of refraction through a prism, which we are next to consider, is, in fact, the case of refraction through a medium bounded by plane surfaces which are not parallel. Conceive two planes at right angles to the plane of the paper, and making on that plane the figure BAC (fig. 4). The question is as to the laws of transmission of a ray, SPQR, of homogeneous light through the prism. Draw mn' and $n'n$ perpendicular to the sides. Then $n'PQ$ and $n'QP$ are respectively the angles of refraction at the first, and of incidence at the second surface. Now, as $n'QA$ and $n'PA$ are each of them right angles, and as all the angles in the figure $n'QAP$ are equal to four right angles, it follows that the angles at n' and at A together are equal to two right angles. But the angle at n' , together with the angles $n'PQ$ and $n'QP$, are equal to two right angles; therefore must the angles $n'PQ$ and $n'QP$ together be equal to the angle at A. In other words, in refraction through a prism: *The sum of the angles of refraction at the first surface, and of incidence at the second, is equal to the angle contained between the plane sides of the prism.* From this it might be shown, that the deviation of a ray caused by passing through a prism is always towards the thicker part of the prism, if the medium be denser than the surrounding atmosphere. It is a geometrical proposition which the student may solve for himself, that if i be the angle of incidence at the first surface, and e that of emergence at the second, and if a be the angle of the prism, then δ , or the change of direction of the ray in its passage, is obtained from the formula $\delta = i + e - a$.

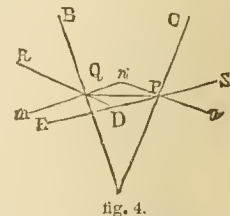


fig. 4.

3. We now take up the case of refraction at a single spherical surface of a medium denser than the surrounding air. And first, of parallel rays refracted at a convex spherical surface. Let ABQP (fig. 5) be the refracting medium, whose terminating con-

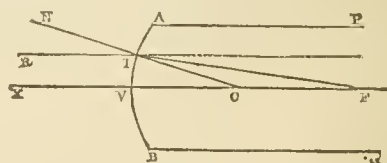


Fig. 5.

vex surface is spherical, C being the center of the surface, and V its vertex. Let XV be the axis of a pencil of parallel rays, of which any ray, RI, is incident at I. Then, if CIN be a normal, the angle of refraction, CIF, will be less than the angle of incidence, RIN, and the refracted ray will thus turn towards the axis, and meet it at some point F. When the pencil is small, or the aperture, AVB, of only a few degrees, the rays will clearly nearly all converge to the same point, F. To find the position of F, we have, in the triangle ICF, the angle $CIF = r$, the angle of refraction, and ICF, the supplement of ICV or NIR (by parallel lines), i.e., of i , or the angle of incidence. Therefore, IF is to $CF :: \sin i$ to $\sin r$. And as for a very small pencil, IF may be taken $= VF$, we have $VF : FC :: \sin i : \sin r$, or, $:: \mu : 1$. And putting $FV = F$, the principal focal distance, and $VC = R$, we have $F = \frac{\mu}{\mu - 1} R$. If the medium be crown-glass, for which the value

of μ is $\frac{3}{2}$, we have $F = \frac{3}{\frac{3}{2} - 1} R$, or $F = 3 R$; i. e., the principal

focal distance is equal to three times the radius of the sphere. The student may by similar reasoning, ascertain for himself the focus of parallel rays incident on a concave spherical refracting surface, as also the focus in the case of a pencil of parallel rays within the medium and emerging from it. The case of a divergent pencil is incapable of such elementary treatment as to justify its insertion here. For branches of the subject, treated under separate heads, the reader should refer to the articles CAUSTIC, LENS, and

REFRACTION. Under **REFRACTION**, he will find a table of the values of μ —the refractive index for various media and kinds of light. See also the articles **SPECTRUM** and **CHROMATICS**.

DIORA'MA. See **PANORAMA**.

DIOSCOREACEÆ, a natural order of plants, of which the genus *Dioscorea* (see **YAM**) is the type. They are twining shrubs, with large tubers, either above or below ground. They are generally classed with endogenous plants; they are among the *Dictyogens* of Lindley. There are about 120 known species. The most important plants of the order are the different species of *Dioscorea* or **YAM** (q. v.). **Black BRYONY** (q. v.) is its only representative in the British flora. *Testudinaria elephantipes*, a South African species, sometimes called *Elephants' Foot*, and *Hottentots' Bread*, has a large fleshy rhizome, with a rough cracked bark, which is used as food by the Hottentots in times of scarcity.

DIOSCORIDÉS, **PEDANIUS**, or **PEDACIUS**, a Greek physician, was a native of Anazarba, or Anazarbus, in Cilicia, and flourished in the 1st or 2d c. of our era. He accompanied the Roman armies as physician through many countries, and collected a great store of information and personal observation on plants. In his great work, *De Materia Medica*, he treats of all the then known medicinal substances and their properties, real or reputed, on the principles of the so-called 'humoral pathology.' Two other works bear the name of D., but their genuineness is very questionable. During 15 centuries, D. maintained undisputed authority in botany and in materia medica, an authority which he still holds among the Turks and Moors. The best editions of D. are by Saracenus (Frankf. 1598), and Sprengel (2 vols., Leip. 1829). The *De Materia Medica* has been translated into Italian, German, French, and Spanish languages. There is also an Arabic translation in MS. in various libraries of Europe.

DIO'SMA. See **BUCKU**.

DIO'SPYROS. See **DATE PLUM** and **EBONY**.

DIP, in Geology, is the inclination of strata downwards into the earth. The amount or angle of dip is the degree of deviation from a level line, or the plane of the horizon. The point of dip is the point of the compass to which the dip is inclined.

DIPHTE'RIA, or **DIPHTHERI'TIS** (Fr. *diphtherite*, from Gr. *diphthera* a pellicle), a name first applied by M. Bretonneau of Tours, a distinguished French physician, to a form of very fatal sore throat occurring epidemically, chiefly in children, and apt to be confounded both with Croup (q. v.) and with malignant sore throat (*Angina maligna*), as it is found in connection with Scarlet Fever (q. v.). Diphtheria is distinct from both these diseases, not only in its symptoms, but in the character and position of the morbid changes on the mucous membrane. In croup, there is a peculiar membrane, indeed, but it is almost confined to the air-passages, and centers in the Larynx (q. v.); in diphtheria, it usually begins in the pharynx or back of the throat, and often extends down the œsophagus, or gullet. Croup is also a much more decidedly inflammatory disease than diphtheria. Malignant or ulcerative sore throat has even less in common with diphtheria; for in the latter there is no ulceration in the majority of cases, the mucous membrane being merely covered over with a more or less thick veil of false membrane; in both affections, however, there is enlargement of the glands behind the ear and in the neck, generally in the neighborhood of the parts internally affected.

The throat affection in diphtheria is often accompanied by a very low and dangerous form of fever, with great and rapid loss of the patient's strength, which is still further reduced of course by the inability to take food; in other cases, the disease is fatal by suffocation, and tracheotomy has been performed (in some few instances successfully) to relieve the patient from impending death. After the acute disease is over, the recovery may be delayed by paralytic symptoms of various kinds; or simply by extreme debility, with exhaustion and loss of appetite. Diphtheria was supposed by Bretonneau to be contagious, but it is doubted by many whether the evidence of contagion is sufficient. There is no good evidence of any specific cure. The use of the tincture of muriate of iron in large doses (fifteen to twenty drops frequently repeated) has been recommended; also various disinfectants and caustics applied to the throat, as nitrate of silver, hydrochloric acid mixed with honey, and latterly Condy's disinfecting fluid; cauterization, formerly used, is now known to be cruel, dangerous, and useless. Diphtheria does not appear to be so much under the influence of known sanitary conditions as other epidemics; at least its modes of origin and diffusion are still extremely uncertain.

DIPHTHONG (Gr. having a double sound) means two vowel sounds following one another so closely as to form but one syllable, as in *out*. In this combination the sound is really composed of an *a* as heard in *father*, and a *u* as heard in *put*. Many double vowels in English are not real diphthongs, there being only one sound heard. The spelling of the English language has little or no relation to the pronunciation in this matter. In many syllables

written with two vowels, only one sound is heard, as in *bread*. The single vowel letters, again, often have a diphthongal sound; thus the long sound, as it is called, of *i* is really composed of the sound of *a*, as heard in *father*, and that of *e*, in *me*; and *tune* is pronounced as if written *teun* or rather *tyun*. Such words as *bread*, *field*, which are now monophthongs, were doubtless at one time real diphthongs, and are still so pronounced in many parts of England.

DIPLACA'NTIUS, a genus of fossil ganoid fishes, peculiar to the old red sandstone, in which six species have been found. The body was covered with very small scales, and the tail was heterocercal. There were two dorsal fins, which with each of the other fins were furnished with a strong spine in front, the base of which was simply imbedded in the flesh, as in the dog-fish, and not articulated, as in the silurids. The head was large, and the mouth wide, and opening obliquely.

DIPLOGRA'PSUS, a genus of fossil zoophytes, differing from the Graptolite (q. v.) in having a double series of cells. They are found in great abundance in the anthracitic shales of the Silurian measures.

DIPLO'MA (Gr. *diploo*, I double, or fold). This term originated in the ancient custom of writing solemn documents on two tablets of wax, which were doubled, or laid one upon the other (see **DIPTYCH**), or on writing material which was folded. The Roman emperors were in the habit of giving diplomas to public servants, and to couriers, to enable them to procure the use of the public servants and horses; hence diploma came to signify a royal charter or prince's letters-patent. The term is now mostly applied to instruments given by universities and other learned societies, in proof of the holder having attained a certain degree; or to the licenses held by professional persons to practise their art.

DIPLO'MACY, the art of managing the intercourse and adjusting the relations of foreign states, by means of ambassadors, envoys extraordinary, consuls, &c. The principles and rules of diplomacy are embodied partly in those international customs and usages which constitute what may be called common, and in those treaties which may be regarded as statute international law. The diplomatic relations of this country are practically under the superintendence of the Secretary of State for Foreign Affairs, but the power of sending ambassadors to, and receiving ambassadors from, foreign states, is an inalienable privilege of the crown. It was doubted whether an exception had not been made in the case of Rome, by the statutes passed against papal encroachments; and it was thought expedient to remove such doubt by 11 and 12 Vict. c. 108, which authorizes her Majesty to enter into diplomatic relations, provided that no person in holy orders in the Church of Rome, or Jesuit, or member of any other religious order, community, or society of that church, bound by monastic or religious vows, shall be received as ambassador at the court of London. Ambassadors are not subject to the municipal laws of the states in which they reside, the theory being that they represent the persons of their respective masters, who cannot be subject to any other laws than those of their own country. If an ambassador offends against the municipal law, or abuses his character, he may be sent home, and accused before his master. Though there was much doubt on the point, this rule seems to extend to crimes against natural law, e. g., to murder, or *mala in se*, as well as to crimes artificially created by the policy of the particular state, *mala prohibita*; and it is now said that the case of Don Pantaleon Sa, the brother and secretary of the Portuguese ambassador, who was executed for an atrocious murder during the protectorate of Cromwell in 1654, was no exception, as he was not 'joined with his brother in the same commission.' See **AMBASSADOR**, **EMBASSY**. The arrangement of international ceremonies belongs to the subject of diplomacy. To treat it in detail would lead us far beyond our limits, and we must content ourselves with remarking a few of the customary and conventional modifications which affect the general principle of international law by which all independent states are held to be equal.

Royal honors are enjoyed by the empires and kingdoms of Europe, including the Swiss Confederation, the grand duchies of Germany, and amongst Catholic states, by the pope; and the same right extends to the United States of America. These along with other rights of greater importance, include the right of taking precedence of the others in all international ceremonials. Amongst those who enjoy royal honors, the order of precedence, after much discussion, was left by the Congress of Vienna on the ancient footing of custom merely. The rule thus fixed is said to be the following: Monarchs enjoying royal honors, but not crowned heads, yield precedence to those who are, whilst they enjoy it over all other monarchs, demi-sovereigns, and rulers of dependent states. This rule leaves the relative rank of the crowned heads and other classes amongst themselves undetermined, and a curious expedient has been found for obviating the necessity of a minuter classification. By what is called the *alternat*, the rank and places of the various powers are changed from time to time

in a certain order determined by lot. If there are several parties to a treaty, for example, a corresponding number of copies is made of it, the name of each state being named first in the copy which it preserves, and the others in the order determined by the *alternat*. But the right to alternation has sometimes been a subject of contention. In 1742, it was refused to Prussia by Great Britain; and Hungary and Sardinia had great difficulty in obtaining it at the peace of Aix-la-Chapelle.

The subject of maritime ceremonies will be treated under its respective heads. They consist of salutes either with cannon, or with the flag or pendant, by furling it, lowering it, or pulling it down. There is also a salute with sails, which generally consists in lowering the foretopsail. Maritime ceremonials are usually made the subject of express compact, but, as a general rule, on the open seas, a ship carrying a pendant salutes a ship of a friendly power carrying an admiral, and detached ships generally salute fleets. It is provided by 22 and 23 Vict. c. 5, repealing in so far 6 Anne, c. 7, that pensions granted for diplomatic services, according to the provisions of 2 and 3 Will. IV. c. 116, shall not disqualify the holder from being elected, or sitting, or voting as a member of the House of Commons.

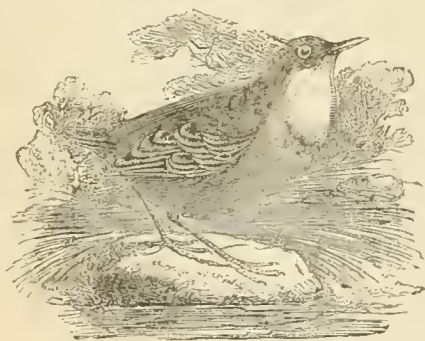
DIPLOMA'TICS, the science of ancient writings. The term can scarcely be said to have been at any time in general use in this country, and even on the continent it has latterly given way to the more convenient and descriptive term, **PALÆOGRAPHY** (q. v.).

DIPLOPTERUS, a genus of fossil ganoid fishes, four species of which have been discovered in the old red sandstone, and two in the carboniferous series. They have heterocercal tails, with double anal and dorsal fins, opposite each other, but having the dorsal pair a little apart. The head is large and flattened, and the teeth are fewer and larger than in the allied genera. The scales are perforated.

DIPNOI. See **LEPIDOSIREN**.

DIPPEL'S ANIMAL OIL, called also *Empyreumatic Animal Oil*, or *Rectified Oil of Hartshorn*, is prepared by the destructive distillation of bones in close vessels, when **BONE-BLACK** (q. v.) is left in the retort or vessel, and the crude oil distils over into a suitable receiver. When obtained in this manner, it is a thick viscid oil of a brown color, and a very disagreeable odor, but on redistillation it may be obtained limpid and colorless. Air and light affect the pure or rectified oil, and render it colored and somewhat viscid. Its elementary constituents are carbon, hydrogen, nitrogen, and oxygen, and it contains a number of volatile organic bases, such as aniline, picoline, &c. Dippel's animal oil is a powerful medicinal agent, and when swallowed in doses of a few drops, it is antispasmodic, and stimulates the vascular and nervous systems. In large doses, it is a powerful irritant poison.

DIPPER (*Cinclus*), a genus of birds of the Thrush family (*Merulidae*), distinguished from the other birds of that family by an almost straight, compressed, sharp-pointed bill, and still more by their manners and habits. They frequent clear pebbly streams and lakes, feeding chiefly on molluscs and on aquatic insects and



Water Ousel (*Cinclus aquaticus*).

their larvæ, which they seek even under water, diving with great facility, and moving about for a short time at the bottom of the water. They carry their rather short tail elevated after the manner of wrens, which they also resemble in their 'frequent becks' or dipping of the head, accompanied with an upward jerk of the tail. One species is found in Britain, the **COMMON D.**, or **WATER OUSEL** (*C. aquaticus*), a bird rather smaller than any of the British thrushes, of a generally dark-brown color, with throat and upper part of the breast pure white. It is found throughout the whole of Europe and the north of Asia, but chiefly in hilly or mountainous districts. It is not gregarious. The D. never fails to attract notice, as it sits upon some stone in the midst of or beside the stream, its white breast rendering it conspicuous as it repeats the movement from which it derives its name.

It builds a very curious nest of interwoven moss, domed and

with the entrance in the side, usually in some mossy bank close by a stream, and often near or under a cascade. The assertion which has been made, that the D. walks without apparent muscular effort at the bottom of the water, is incorrect; its feet are not well formed for walking, and it moves under water by means of its wings—which are short—not without much muscular effort. The statement also often made, that it eats the spawn of salmon and other fishes, in the belief of which it is much persecuted in Scotland, has never been sufficiently authenticated. Other species of D. are found in Asia and North America. In Scotland, the D. is called the *Water Crow*.

DIPPING-NEEDLE. If a magnetic needle be supported so as to be free to move vertically, it does not at most places on the earth's surface rest in a horizontal position, but inclines more or less from it. If the vertical plane in which the needle moves is the magnetic meridian of the place, the angle between the needle and the horizontal line is called the *dip* or *inclination* of the needle. Thus, if the needle, NS, be supported at its center, C, so as to be free to move vertically, the plane of the paper being supposed to be that of the magnetic meridian, the angle NCA is the dip. The dip of the magnetic needle at any place can be ascertained with

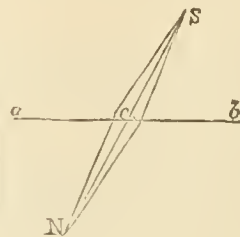


Fig. 1.

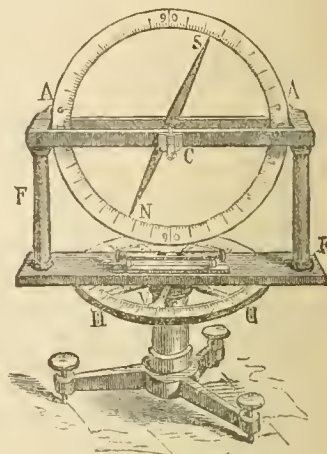


Fig. 2.

very great exactness by means of the dipping-needle, fig. 2. It consists of a graduated circle, AA, fixed vertically in the frame FF, and moving with it the vernier V, on the horizontal graduated circle HH. This last is supported by a tripod furnished with leveling screws. At the center of the circle, C, there are two knife-edges of agate, supported by the frame, and parallel to the plane of the circle. The needle, NS, rests on the knife-edges by means of two fine polished cylinders of steel, which are placed accurately at the center of the needle, and project at right angles from it: so adjusted, the needle moves with little or no friction. It is so made, moreover, that before being magnetized it remains indifferently in any position; after magnetization, therefore, the dip which it shows is wholly due to the magnetic influence of the earth.

In order to understand how an observation is made with the dipping-needle, we must regard the directing force of the earth's magnetism exerted upon the poles of the needle in any vertical plane in which it may happen to be, as resolved into two forces, one acting at right angles to the plane, and the other acting in the plane. There being a corresponding but opposite force at each pole, we have thus two statical couples acting on the needle—one tending to turn it at right angles to the plane in which it moves, and the other tending to bring it round to a position in the plane such that the needle and the forces of the couple may be in a line. In the dipping-needle, the mode of support completely neutralizes the first of the couples; and the position that the needle takes in any plane is due wholly to the second. When the plane of the needle is at right angles to the magnetic meridian, the forces of this latter couple act vertically, and bring the needle to the same position. This, then, gives us the means of determining the magnetic meridian, for we have only to bring the vertical circle round till the needle stands at 90° to put it in a plane at right angles to that meridian; and then by moving the vernier on the horizontal circle over 90°, we place the upper circle and needle in the plane of the magnetic meridian. The dipping-needle thus serves the purpose of a *Declination Needle* (q. v.). In bringing the needle round from the plane at right angles to the magnetic meridian, the dip is less and less, till it becomes least in the plane of that meridian. We might thus, also find the magnetic meridian, for it is that plane in which the dip of the needle is least. When the needle is in the plane of the magnetic meridian, the couple which acts in other

vertical planes at right angles to them disappears, and the whole force of the terrestrial magnetism acts at each pole of the needle, forming a couple which swings the needles round till it stands in a line with itself. The degree on the circle then pointed to by the needle is the dip at the place of observation. Two readings are necessary, for the reason stated in the DECLINATION NEEDLE. One reading is taken, the needle is then reversed so as to change its supports, and then a second reading is noted, and the mean of the two gives the correct reading. The position of the needle when the dip is read off is manifestly the same that a needle suspended in air, if that were possible, and free to move in any way, would finally assume. In resolving, therefore, the total directive force of the earth as we have done above, we must keep in mind that it always acts parallel to the direction of the dipping-needle.

DIPSA'CEE AND DIP'SACUS. See TEASEL.

DIP'SAS (Gr. a kind of serpent), a genus of non-venomous serpents of the family *Colebridae*, of very elongated form, and with a thick, broad, and obtuse head. They are tree-snakes, inhabitants of the warm parts of Asia and America. One species only, *D. fallax*, somewhat doubtfully referred to this genus, occurs in the south of Europe. Some of the species are of great size. The figure represents a large and beautiful species found in Java and Sumatra. The form is more attenuated than in others of the genus.



Dipsas cyanodon.

DIPSOMA'NIA (Gr. *dipsa*, thirst, and *mania*, madness, or eager desire) is a term intended, whether correctly or not, to denote a condition in which certain individuals manifest an irresistible craving for alcoholic drinks. **OINOMANIA** (Gr. *oinos*, wine), used by German writers; and the English **DRINKING INSANITY**, are also intended to designate the same state. It is of importance to distinguish dipsomaniacs from ordinarily intemperate and drunken individuals. In our streets and in society, we are only too familiar with the various phases of the habit and vice of drunkenness, and the different grades and circumstances of drinkers, such as the morning dram-drinker; the jolly social drinker; and the individual who, knowingly and intentionally, gives himself up to a debauch. While many thus of their own choice degrade and injure themselves, they are generally able, for a time at least, to perform tolerably well their usual occupations during business-hours. Many hard drinkers can exercise wonderful control over themselves, choosing the time to drink and the time to keep sober; and while sober, can discharge all their family, professional, social, or even religious duties—so far at least as outward appearances go. Some of them may drink continuously, until attacked by what is called *Delirium Tremens* (q. v.), or fall into the state of *Delirium Ebriosum* (q. v.), or what has been called *Mania a potu*; but when the supplies are stopped, and the necessary treatment is undergone, they are soon able to resume their usual duties, and too soon, in general, their former practices.

There is, however, especially in persons of a nervous and sanguine temperament and constitution—and more readily in women than in men—a condition in which the mere vice is transformed into a disease, the vicious habit into an insane, impulsive propensity, and then the drunkard becomes a dipsomaniac. The alcoholic principle, by habitual abuse, perverts the action, if not the nutrition of cerebral matter; and the frequent disturbances of the mental functions from fits of intoxication, the loose and irregular habits engendered, and the alternate states of remorse and attempts to drown conscience by more copious libations, all combine to create the dipsomaniac. He loses entire command over his will; has no power to resist the craving for alcoholic stimuli; and is transformed into the involuntary slave of an insane propensity. Physically, the dipsomaniac has a lamentably broken-down aspect; limbs feeble and tremulous; visage pale, leaden-colored, or sordid; and eyes watery and lustreless. But in the manifestations of mind and heart, the change is still more sad. A process of mental deterioration goes on simultaneously with the habit of indulgence; the main aim of life is how to obtain liquor; capacity for business is limited to the means of gratifying the craving; the precepts of morality and religion, the ties of nearest and dearest kin, have no sway over him; indeed, no consideration, human or divine, will interpose any barrier in the way of gratifying the propensity, whenever it is possible.

Nor does he now drink with real relish, socially and convivially, but will swallow spirits, away from society and observation, even as it were a drug; and the only satisfaction derived from the act is, that it secures insensibility to the wretched state of

mind which prompts the insatiable desire. When this has gone on for some time, although a suspension of the use of stimulants be imposed by the interference of friends, or the occurrence of an attack either of the form of delirium or maniacal excitement mentioned, yet his mind has suffered so materially, that unless control is exercised over him, and continued for a considerable period, he returns immediately like the 'dog to his vomit.' His moral feelings become more and more perverted, and his intellectual powers weakened. He is thus rendered either facile or wasteful, and incapacitated for the ordinary business of life; or he is irascible, resentful, or mischievous, and torments and annoys those about him; or commits homicide or suicide; or he becomes decidedly insane. Such is acquired dipsomania. But very frequently it is met with as a disease, *ab origine*—a constitutional, and in the greater proportion of instances, a hereditary affection. When it takes this character, dipsomania resembles other constitutional diseases; and such cases especially illustrate its affinity to insanity. It is well known that gout and rheumatism, or disease of the heart, may be developed from errors in the mode of living of individuals in whose family connections there is no sign of predisposition; while, on the other hand, these diseases may also exist in virtue of a strong hereditary tendency, without any appreciable infringements of the laws of health. And so also dipsomania; for, while frequently resulting from acquired vicious habit, it occurs likewise from an insane hereditary taint, very frequently visited on children by the sins of their parents, especially if the latter have suffered from repeated attacks of delirium tremens, or have been in reality confirmed dipsomaniacs. Indeed, it has even been met with in the offspring of dipsomaniacs during the years of childhood, and that also in the sudden paroxysmal form. But what goes still further to prove its affinity to insanity, is the well-known fact, that in the family of the dipsomaniac, not only several cases of this drink-craving propensity are often met with, but marked instances of mental disorder in other forms. Some interesting examples of this may be found in the *Edinburgh Medical Journal* for April 1858, by Dr. Thompson of the Perth prisons. When dipsomania thus occurs from constitutional organization, the disease is assuredly of a worse type than when it springs merely out of the vicious habit of drinking. There is generally more eccentricity of habit and deportment, more perversity of mind and disposition, and more untruthfulness and deceit, which is a remarkably uniform feature in this malady. The victim of it is more unscrupulous in the means employed to gratify the ruling desire of existence; and when the disease is fairly developed, and allowed to take its course unrestrainedly, the moral sense becomes utterly perverted, and the intellect annihilated, so that the affected is readily led to the commission of crimes which would not otherwise be perpetrated, or sinks into a state of complete imbecility or hopeless mania.

Whether, therefore, the disease exists in its ordinary phases and intensity from voluntary intemperance; or whether it springs out of the propensity, as a consequence of abnormal organization—and these are sufficiently characteristic to present a marked line of distinction from the ordinary vice of intemperance—the pathological and mental phenomena and results are the same—viz., an insatiable craving for alcoholic stimulants, with complete loss of self-respect and self-control in gratifying the desire, despite all obligations due to God and to man. There are generally also some special features in each case, affording additional evidence of decided mental unsoundness. Some of these are wastefulness and senseless extravagance; ridiculous eccentricity of conduct; gross indecency of behavior, and obscenity and profanity of language; tendency to theft of articles of little or no value—often of one class or kind of things; extreme perverseness and vindictiveness of disposition; and impulsive violence, which leads readily to the commission of homicide or suicide.

These, then, are the features, variously combined in different cases (of which many examples could be easily given), which distinguish instances of dipsomania from ordinary drunkenness, and warrant the opinion that the condition described is a form of mental affection—a disease, like any other insanity. Almost all medical men, we believe, now hold this view, or at least that it should be treated as an insanity; and it has of late been very widely accepted by the general public, at anyrate by all, without exception, who have come in contact with instances in their own families or among their friends.

If such, then, is a correct view of the case, it follows that special physical treatment must be adopted before moral and spiritual agencies can be expected to operate with any chance of success; and as the dipsomaniac is incapable of governing his own will, and making any effort to subdue his ruling desire, it is evident that he should be placed under the power of others who have the means of controlling him. From the very nature of the malady, however, it is scarcely to be expected that the inveterate drunkard will voluntarily submit to control, or continue under it for a sufficient length of time to receive lasting benefit; and therefore it seems essential, as in the case of other insanities, that legal power, with

proper precautions and restrictions, should be available, to secure the possession of his person, and the protection of his property. It is undoubtedly the duty of a good and wise government to provide for such care, when it is so well known that the consequences of unrestrained action may be so serious to the individual chiefly concerned; when families are so often thereby plunged into deep distress or absolute ruin; and when the amenity of society is so frequently outraged by a display of mischievous eccentricity, or glaring indecency, or by the occurrence of some flagrant crime. 'The liberty of the subject' is a precious trust, but the absence of law to meet the case of the insane drunkard, is in reality license for evil, since no precaution is taken to prevent most grievous infringements of the liberties of others.

It is certainly an overstrained delicacy in legislation to shirk interference with a class of cases which lead to so much private misery and public expenditure, as the records of our courts of law, prisons, poor-houses, and lunatic asylums can amply attest. But considering the case of the dipsomaniac from another point of view, a facility by law to control, would confer on himself an unspeakable benefit. It would thus afford him his only chance of cure and restoration to society, instead of permitting him to go on to wreck and ruin. Indeed, the neglect of law to provide such a check and remedy, seems inconsistent, unjust, and inhumane, when we consider, that while it permits the insensate drunkard to endanger his life, to waste his property, and deprive his family of that which they are justly entitled to expect from his hands during life, or to fall to them at his death, it holds him responsible for any criminal act he may commit. No doubt, the law assumes that he drinks voluntarily, and with his eyes open to all the consequences; and that his practices therefore form an aggravation of his guilt; but such is not the case, for he drinks—as has been shown—involuntarily, and without any reflection as to ultimate consequences; and he is manifestly unable to exercise his reason aright, or govern his will. That the existing law of lunacy does not meet the case of insane drinkers, is well known and much felt. The medical certifier declines to interfere unless there is evidence of some fury in the case, or the existence of a delusion; and in all probability, were he to do otherwise, and the case be carried into court, a deliverance would be given against the plea of insanity. In the Lunacy Amendment Act of 1866, permission is given to the superintendent of any asylum, with assent, in writing, from one of the Commissioners in Lunacy, to admit as a boarder any person wishing to submit himself to treatment, though his mental condition is not such as to warrant certificates of insanity.

Establishments for inebriates, on a small scale, have existed in this country for many years; and there are at present several excellent ones, for the middle and upper classes, in various parts of the country. Into these places, however, only a very few individuals go quite voluntarily; in fact it is generally under more or less constraint.

The Americans are in advance of us in legislation regarding the care of the person and property of inebriates; for to the magistrate, or rather judge, is committed the care and custody of all insane persons, and of all persons who are wasteful and incapable of conducting their own affairs, in consequence of habitual drunkenness; and he is empowered to provide out of their estates for their safe keeping and maintenance, and for the maintenance of their families and the education of their children. There are numerous homes or retreats for dipsomaniacs in the United States; but into all the admissions are mostly voluntary.

In Scotland it has long been felt that special legislation was required to meet the case of insane drinkers; and after a good deal of public discussion, Mr. Dalrymple introduced a bill in 1860, and in 1871 another, with provisions of a mixed reformatory and punitive character. In 1875 there was formed a 'Society for promoting Legislation for the Control and Cure of Habitual Drunkards.' In 1879 a mild Habitual Drunkards' Bill was passed, to come into operation in 1880, and be valid for ten years; but in it the erection of retreats is merely sanctioned, and admission is not compulsory, but only permissive, though some power of detention is given.

DIPTERA (Gr. two-winged), an order of insects, which received from Aristotle the name it still bears. Its distinguishing characters are so obvious that it has been acknowledged, with little change of its limits, by almost all naturalists. FLY is a popular name very generally applied to dipterous insects, and often with some distinguishing prefix (as House-fly, Flesh-fly, Blow-fly, Bot-fly, Crane-fly, &c.), although it is sometimes used with such prefix to designate insects not belonging to this order (Dragon-fly, Day-fly, May-fly, &c.). Midges, gnats, and mosquitoes are also dipterous insects. In the number of species which it contains, this is one of the most extensive orders of insects: some of the species are also remarkable for the immense multitudes in which they appear; and although most of them are of small size, and few attract us by brilliant hues, not a few are important on ac-

count of the annoyance or mischief which they cause, either in their perfect or in their larva state; whilst many of their larvæ (maggots) are also very useful in consuming putrescent animal matter, which might otherwise prove a source of pestilence.

The D. have only two wings, which are membranous and simply veined. A little behind the wings are two small slender organs called *Halteres*, poisers, or balancers, the use of which is not well known. They are usually present even in those exceptional insects of this order in which wings are not developed. The head of the D. is generally in great part occupied by the large compound eyes, which often contain thousands of facettes; and besides these, three simple or stemmatic eyes (ocelli) are often also present, placed upon the crown of the head. The mouth is formed exclusively for suction, and is usually furnished with a short membranous suctorial proboscis, composed of parts which represent, although so differently modified, the portions of the mouth in coleopterous and other masticating insects, some of the parts, however, often disappearing. The proboscis of many is capable of piercing the skins of animals on the juices of which they feed; others are quite destitute of this power of piercing. Many feed chiefly on saccharine and other vegetable juices.

In some genera, the perfect insect seems destitute of a month; and the term of life, after the perfect state has been attained, very brief in some, appears to be brief in all. The power which many dipterous insects possess of walking even on very smooth surfaces, in any position, even with the back downwards, familiar to every one in the example of the common house-fly, has not yet received a sufficient explanation. The opinion that their feet are furnished with discs for the formation of a vacuum, has been called in question, but nothing satisfactory has been substituted for it. The terminal rings of the abdomen in the females of many species, form an ovipositor capable of piercing the substances in which the eggs are to be laid, and composed of pieces which may be exerted or retracted into one another like those of a telescope. The eggs are very generally deposited in putrescent animal substances, but those of some kinds in the bodies of living animals, some in vegetable substances; the larvæ of some live in water; the eggs of a few are hatched within their own bodies, and the larvæ of some even remain there till they pass into the pupa state. All the D. undergo a complete metamorphosis. Their larvæ are destitute of true feet, although some of them have organs which serve for the same purpose; some have a distinct head; but others have the head soft and changeable in form, capable of being retracted into the body, and distinguishable only by its position, and by the organs of the mouth. Those which dwell in water or in fluid putrescent matters, have a retractile tail-like prolongation of the body, terminated by a radiated expansion, which communicates with air-tubes, and constitutes part of a very remarkable respiratory system. The larvæ of some D. spin cocoons when about to pass into the pupa state; but in others, the skin of the larva hardens and encases the pupa; the perfect insect finally making its escape by forcing off with its head the end of its pupa case.

DIPTERA'CEÆ, or DIPTEROCARPA'CEÆ, a natural order of exogenous plants, consisting of beautiful and majestic trees, natives of the East Indies. Some trees of this order, of which about fifty species are known, are highly valuable as timber-trees. Among them is the SAL (q. v.), the most esteemed timber-tree of India. They abound also in balsamic resin, and their resinous products are used for a variety of purposes. See ANIME, CAMPHOR, COPAL, DAMMAR, VARNISH TREE, and SAL.—*Dipterocarpus*, the genus from which the above order has received its name, contains several species of the noblest trees of India. They abound in the warm parts of the east coast of the Bay of Bengal and the Eastern Peninsula. The wood is used for house-building, ship-building, &c. *D. turbinatus*, the GURJUN or GOORJUN TREE, the species by which the genus first became known, often attains a height of upwards of 200 feet, and a girth of 15 feet. It has a pale-gray trunk, rising without a branch till it forms at its summit a small symmetrical crown. The leaves are broad, glossy, and beautiful; the flowers in white racemes, but not conspicuous.

The wood is hard, close-grained, and durable. A fragrant oil exudes from the trunk, which is extremely valuable for pitch and varnish, and is also used medicinally. It is procured by cutting transverse holes in the trunk, pointing downwards, and lighting fires in them, which causes the oil to flow. The tree is sometimes called the WOOD-OIL TREE. This oil or balsam is also procured from other species of *Dipterocarpus*. *D. trinervis* yields a resin which is valuable for plasters, and acts on the mucous membranes like Balsam of Copaiva. The Javanese smear banana leaves with this resin, which then burn as torches, with a pleasant odor and white light.

DIPTERUS, a genus of fossil ganoid fishes, peculiar to the old red sandstone, in which two species have been found. They derive their name from their most striking characteristic—the double anal and dorsal fins, which are opposite to each other. The head

is large and flattened, the teeth subequal, the scales perforated by small foramina, and the tail heterocercal.

DIPTYCH (Gr. *diptycha*), a double writing tablet, or two writing-tablets, which could be folded together. Herodotus speaks of such a tablet, made of wood and covered with wax. It was in the later Roman time, however, that they were most used, and those which have been preserved belong chiefly to the period when classical was merging into medieval life. The beautiful carving with which they are often covered on the outside, consequently represents not unfrequently a combination of classical and of Christian subjects. Ivory and metal were sometimes employed in place of wood; but the construction was always the same, the wax with the writing being in the inside. Under the emperors, diptychs were distinguished into consular and ecclesiastical. The former, which were presented by the consuls and other magistrates to their friends, and those officially connected with them, on their entrance on office, were inscribed with their names, and bore their portraits. The ecclesiastical diptychs, on the other hand, are decorated with scenes from sacred history, and were preserved in the churches as part of the sacred ornaments. Those that exist are of various sizes, rarely exceeding eight inches by four.

DIPUS. See **JERBOA**.

DIRE'CT. See **CONSANGUINITY**.

DIRECT' AND RETROGRADE. In Astronomy, the motion of a planet is said to be direct when the planet goes forward by its proper motion in the zodiac according to the succession or order of the signs (i. e., from west to east), or when it appears to do so to an observer. On the other hand, it is said to be retrograde when it appears to go the contrary way.

DIRE'CTOR, one of the number of persons appointed to conduct the affairs of joint-stock undertakings, such as banks, railways, water and gas companies, fire and life assurance companies, and various kinds of manufacturing and trading concerns. The office of a director is in all cases one of less or more responsibility, sometimes of considerable risk, and according to commercial maxim, ought not to be accepted lightly or for the mere honor which is supposed to be incidental to the position. On this point, unfortunately, there is not a little loose morality and want of due consideration. Men are seen to enter on the office with scarcely a thought of attending to their duty, or of the injury they may inflict by allowing their names to be attached to undertakings in the management of which they cannot be said to take any particular interest. Latterly, so many instances have occurred of the perfunctory performance of the duties of directors, greatly to the damage of those who confided in them, that, perhaps, new and more wholesome views may arise on the subject. As a member of a body incorporated by the legislature, a railway director is bound to administer the affairs of the company only with the means legitimately put at his disposal, nor can he be expected to incur any personal liability to sustain the general operations. Usually, however, when there is any temporary or peculiar shortcoming in the finances, the directors overdraw to a certain extent the company's bank account on their personal responsibility; in all such cases, and where the outlay has been justifiable, the shareholders rarely decline to authorize measures which will relieve the directors of their obligations. In the case of banks, there are usually two kinds of directors—the ordinary and the extraordinary. The ordinary directors are practically the conductors of the undertaking, while the extraordinary attend only on particular occasions, and are, in fact, little else than ornamental appendages, whose names impart a degree of distinction to the concern. As regards bank as well as railway directors, it is the rule that they must respectively possess a certain amount of stock. It is an understanding that the directors of railways, banks, and assurance companies should be paid in some way for their services. Being mostly men in business, they cannot be expected to give away their time and take trouble for nothing. Their payment, however, in the shape of an *honorarium*, is generally trifling in comparison to the amount of labor which is to be encountered. At meetings of shareholders, small sums are voted to be set aside for the directors, which sums are for the most part appropriated in the ratio of attendance. The fee of a bank director is not unusually half a guinea at each meeting; though it is as customary for those present to divide amongst them the sum set apart for the occasion, wherefore the regular attenders get most. The insignificance of these fees, even where no stinginess prevails, is employed as an argument why anything like a scrupulous examination into affairs is not reasonably to be expected—an argument seemingly of no moral or legal force; for it is clear there can be no valid excuse for neglecting a trust which has been voluntarily accepted.

The difficult questions as to the cases in which directors incur liability for the losses sustained by the shareholders, have often been raised in courts of law. The trial and imprisonment in 1879 of the directors of the City of Glasgow Bank drew attention to

this subject again. See **JOINT-STOCK COMPANY**. Of the statutory provisions as to directors contained in the Joint-Stock Companies Acts (1862 to 1879), the chief are these—1. That the first directors shall be selected, and their number determined, by the subscribers of the original memorandum of association, who shall themselves be deemed directors until other directors are appointed. 2. That his office of director shall be vacated by the acceptance of any other office or place of profit under the company, by bankruptcy or insolvency, or by being concerned in any contract with the company. 3. At the first ordinary meeting after the incorporation of the company the whole of the directors shall retire from office; and at the first ordinary meeting in every subsequent year, one-third of the directors for the time being, or if their number is not a multiple of three, then the number nearest to one-third, shall retire from office. In every subsequent year, one-third, or other nearest number, who have been longest in office, shall retire. A retiring director shall be re-eligible. 4. The company in a general meeting may increase or diminish the number of directors. 5. Any casual vacancy occurring in the board of directors may be filled by the directors; but any person so chosen shall retain his office so long only as the vacating director would have retained the same if no vacancy occurred. The company, in general meeting, may remove any director, and appoint another in his stead. 6. The directors may meet together for the dispatch of business, adjourn, and otherwise regulate their meetings as they think fit, and determine the quorum necessary for the transaction of business. 7. Questions arising are determined by a majority of votes, the chairman having a casting vote in case of equality. 8. A director may at any time summon a meeting of directors. 9. The directors elect their own chairman, and determine the period of his office. In case no chairman has been appointed, or he is absent, the directors shall appoint one of their number to preside for that time only. 10. Directors may delegate their powers to committees of such number as they may judge expedient. 11. The directors must cause minutes to be made in books provided for the purpose. These minutes shall set forth all appointments of officers made by the directors, the names of the directors present at each meeting of directors or of committee, all orders made by meetings or committees, and all resolutions and other proceedings of these bodies. These minutes shall be signed by the chairman, and shall be receivable in evidence of what took place without any further proof. 12. The directors, with the sanction of the company in a general meeting, may declare that a dividend shall be paid to the shareholders in proportion to their shares. No dividend shall be payable except out of the profits arising from the business of the company. 13. If the directors shall declare any dividend when the company is known by them to be insolvent, or any dividend the payment of which would, to their knowledge, render it insolvent, they shall be jointly and severally liable for the debts of the company then existing, and for all that shall be thereafter contracted, so long as they shall respectively remain in office.

It is provided that the amount for which they shall be so liable shall not exceed the amount of the dividend declared, and that if any of the directors were absent at the time of making the dividend, or protested in writing, they shall be exempted from liability. Before recommending a dividend, the directors may set aside a reserved fund out of the profits of the company. In companies incorporated for carrying on undertakings of a public nature, such as railways, the appointment, rotation, and powers of directors, are regulated by the statute commonly called 'The Companies' Clauses Act,' 8 Vict. c. 16 (for Scotland, c. 17). Two directors are sufficient to sign a contract. The directors have the management and superintendence of the affairs of the company, and may lawfully exercise all the powers of the company, except such matters as are specially directed to be transacted by a general meeting of the company. See **LIABILITY (LIMITED) ACTS**, **JOINT-STOCK COMPANIES**.

DIRE'CTORY. On the death of Robespierre, in 1794, a reaction commenced in the Convention itself, as well as throughout all France, against the sanguinary excesses of the Terrorists. Ultimately a new constitution—that of the year 3 (1795)—gave birth to a new government, composed of a legislative body divided into two councils—the Council of Five Hundred, whose function was to propose laws; and the Council of the Ancients, whose function was to pass them. The actual executive power was intrusted to five members chosen from both sections, and who sat at the Luxembourg. Their names were L^epeaux, Letourneur, Rewbel, Barras, and Carnot. These five constituted the famous *Directory*. They assumed authority in a moment of immense peril. France was envired with gigantic adversaries, while distrust, discontent, and the malice of rival factions made her internal administration almost hopeless. The frantic heroism of her soldiers saved her from spoliation by the foreigner; and had all the members of the Directory been patriotic and honest, she might have been saved also from spoliation by her own children. But, on the

contrary, the home-policy of the Directory was deplorable. The demoralization which had begun to characterize officials even in Danton's time, now seized almost every class. Barras, a representative of all the turpitude of the hour, set the example. The majority of the two Councils were equally corrupt; and although there were some both in the Councils and Directory whose virtues and talents were unimpeachable, yet they were too weak to counteract the knavery of their associates. It soon became clear that France could not be reconstituted by the fag-ends of the Revolution. The power and skill requisite for such a herculean work must be sought for elsewhere, among men who had received a nobler discipline than could be obtained in the political squabbles of the metropolis. Such was the thought of the Abbé Sièyes. He turned his eyes to the army, where a host of new and brilliant names had appeared—Hoche, Joubert, Brune, Kleber, Desaix, Massena, Moreau, Bernadotte, Augereau, Bonaparte.

Sièyes propounded his plan for the overthrow of the Directory, and the establishment of a consulate, that should be, in reality, a monarchy under republican forms, first of all to Moreau, who was frightened by its audacity; then to Bernadotte, whose excessive caution hindered him from approving of it; then to Augereau, who could not understand it; and finally to Bonaparte, on his return from Egypt. The last admired the project; a conspiracy was rapidly formed; all those functionaries who had been promised places by the Directory, but had not received them, offered their aid; and by the *coup d'état* of the 18th Brumaire (q. v.), an end was put to a government of weakness, immorality, and intrigue. It was succeeded by the Consulate (q. v.).

DIRECTORY FOR THE PUBLIC WORSHIP OF GOD, a code of regulations concerning the different parts of public worship, drawn up by the Westminster Assembly in 1644, ratified by the English parliament in the same year, and adopted by the General Assembly of the Church of Scotland and by the Scottish parliament in 1645. It was on express order from both Houses of the English parliament, that the Westminster Assembly addressed itself to the work of preparing this Directory, to supply the place of the Book of Common Prayer, which had been abolished. In Scotland, it was hailed as conducive to 'a happy unity and uniformity in religion among the kirks of Christ in these three kingdoms, united under one sovereign,' and to 'the corroboration of peace and love between the kingdoms.' Many of the regulations of the Directory are still complied with in all branches of the Presbyterian Church in Scotland, but in many things it has been generally departed from; and a disposition prevails in almost all quarters to allow greater freedom and variety in the forms and unessential circumstances of worship; whilst many esteem a departure from the requirement of unnecessary *uniformity* in these things, as tending not a little towards the healing as well as the prevention of divisions, and the establishment of a real *unity*, and even as more consistent with the first principles of Presbyterianism.

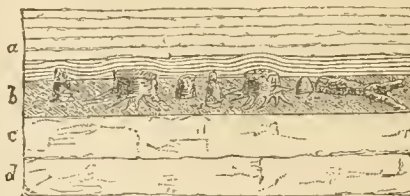
DIRECTRIX is a right line perpendicular to the axis of a conic section, in reference to which its nature may be defined. Assuming the indefinite line AB in the figure as the directrix, and F a point without it as a focus, then, if the line FD revolve about F as a center, while a point D moves in it in such a manner that its distance from F shall always be to CD, its perpendicular distance from the line AB, in a constant ratio, then the curve VD, described by the point D, is a conic section, and is an ellipse, a parabola, or an hyperbola, according as FD is less than, equal to, or greater than CD, or FV than VA. The constant ratio referred to is called the determining ratio of the conic.

DIRK is a short dagger which at various times and in various countries has been much used as a weapon of offence. In the royal navy, at the present day, it is worn by officers rather for ornament than for use, belted and buckled to the left side.

DIRK-HARTOG ISLAND, measuring 45 miles by 10, lies off the west coast of Australia, in lat. 26° S., and long. 113° E. Along with two smaller islands to the north, all the three having their lengths parallel with the mainland, it forms the breast-work of Shark's Bay, one of the most commodious inlets on that coast.

DIRT-BEDS, the quarrymen's name, introduced into geology, of several layers which occur in the Lower Purbeck Beds (q. v.), having the appearance of black dirt. They rest on the fresh-water beds of the Lower Purbeck, and consist of one principal layer, from 12 to 18 inches thick, and from two to four thinner layers. The substance is, to a large extent, a dark-brown or blackish earthy lignite, being the remains of an ancient vegetable soil. Through it are dispersed, in considerable abundance, rounded fragments of stone from three to nine inches in diameter. Fossil Cycads and Zamias are the predominant vegetable remains; they

occupy their original upright position, having become fossil on the spots where they grew. The stumps stand erect for a height of from one to three, or even more feet, and at distances from each other similar to what may be observed in a recent forest. Besides these, the dirt-bed contains the silicified stems of coniferous trees, laid prostrate in fragments three or four feet in length. From



Dirt-bed, Isle of Portland:

a, fresh-water calcareous slate; b, dirt-bed with stools of trees; c, lowest fresh-water beds of the lower Purbeck; d, Portland stone, marine.

the accompanying diagram, it will be seen that the marine oolitic limestone, called Portland stone, was overspread with fluviatile mud, which became the soil on which a forest of Cycads and Zamias grew, and that this was afterwards submerged without any violent agitation, since the layer of black earth has not been abraded, and then was covered with standing fresh water, from which the beds of calcareous mud, now converted into slate, were deposited.

DISABILITY, LEGAL, is either absolute, which wholly disables the person from doing any legal act—e. g., outlawry, excommunication, attainder, alienage—or partial, such as infancy, coverture, lunacy, drunkenness, and the like. It may arise from the act of God, of the law, of the individual himself, or of his ancestor, or the person from whom he inherits.

DISBANDING, in Military Matters, is the breaking up of a regiment or corps. When peace is proclaimed after a war, and a reduction of the army becomes necessary, this is effected by disbanding or disembodiment; the men are discharged, and the officers are mostly placed on half-pay.

DISBAR, the degradation from the rank of barrister-at-law. This power is in England reposed in the benchers of the four Inns of Court. As the courts of law require that every barrister, before he is allowed to practice, must have been admitted to that office by one of the Inns of Court, so they will refuse to hear any one who has been deprived of his rank by the same authority. The power has rarely been exercised, and only when the conduct of the offending party has been grossly irregular. There can be no doubt that the high position held by the bar has been in great measure sustained by the code of honor administered by the Societies of the Inns of Court—a code by which those who are by nature devoid of the feelings of gentlemen are obliged, outwardly at least, to recognize and to observe the demeanor of gentlemen. For some time this wholesome censorship had been exercised with less vigilance than formerly, but a case of disbarment occurred in 1862, and another in 1874.

In Scotland, the power to disbar rests in the Faculty of Advocates (see **ADVOCATES**).

DISC, in Botany, a part intervening in some flowers between the stamens and the pistil. It seems in most cases to represent an inner whorl of stamens variously modified. It is often a mere ring; sometimes it exhibits a whorl of scales or of rudimentary stamens, or even of petal-like appendages; sometimes it rises into a sort of cup around the pistil; sometimes, as in the rose, it assumes the form of a waxy lining of the tube of the calyx. It is often glandular, and secretes a honey-like fluid. It is one of the parts included under the vague comprehensive term *nectary* by the older botanists.

DISC AND DISCO'BOLUS. See **QUOIT**.

DISCHARGE, from the Military Service, is by right at the expiration of the period for which attested; or earlier, by indulgence. In the latter case, the grant may be gratuitous, as on reduction of numbers, or when the man is not worth retaining, or paid for by the man discharged. In the last case, the soldier pays a sum of money computed with reference to the unexpired period of service. If a soldier has many years still to serve, the discharge purchase may amount to as much as £20. In the sappers and miners, where the men are all artisans, it may amount to £35; and among this corps such discharges are very frequent, on account of the value placed on the services of these intelligent men by private employers. Soldiers are, under the act of 1870, frequently discharged from service in the regular forces, after three or six years therein, on condition of serving the remainder of their original term in the Reserve. Earl Grey, when Colonial Secretary,

introduced the plan of enabling discharged soldiers to settle on a piece of land in the colonies instead of returning home.

Soldiers are occasionally 'discharged with ignominy,' for some offense that brings dishonor on the corps. In such case, the regiment is assembled, the crime recapitulated, and the sentence read. The buttons, facings, chevrons, medals, and all decorations, are cut from the man's uniform, and he is 'drummed out' of the regiment, if a foot-soldier, or by sound of trumpet, if it be a cavalry regiment. Notice of his degradation is afterwards sent in writing from the War-office to his parents or relations.

DISCHARGING, in the Royal Navy, is the process of placing a ship 'out of commission.' A regiment of soldiers is permanently in pay, whether engaged in active service or not; but the crew of a ship are paid wages only so long as their names are on the books of a ship 'in commission.' Naval officers, too, are on full pay only so long as they belong to a particular ship in commission.

DISCIPLINE, FIRST BOOK OF, or OF POLICY, in Scottish Ecclesiastical History, an important document, drawn up by John Knox and four other ministers, in 1560. Along with the Confession of Faith of the same year, it must be held as exhibiting the principles on which the Reformed Church of Scotland was originally founded. It lays down rules for the election of 'pastors or ministers' by the congregation, their examination by 'the ministers and elders,' &c., also for the election of elders and of deacons; it recognizes the office of Superintendent (q. v.) as then established; but it is most largely occupied with things pertaining to ecclesiastical discipline, strictly so called, and the mode of dealing with persons guilty of offences. The First Book of Discipline never received the sanction of an act of parliament, but was subscribed by many of the nobles and barons.

DISCIPLINE, SECOND BOOK OF, or 'Heads and Conclusions of the Policy of the Kirk,' a document of great importance in the ecclesiastical history of Scotland, adopted by the General Assembly in 1578; and, although never ratified by act of parliament, still frequently appealed to as the most perfect and authoritative exhibition of Scottish Presbyterianism. The separations which have taken place from the Established Church in Scotland, have not been on the professed ground of dislike to the constitution exhibited in the Second Book of Discipline, but of anxiety for its perfect maintenance; and this document has recently been adopted as one of the articles of union among Scottish Presbyterian churches in Australia. It was prepared with great care by a committee of the General Assembly, in which Andrew Melville took a leading part; and in a time of much conflict between the court and the church, concerning the power of the civil government, in things ecclesiastical, church government, and Patronage (q. v.). It begins by asserting strongly the powers regarded as essentially inherent in the church, sets forth the distinctions between civil and ecclesiastical government and their mutual relations, and lays down a thoroughly Presbyterian platform of church-government.

DISCIPLINE, in Naval and Military matters, is a general name for the rules laid down for the proper behavior of the persons employed. The Mutiny Act, the Articles of War, and general orders issued by the Admiralty and the War Office, form collectively the code by which the discipline is regulated. See **ARTICLES OF WAR, MUTINY ACT**.

In the army, regimental discipline is chiefly maintained by the adjutant. He sees the regimental orders carried out; superintends the drill and field movements; inspects and tells-off all guards, escorts, and parties; regulates all duty rosters, or rollsters; receives garrison orders; keeps regimental books. The adjutant-general is to the whole army what the adjutant is to a regiment, in reference to discipline. In the navy, the discipline is necessarily very strict.

DISCOBOLI, according to Cuvier, a family of malacopterous



Discoboli (*Liparis Montagu*):
a, sucker, on a larger scale.

fishes, remarkable for having the ventral fins united to form a sucking disc on the under surface of the body. To this family, also called *Cyclopetridæ*, belong the Lump-sucker (*Cyclopterus*

lumpus), the muttonsucker or sea-owl or cock-paddle *snail*, and one or two other British fishes. To this family Cuvier also referred the Remora (q. v.), adverting, however, to the different position of the sucking disc, and other important distinctions, on account of which a very different place in the system is now assigned to it. The use of the sucking disc, however, is much the same—that of attaching the animal to fixed substances, so that it may remain and obtain its food, where otherwise it would be swept away by the current. The adhesive power of the sucker, in the larger specimens of the lumpfish, remains after death.

DISCORD, sounds which have no harmonical relation whatever; differing from Dissonance (q. v.), which in musical language is applied to sounds that are in grammatically correct relation to each other, though not consonant.

DISCOUNT, the difference between a sum of money due at a future period and its present value; or the deduction made from the amount of a debt that is paid before it is due. It is usually ascertained—in the case of bills of exchange, promissory-notes, and the like—by subtracting from the principal amount its interest, calculated from the date of payment until the date when the amount is due; but this, although sanctioned by usage, leads to an excess of charge, the interest being thus advanced to the lender before it has actually accrued. True discount is computed as follows: Suppose that £100 is advanced for one year at, say 5 percent., the sum repayable at the end of the year in respect of this advanced will be £105; therefore, £100 is the present value of £105 due a year hence; and from this conclusion it is easily deduced by proportion, that the value of £100 due a year hence is £95, 4s. 9½d. Hence the true discount on £100 due in a year at 5 per cent., is £4, 15s. 2½d. The usual formulas—are for the present

value, $\frac{100A}{100 + nr}$; for the discount, $\frac{Anr}{100 + nr}$; where 'A' is the principal sum due; 'n' the time, in years or fractions of a year; and 'r' the rate per cent., *simple interest being assumed*. For example, let it be required to find the discount on £97, 7s. 6d., due seven months hence, at 4½ per cent. Here $A = £97, 7s. 6d. = 97.375$, $n = \frac{7}{12}$, $r = 4\frac{1}{2}$; $nr = \frac{7}{12} \times \frac{9}{2} = \frac{63}{8} = 7\frac{7}{8}$. $Anr = 97.375 \times 7\frac{7}{8} = 761\frac{1}{8}$. $100 + nr = 100 + 7\frac{7}{8} = 107\frac{7}{8} = \frac{863}{8}$.

Hence the discount is $\frac{97.375 \times \frac{63}{8}}{\frac{863}{8}} = \frac{97.375 \times 63}{863} = \frac{204.4875}{863} = 2.491 = £2, 9s. 10d.$

But it is easier first to determine the present value, and hence, by subtraction from the amount due, the discount.

An extension of the above formulas is necessary in computations connected with leases, reversions, &c., to be valued on the stricter principle of compound interest, for which, see **INTEREST**.

By discount is likewise understood the depreciation in value of a fixed investment; as when a railway share, on which say £100 has been paid, can be sold for £90 only, the 'discount' being thus 10 per cent.

The allowance made to a trader, under the name of discount, for prepayment of a debt, is usually greater than the current rate of interest, as the creditor receiving the money before it becomes due, secures himself against the insolvency of the debtor.

The rates of discount vary according to the demand for money and the nature of the security. The range in Britain is from 3 to 10 per cent., except in the case of doubtful bills or post-obit bonds, when a much higher rate is exacted. Bills at and under three months' currency are usually charged a per cent. less than those of a long date. In the colonies higher rates are allowed.

DISCOVERY, BILL OF, a bill in Chancery (q. v.) which prays the disclosure by the defendant of some matter pertinent to the cause of the plaintiff. By means of bills of discovery, the equity courts formerly possessed an advantage over the courts of common law in extracting evidence from the parties to a suit, who could not be examined as witnesses in an action at law. But by 14 and 15 Vict. c. 99, 16 and 17 Vict. c. 83, and 17 and 18 Vict. c. 125, parties to an action are competent witnesses, and must give evidence. See the Judicature Act (1875), ord. xxxi.

DISCUSSION, in Scotch Law. By the law of Scotland, all cautioners, unless bound jointly and severally with the principal debtor, were formerly, and cautioners bound prior to the passing of the Mercantile Law Amendment Act (21st July 1856) are still, entitled to insist that the creditor shall call on the principal debtor in the first place; or *discuss* him, as it is technically said. Where the principal debtor fails to satisfy the obligation in full, the creditor was bound to give the cautioner the benefit of such portion of it as he did discharge. Discussion was not merely a demand for payment, but enforcement of it, in so far as the means of the principal debtor admitted of. Cautioners bound subsequently to the date of the Mercantile Law Amendment Act (19 and 20 Vict. c. 60, s. 6), can enjoy the right of discussion only by express stipulation.

DISEASE, according to its literal construction, a state of *disease*, or absence of the condition of health, in which all the faculties and organs of the body and mind work together harmoniously and without sensible disturbance. In a strictly scientific sense, there may be disease without pain or uneasiness in the ordinary meaning of these words, but hardly without functional disturbance or incapacity of some kind. It is, therefore, only necessary to include in the definition of disease the diminution of functional power, whether attended or not by suffering, and the scientific and practical ideas of the word will closely correspond. It must be admitted that slight structural and functional deviations from the state of health are sometimes unnoticed; but only because they are slight, and because the functions to which they extend are not habitually in use to the full extent. A great deal of unnecessary obscurity is found, especially in continental writers, in discussing the abstract idea of disease, which has been connected with all the most intangible subtleties of the most abstruse and metaphysical philosophy, by regarding it as dependent upon the idea of life and of the vital force. Many authorities have thus generalized disease into a separate active principle, opposed to, and everywhere seeking to destroy, the principle of health: and Paracelsus was hardly more open to objection on the ground of absurdity than many others of his countrymen, when, in his picturesque and at the same time mystical manner, he endowed the vital principle with a kind of personality, and spoke of disease as due to the whims and caprices of a displeased and resentful Archæus, an idea which was still further developed by Van Helmont. It is common to treat of disease as being *functional* or *organic*, i. e., evidenced by changes of function or of structure; but function and structure are so closely allied in fact and in nature, that the more this distinction is examined, the more vague and impalpable it becomes, and it can therefore only be kept up as a provisional and conventional arrangement. The classification and arrangement of diseases according to their external characters has been termed *Nosology* (q. v.); while the observation of their more intimate and less superficial relations in connection with their causes and results, is called *Pathology* (q. v.); both of these sciences, of course, being kept in view in the healing art or *Medicine* (q. v.), of the more practical portion of which they form the pillars.

DISEASES OF PLANTS form a subject of study interesting equally in its scientific and its economic or practical relations, but in regard to the most important parts of which much obscurity and uncertainty still exist. Enough, indeed, is known to show that, as might have been expected, an analogy subsists between the kinds of disease to which plants are subject and those of animals, both in their nature and their causes, yet with wide differences, according to the differences between vegetable and animal life. Plants, like animals, are liable to suffer from unsuitable external circumstances, as of temperature (drought, or moisture, &c.); they are liable, like animals, to suffer from deficiency of food, from excess of it, or from being compelled to subsist on improper kinds of it, or too exclusively on some particular kind. They often suffer much from vegetable parasites, chiefly fungi, and from multitudes of minute animals, which without eating them up, destroy organs essential to their health, or prey upon their juices.

The constitutions of plants are accommodated to particular temperatures, and they neither flourish when the temperature is for any considerable time much above or much below certain limits, very different, however, for different species. Light is of the greatest importance to vegetable life, and a want or deficiency of it speedily produces an unhealthy condition, the proper chemical changes not taking place in the juices of the plant; and this unhealthy condition, sometimes very extensively produced in gloomy seasons, when the deficiency of light is accompanied with excess of moisture both in the air and in the soil, renders plants very liable to the attacks both of vegetable parasites and of minute animal tribes.

Excess of nutriment, causing an extreme rapidity of growth, sometimes produces an unhealthy condition in particular parts of plants, in which a greater amount of tissue is developed in a single season than can be thoroughly matured.—Maures, injudiciously and unsuitably applied, are often productive of disease. Putrescent matter coming in contact with the roots of many plants, is very injurious to them, and causes *canker*.—Contagion, as a cause of disease in plants, if not fully demonstrated, is rendered highly probable by such facts as the memorable prevalence of the potato disease, and the rapid spread of the vine disease (*oidium*); nor does the existence of particular fungi in the diseased plants materially affect this probability.

With regard to the diseases of plants generally, little has been hitherto found practicable in the way of cure, and prevention is the object chiefly aimed at in all investigations of their nature and causes.

Some of the most important diseases of plants are noticed under particular heads; and some of the most destructive parasitic fungi are described in their proper places in this work.

DISHONOR OF A BILL. When the drawee, or person on whom a bill is drawn, declines to accept it or pay it, he is said to dishonor it. The act of drawing or of indorsing a bill implies an obligation to pay it in the last instance, and the person in whose favor it is drawn has thus recourse against the drawer and indorsers, should the drawee fail to accept or to pay. In order to preserve this recourse, however, it is indispensable that notice of dishonor shall be given to the drawer and indorsers. No particular form of notice is requisite. The notice must be such as to identify the bill, and to inform the party to whom it is given of the protest, a copy of which ought to accompany it. If the notice is put into the post-office, and properly addressed, it is sufficient; and even verbal notice, if clear, will suffice. In the case of foreign bills, the period within which notice must be given, is regulated by the wages and customs of merchants. Any delay which can fairly be ascribed to neglect or omission, and is not justified by the circumstances of the case, will be fatal to the bill-holder's claim for recourse. In inland bills and notes, the rule in Scotland formerly, was, that fourteen days after the protest was taken should be allowed; but the Mercantile Law Amendment Act of 1856 provides that notice of dishonor of inland bills and promissory-notes shall be given 'in the same manner and within the same time as is required in the case of foreign bills by the law of Scotland.' To both classes of bills, then, the English rule is now applicable, which is, that notice must, in the general case, be sent the next day, where the parties reside in the same place, and by the next post, if they reside at a distance.

DISINFECTANTS are, strictly speaking, agents which can prevent infectious diseases from spreading, by destroying their specific poisons. The term is, however, often applied to all substances which destroy or neutralize bad odors, though not all such have the power of counteracting infection. Many infectious diseases have now been proved, and all are believed, like Putrefaction (q. v.), to be due to special micro-organisms which are found in different parts of the body, and are communicable in different ways in different diseases. (See *GERM THEORY*.) The action of D. is therefore exactly analogous to that of Antiseptics (q. v.), and consists in the destruction of low forms of life. But the two classes do not necessarily correspond, as the same substance may have unequal poisonous effects on different forms. It is of the utmost importance to discover the conditions which are most deadly to each disease-poison, and to apply them, if possible, within as well as without the diseased body. But little has yet been done in this direction.

The chief measures to prevent the spread of infectious disease may be summed up as follows: (1) Complete isolation of the patient during the whole attack from all but necessary attendants; (2) thorough disinfection of his discharges, and of all articles used by him; (3) and of the patient himself, his room, bedding, &c., at the end of the illness.

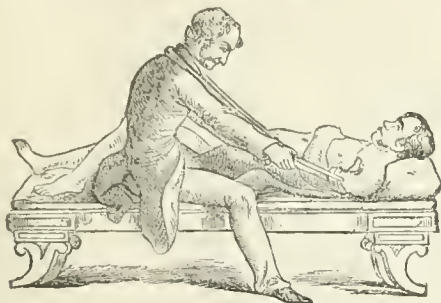
When applicable, heat is the most convenient and satisfactory disinfectant. Infected water and milk are not known to have communicated disease after being boiled. Clothes, bedding, &c., can be rendered harmless by boiling, or by exposure for some hours to air or steam, at a temperature from 212° to 230° F. But these methods cannot, of course, be applied to patients or rooms; here chemical agents are used. (a) Of *gaseous D.*, the most important are sulphurous acid (fumes of burning sulphur); chlorine, obtained by exposing bleaching-powder (chloride of lime) to the air; nitrous acid, by allowing nitric acid to act on copper. These are all deodorants, even when present in small quantity in the air, and may have some slight disinfecting action also; but none of them can act as thorough D., unless evolved in such amount as to render the air irrespirable. (b) Of *liquid D.*, solutions of potassic permanganate (Condy's fluid, see under *MANGANESE*) and of Carbolic Acid (q. v.) are most commonly used in the treatment of disease—also reliable only when of sufficient concentration. Less satisfactory for this purpose, though good deodorants for sewage, are solutions of zinc chloride (Burnett's disinfecting fluid), lead nitrate (Ledoyen's disinfecting fluid), iron perchloride (Ellerman's deodorizing fluid), and others.

The exact mode of action of D. is not known. Whether it is due in some cases to their oxidizing power (chlorine, nitrous acid, Condy's fluid), or reducing action (sulphurous acid), or to some more abstruse action on diseased organisms, is uncertain.

DISLOCATION consists in the displacement of one bone from another with which it forms a joint (*put out of joint* being the popular expression). Dislocations are generally the result of sudden accident, but may be the result of disease, or may be congenital. The displacement may be *partial* or *complete*; and surgeons classify their cases into *simple* dislocations, when the skin remains unbroken, and compound, when there is a wound by which the external air may communicate with the joint. Occasionally, in addition to the dislocation, there are fractures of the bones, or lacerations of important blood-vessels in the neighborhood; it is then termed a complicated dislocation. Dislocation is a rare accident in infancy and old age, because in the former the joint-ends

of the bones are very flexible, and yield to violence; while the aged skeleton is so rigid that the brittle bones fracture under force that would drive younger and firmer ones out of their sockets. Dislocations are most frequent between the ages of thirty and sixty. Persons with weak muscles, and lax, long ligaments, or those in whom the latter have been softened by inflammation of the joint, are pre-disposed to dislocation. The joints most frequently displaced are the shoulder and the elbow.

General symptoms of a dislocation.—After a blow, fall, or violent muscular exertion, a limb is found to be immovable at the injured joint, there is great pain, and the shape of the part is changed; but soon swelling ensues, and every distinctive mark about it is



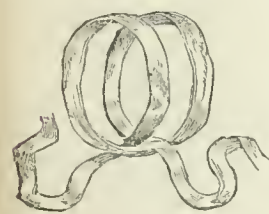
Reduction of Dislocation of Shoulder-joint.

obscured. If left alone, or merely treated as an inflamed joint, the swelling gradually subsides; but the immobility continues, the limb is crippled for months or years, when at last nature forms a new socket for the end of the bone, and some amount of useful motion is restored. The proper shape of the part is never restored, but remains an eyesore to the patient, and a disgrace to the surgeon.

The general treatment of dislocations consists in their reduction, or pulling the displaced bone back into its place. Its return is opposed by the muscles attached to it, which are stimulated to contraction by the pain of the operation, which requires, of course, a good deal of force to be employed. It is desirable to remove this spasm of the muscles, which is the great obstacle to the reduction of a dislocation; and in former days, bleeding from the arm, emetics, the warm bath, &c., were generally made use of; now-a-days, chloroform or ether attains the same end, and renders the treatment of dislocations much more simple and humane than before the introduction of anesthetics.

When the surgeon is about to reduce a dislocation requiring any degree of force, he fastens the part of the limb above the displaced bone or the trunk, so as to afford him counter-extension; he then

pulls on the limb either with his hands, or with a bandage or handkerchief attached to it. The best way of fastening this is to roll a bandage, wetted to prevent slipping, round the limb, and then taking the thing with which he wishes to extend in both hands, he casts it into two loops, forming what is called a *clove-hitch*, and then slips the double noose up the limb till it rests on the wet bandage previously applied. In old-standing cases, the hands grow



Clove-hitch.

weary before the extension has been kept up sufficiently long, so it is well to adapt pulleys to draw upon the clove-hitch, as with them the traction can be regulated as the surgeon desires. Sudden, forcible pulling is useless and hurtful, the object being merely to tire out the muscles which resist the attempts at reduction; when they are exhausted, the bone will generally slip back into its place with an audible snap.

A class of shrewd individuals, called '*bone-setters*,' frequently derive profit from some conditions of joints which resemble dislocations. Chronic rheumatic inflammation is occasionally known to fix itself by an accident on some particular joint, especially the shoulder or hip, and may so change the surfaces of the bone-ends that they are spontaneously dislocated; the empiric, naturally antagonistic to the regular practitioner, tells the patient that when he met with the accident the dislocation occurred, but that his doctor overlooked it. Again, many persons who have injured their joints do not submit to having them moved about, after the first inflammation has subsided. The bone-setter gives a forcible bend to the limb, which breaks up the adhesions; and because he has done roughly what the doctor would have done equally well gently, the patient praises him, while he blames the one who guided his joint in safety through the first effects of the accident.

Whenever a dislocation occurs, the nearest medical man should be summoned, even should the mere displacement be rectified at once, because no such accident can occur without some tearing of

the soft parts, and it will depend on the after-treatment whether the joint will ever become useful again or not. It must also be remembered, that the sooner a dislocation is reduced, the easier is the reduction. Since the introduction of anesthesia, however, and the subcutaneous division of tissues, many ancient cases may be improved, and many crippled limbs restored to usefulness.

DISLOCATION, or FAULT, a term used in Geology to characterize certain displacements common among stratified rocks. The agency that raised these rocks above the waters of the sea, produced in the elevation numerous rents. In their simplest form, the rents are mere cracks, the parts, though separated, remaining contiguous; sometimes a greater or less fissure intervenes between the disunited portions, and this is filled with materials pressed in from above, or with igneous rocks intruded from below.

The beds, however, are not always found at the same level—a displacement as well as a severance often takes place, so that the beds on one side of the fissure or crack are many feet, or many hundreds of feet, above or below the beds on the other side with which they were once continuous. One of the best known faults is that called the 'Ninety Fathom Dike' in the Newcastle coal-field. The same beds are 90 fathoms lower on the northern than

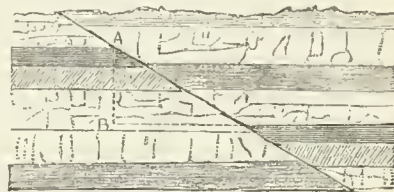


Diagram of Dislocated Strata.

they are on the southern side. The fissure varies in width from a few feet in some places to more than 20 yards in others: it is filled with sand-stone. In the Edinburgh coal-field, the greatest fault is the one known as the 'Sheriffhall Slip.' It has produced a dislocation of the strata to the extent of 400 or 500 feet, so that the coal which is worked on the south side of the slip, near the surface, is on the north side 500 feet below it. Mr. Milne Home enumerates 120 faults in the Mid-Lothian and East-Lothian coal-fields. He has himself examined 78 of these, and has found that 35 dip to the south, and 43 to the north; and that while the sum of the down-throws by the faults dipping to the south is 385 fathoms, those dipping to the north have depressed the strata 754 fathoms.

Faults in coal-fields are well known, because of their serious interference with the progress of the miner. But though they often cause considerable labor and expense in searching for the continuation of a valuable seam of coal, they often cause disadvantages, since they disclose on the surface the value of the buried minerals, and when filled with solid materials, they form embankments which confine water, and thus save considerable expense in draining the mine.

The amount of dislocation is the measure of a line drawn from one part of the bed, at right angles to its plane, to a line produced from the other separated part of the bed representing its plane. Thus, in the diagram, AB shows the extent of the down-throw, say 10 feet. Although no notion can be formed, in meeting with a fault, of the extent of dislocation, yet the direction in which the lost strata are to be sought can be certainly determined, for it has been found to be an invariable law, that the strata are lowest on the overlapping side of the slip, so that in the diagram the beds a, b, c, are 10 feet deeper in the overlying side than the same beds on the other. Faults have local names from the miners, all of which have been used by geologists. They are called hitches, dikes, troubles, slips, slides, heaves, and throws.

DI'SMAL SWAMP, measuring 40 miles from north to south by 25 in breadth, lies chiefly in Virginia, but partly in North Carolina. In the center is Lake Drummond, covering about six square miles. Elsewhere the surface is divided between tangled reeds and heavy timber, with a thick undergrowth. This extensive morass has been, at a vast cost, traversed by canals, and two lines of railway pass through the outskirts of the Virginian part of the swamp.

DISMA'NTLE is the operation which a ship undergoes when to be laid up in ordiuary, or placed out of service. She is unrigged; the yards and most of the ropes are removed; and the upper masts taken down.

DI'SMAS, St., the name which Catholic tradition has attached to the 'good thief.' He is represented with a cross beside him.

DISORDERLY HOUSE. For this, see **NUISANCE**.

DISPA'RT, in Gunnery, is a mark set upon the muzzle of a gun, to aid the gunner in obtaining a line of sight truly parallel

with the axis of the bore. The dispart, in strictness, is not the mark itself, but a distance or quantity denoted by the mark; and 'to dispart' a gun is to determine this distance. It depends mainly on the relation between the diameter of the breech and that of the muzzle.

DISPENSATION, a license granted by the pope for that which is ordinarily prohibited. The nature and limits of the dispensing power have been the subject of much discussion not only in controversy with Protestants, but among Roman Catholics themselves. It is held by the extreme advocates of papal power, that the pope may dispense in any divine law, except the articles of faith; by others, that his dispensing power does not extend to express precepts of the New Testament; some say that his dispensation is valid only when it proceeds upon just cause; some, that it is not properly a relaxation of the law's obligation, but merely a declaration that in the particular case the law is not applicable. The usage of the Church of Rome, however, agrees with the opinions of her theologians in making the pope supreme in releasing from oaths and vows; and a decree of the Council of Trent anathematizes all who deny the power of the church to grant dispensations for marriages within the prohibited degrees of the Mosaic law; whilst the multiplied prohibited degrees of the canon law give much occasion for the more frequent exercise of the same power.—Nothing really of the nature of a dispensation is known in any Protestant church. The only kind of dispensations now in use in England, are those granted by a bishop to a clergyman, to enable him to hold more benefices than one, or to absent himself from his parish. Formerly, the pope's dispensations in England, as elsewhere, prevailed against the law of the land, not in ecclesiastical matters only, but in all that large department of civil affairs which, by an interested fiction, was brought within the scope of ecclesiastical government. This abuse was swept away at the Reformation, by 25 Henry VIII. c. 21. The power of the pope was then conferred on the Archbishop of Canterbury, in so far as it was not contrary to the law of God. The granting of special licenses of marriage, and the like, is the only form in which it is ever exercised.

In former times, the crown claimed a dispensing power in civil, similar to that which belonged to the pope in ecclesiastical matters. The power was grossly abused by James II., and was consequently expressly abolished by the Bill of Rights. The privilege of granting pardons in capital cases is the only form in which the dispensing power of the crown still exists.

DISPERSION. Ordinary white light is heterogeneous in its character, being composed of rays of different refrangibility, and the term dispersion is used in optics to denote the separation of these rays by refraction. Transparent media of various kinds possess different dispersive powers, or, in other words, different powers of widening the angle between the red and violet rays, when a ray of white light suffers refraction through a prism of given angle at a given angle of incidence. The circumstance called the 'irrationality of dispersion,' consists in the fact, that when a spectrum is measured after Fraunhofer's manner, it is found that the distance between any of the same two fixed lines of the spectrum has not a constant ratio to the distance between the extreme fixed lines, where different media are used. See **SPECTRUM**. It may be noticed that the word dispersion is also sometimes used to denote in Optics irregular reflection or the scattering of light on imperfectly polished surfaces. See **CATOPTICS**. The amount of light not reflected according to the regular law varies with the nature of the reflecting surface. In the case of light incident at right angles upon a surface of common glass, $\frac{1}{3}$ only is properly reflected. In perpendicular reflection at an ordinary silvered looking-glass, about $\frac{1}{2}$ is lost by this sort of dispersion. A little less than $\frac{1}{2}$ is lost in perpendicular reflection from highly polished speculum metal.

DISPLAY'ED, in heraldic usage, means *expanded*; as an eagle displayed, or what is vulgarly known as a spread eagle. See **EAGLE**.

DISPOSITION, in Art, differs from *composition*, inasmuch as the former has reference to the arrangement of the parts, the latter to the effect of the whole.

DISPOSITION, in Music, a term now used in organ-building, adopted from the German, meaning the arrangement and combination of the stops on the different rows of keys and pedals, with the pitch of each stop, or length of the lowest CC pipe.

DISPOSITION, in the Law of Scotland, is a deed of conveyance, applicable either to heritable or movable property, but most frequently used for the purpose of transferring the former from the seller to the buyer. There is another well-known form of the deed, the object of which is to settle a whole succession, both heritable and movable, a will or testament, in Scotland, being used mostly for movable property. This latter deed is commonly known as a disposition and settlement. The following are the clauses usually contained in a disposition for the purpose of conveying heritable property: 1. The *narrative* or *inductive* clause, in which the names

of the disponent and disponent are set forth, the cause of granting the deed is stated, and the receipt of the price or consideration is acknowledged, if the conveyance has been for an onerous cause. 2. The *dispositive* clause, in which the maker of the deed 'sells and disposes,' or 'gives, grants, and disposes,' if there has been no price paid or consideration given. 3. A clause obliging the disponent to infeft. See **INFECTMENT**. 4. A procuratory of Resignation. 5. A clause of Warrandice (q. v.). 6. An *assignment* to the title-deeds and rents of the subject. 7. An obligation to free the disponent from public burdens due before his term of entry. 8. A clause to the effect that the title-deeds have been delivered to the disponent. 9. A clause of registration. 10. A precept of Sasine (q. v.). And lastly, a Testing Clause (q. v.). Though it is still optional to make use of these clauses, they have been greatly shortened, and in some instances dispensed with by recent acts, which are consolidated by the Titles to Land (Scotland) Act (1868), 31 and 32 Vict. c. 101 and 32 and 33 Vict. c. 116.

A disposition for the conveyance of movables is a much simpler document. It often bears reference to an inventory containing a more particular enumeration of the effects conveyed. It grants power to the disponent to take possession of the subjects, and it also contains clauses of warrandice and registration, and a testing clause. The disposition and settlement, again, varies in form according to the nature of the property conveyed, and the arrangements which are made with reference to it. Sometimes it is a direct conveyance; in other cases it conveys the property to trustees, to be held and administered by them for the benefit of other parties. In this latter case, it is known by the name of a trust-disposition and settlement. When contingencies which cannot be foreseen with certainty are anticipated, where the management is complicated by details, or where the operations under the deed are likely to be protracted, the appointment of trustees (see **TRUST**) is usually resorted to. In either case, the grantor's life-interest in the property is reserved in express terms, and there is also a clause dispensing with delivery. The word 'dispose' used to be considered a vital word in all these deeds, but is now no longer essential, though it is still current. A disposition in security, which corresponds to the English mortgage, will be explained under **HERITABLE SECURITIES**.

DISRAELI, ISAAC, D.C.L., a well-known English author, was the descendant of a Hebrew family which flourished first in Spain, and afterwards in Italy. His father, Benjamin D'Israeli, came to England in 1748, entered into business in London, amassed a fortune while yet in middle life, and retiring to Enfield, there died in 1817, aged 90. His son Isaac, born at Enfield in 1766, was educated at Amsterdam and Leyden. He commenced his career as a poet and novelist; but, after the publication of the first volume of his *Curiosities of Literature* (1791), he discovered that his forte lay not in creative literature, but in the illustration of history and literary character, and to this he devoted himself. His style is elegant and pleasing, presenting the fruits of antiquarian research and study without their dryness and general want of connection. No writer is more instructively amusing or amusingly instructive than he. Lord Byron speaks of him as 'that most entertaining and searching writer.' D. died in 1848.

D.'s principal works are the *Curiosities of Literature* (1791—1823; new edition, with Life, Lond. 1851); *A Dissertation on Anecdotes* (1793); *Essay on the Manners and Genius of the Literary Character* (1795, 14th ed., 1850); *Inquiry into the Literary and Political Character of King James I.* (1816); *Commentaries on the Life and Reign of Charles I.* (1828—1831); *Eliot, Hampden, and Pym* (1832); *Amenities of Literature* (1841)—for which he received from Oxford the honor of D.C.L.

DISRAELI, BENJAMIN, EARL OF BEACONSFIELD, author and statesman, eldest son of the preceding, was born in London. The date of his birth has been variously given in 1804 and 1805; the 21st Dec. 1804, was that placed on his coffin. D. received a careful but private education; entered the Church of England by baptism in 1817; and was articled to a solicitor in 1821, in order to qualify him for a government office. He was admitted a student at Lincoln's Inn in 1824, and kept nine terms, but had his name removed from the books in 1831. Abandoning the study of law, he manifested an ambition to shine in political and fashionable life. In 1826, he published his novel *Vivian Grey*, which was succeeded at intervals by other brilliant works of fiction, including *The Young Duke*, *Contarini Fleming*, *The Wondrous Tale of Alroy*, and *Henrietta Temple*. He also wrote *The Rise of Iskander*, *A Vindication of the British Constitution*, and *The Revolutionary Epic*. After visiting Italy, Greece, Turkey, and Syria, he returned to England, to find the country involved in the Reform Bill agitation. His sympathies appear now to have inclined to Radicalism in politics; and having obtained recommendations from Mr. Hume and Mr. O'Connell, he presented himself in 1832 to the electors of Wyeombe, but was defeated. At the general election in 1835, he met with no better success. In April in the same year, he contested Taunton on Conservative principles, but again without suc-

cess. In 1837, his desire for a political career being unabated, he contested Maidstone in the Conservative interest along with Mr. Wyndham Lewis. He was elected, and at the age of 32 took his seat in the House of Commons. His maiden speech, which was in a high-flown style, and delivered with extravagant gestures, excited the laughter of the House of Commons. He was so much disconcerted, that he stopped short abruptly, but not without uttering the remarkable prophecy: 'I shall sit down now, but the time will come when you will hear me.' In 1838, Mr. W. Lewis died, and in the following year D. married the widow of his late colleague. He then carefully studied the style of successful parliamentary orators, making few speeches. It was not till 1849 that he began to attract notice, and not long afterwards he gained the ear of the House as the leader of the Young England party. After entering parliament, D. wrote several novels—*Contingency* (1844), *Sybil* (1845), and *Tancred* (1847), in which the principles of Young England are most ingeniously blended with theories about the intellectual supremacy of the Jews, inaccurate scientific notions, and misconceptions of English social life. At the general election in 1841, he obtained a seat for Shrewsbury. He then became the organ of the dissatisfaction with which the landed aristocracy and country gentry regarded Sir Robert Peel's relaxations of the system of protection to native industry. His brilliant invective and polished sarcasm inspired the Protectionist party with fallacious hope and confidence.

On the death of Lord George Bentinck in 1848, D. succeeded to the leadership of the Protectionist party in the Commons. He bore generous testimony to the political consistency and private worth of his predecessor in his *Lord George Bentinck, a Biography*. In 1852, the Earl of Derby, having undertaken the construction of a cabinet, offered him the post of Chancellor of the Exchequer. It was the first time a brilliant novelist had ever figured as the finance minister of a great commercial state, and it argues well for the versatility of his genius that he emerged with honor and credit from the ordeal. His second budget, in 1853, failed, however, to find acceptance with the House of Commons, and the government being outvoted upon it, the Derby cabinet ceased to exist. D. resumed the leadership of the opposition, from which he was again summoned in 1858, to fill the post of Chancellor of the Exchequer in the second administration of Lord Derby. In 1859, he introduced a measure of parliamentary reform, which, being thrown out, was followed by the resignation of the government. For seven years the Liberals remained in power, and Mr. Disraeli, in opposition, displayed talents as a debater, and a spirit and persistency under defeat, which won for him the admiration of his opponents. When Lord Derby returned to power in July 1866, D. again returned to the post of Chancellor of the Exchequer. It was he chiefly who induced the Conservative party to pass the Reform Bill of 1867, his argument being, that the working-class householders are more Conservative than those to whom the franchise had been previously extended. In February 1868, D. succeeded Lord Derby as premier, but, in the face of a hostile majority, he resigned in the following December. On this occasion, Mrs. Disraeli, in acknowledgment of her husband's services, was raised to the peerage as Viscountess Beaconsfield (died 1872), D. then declining the honor in his own case. In 1870, D. published another novel, *Lothair*, marked by most of the merits and defects of those which preceded it. In 1873 the popularity of Mr. Gladstone subsided, and the election of 1874 giving the Conservatives a large majority, D. returned to power as prime-minister. In 1877, D. took his seat in the Upper House as Earl of Beaconsfield. Still premier, the earl was the guiding spirit of his cabinet during the critical years 1877-78, seeking by energetic action in Eastern affairs to give an 'imperial' character to English policy; and he returned from the congress of Berlin bringing, as he said 'peace with honor.' He was shortly thereafter decorated with the Garter. After a keen contest, in which the Liberal leaders, headed by Mr. Gladstone, vigorously denounced government measures, especially in regard to the affairs of Eastern Europe, Afghanistan, and South Africa, the general election returned a large Liberal majority; and the government resigned ere parliament assembled. The ex-premier, who held several honorary degrees as D.C.L. and LL.D., employed his leisure in publishing his last novel, *Endymion*, the hero of which is a successful English politician. The Earl of Beaconsfield took his share in public affairs as a member of the Upper House till he fell ill in the spring of 1881; on 19th April 1881 he died. The terms of his will alone precluded the honor of a public funeral and burial in Westminster Abbey, proposed by the government.—See Hitchman, *The Public Life of Beaconsfield*, by Brandes (transl. 1880); the (hostile) *Life* by O'Connor (1878); *Selected Speeches*, edited by Kebbel (1882).

DISRUPTION, the name generally given in Scotland to the famous act of 1843, by which upwards of 400 ministers of the Church of Scotland (nearly two-fifths of the whole) left their churches and manse to vindicate principles which they conceived

to be essential to the purity of that church, and in harmony with its earlier history. The word Disruption was probably chosen to indicate that these ministers did not look on their act as a *secession* or *dissent* from the Church of Scotland, but as a *split* or *division* within it, and the body formed by them assumed the name of the Free Church of Scotland. See **FREE CHURCH**.

DISS, a market-town of the county of Norfolk, 19 miles south-south-west of Norwich. There are brush manufactories and breweries. Pop. (1881) 3855.

DISSECTION. See **ANATOMY**, in Law.

DISSECTION WOUNDS. The practical study of anatomy is attended with certain dangers, which, however, during the last quarter of a century have been much lessened. The atmosphere of the dissecting-room, now comparatively pure by the application of proper ventilation and other sanitary measures, was, less than a generation ago, too commonly loaded with noxious emanations, which more or less poisoned the blood of those who continuously inhaled it, and consequently produced nausea, sickness, diarrhœa, a bad taste in the mouth, and other symptoms. Dissection wounds, which are always attended with a certain amount of risk, were rendered more dangerous by the low state of the system, induced by the depressing influence of the surrounding air. Now, probably in consequence partly of the purer air, and partly of the general and extensive use of antiseptic injections into the vessels of the subjects to be dissected, it rarely happens that severe symptoms follow a cut or puncture; it being an established rule, that every puncture should be carefully sucked as soon as it is observed, and then freely touched with nitrate of silver. When, however, the poison has been absorbed, and is going to act, the patient begins to have a feeling of general illness in less than 24 hours. He is low-spirited, faint, and chilly, and often complains of nausea. Then come rigors, intense headache, rapid and sharp (but weak) pulse, a coated tongue, vomiting (sometimes) and great restlessness.

The general symptoms increase in severity, the breathing becoming difficult, the pulse very rapid and weaker, the tongue dry, brown and often tremulous when protruded, and the skin more or less yellow. The case may terminate fatally at or before this stage; or abscesses may continue to form, from which the patient may more slowly sink; or if he survive, the arm may remain stiff and useless, or some of the fingers may be destroyed by gangrene. The treatment, both general and local, is similar to that of Pyæmia (q. v.); and see **POISONS**.

As a precautionary measure in post-mortem examinations, the surgeon, especially if he be out of health, or if the patient have died from a disease of an erysipelatous character, should thoroughly anoint his hands with lard. Very thin india-rubber gloves have been recommended as a safeguard to dissectors; but they have not been found to answer; probably from the constraint to which they subject the action of the fingers.

DISSENTERS, the common appellation of those who dissent or differ from the established church of their country in any of its doctrines, or in any part of its constitution, and therefore separate themselves from it. Although sometimes employed as a sufficiently appropriate designation of the sects which separated themselves from the general body of the church during the early and middle ages, the term dissenters belongs to modern times and Protestant countries; the claims of the Roman Catholic Church, where dominant, having always been asserted in a manner incompatible with the existence of recognized religious dissent. The measure in which the rights of dissenters are conceded by law, may be esteemed a fair test of the religious liberty enjoyed in a country, and of the general enlightenment of a people. The term dissenters is of English origin and growth, although its almost exact equivalent may be said to have existed in Poland in the name *Dissidents*, used in 1573 to denote the Polish Protestants, in contradistinction to the members of the established Catholic religion. After 1632, the term Dissidents was applied in Poland to Lutherans, Greeks, Armenians, &c.

In England, the term dissenters appears to have come into use in the 17th c., as synonymous with *Nonconformists*; and from England its use was transferred to Scotland in the 18th c., after the Secession (q. v.) Church had been founded in that country. It is usually applied to those who agree with the established church in the most essential doctrines, but differ from it on some minor point, or on questions of church-government, relation to the state, rites, &c.; as in England to Presbyterians, Independents, and Baptists. The claim of the Church of Rome to be regarded as the *Catholic Church* prevents its members from accepting the name dissenters, and others seldom seek to apply it to them. On somewhat similar grounds, it is rejected by *Episcopalians* in Scotland; and for very different reasons, elsewhere explained, the *Methodist* (q. v.) churches are seldom included in it, as ordinarily used. Since the beginning of the 18th c., the Presbyterian, Independent or Congregationalist, and Baptist denominations in England, have been associated under the name of the *Three Denomi-*

nations. See ESTABLISHED CHURCH, NONCONFORMISTS PURITANS, TOLERATION, &c.

The term dissenters is not strictly legal or ecclesiastical, those to whom it applies being usually described in legal language by a periphrasis. It may be said to be a convenient term to designate those Protestant denominations which have dissented from the doctrine and practice of the church as by law established. Immediately after the Reformation, dissenters, or nonconformists, as they were then called, were subjected to severe restrictions and penalties. During the Rebellion, the laws against Protestant sectaries were repealed; but they revived at the Restoration; and the parliament of Charles II. proceeded to enforce systematically, by new measures of vigor, the principle of universal conformity to the established church.

In 1690, the restrictions on dissenters were first relaxed, and certain denominations were suffered to exercise their own religious observances. From that period, various statutes have been passed, each extending in some degree the free exercise of religious opinion. At the present time, dissenters of all denominations are allowed to practise without restraint their own system of religious worship and discipline. They are entitled to their own places of worship, and to maintain schools for instruction in their own opinions. They are also permitted, in their character as householders, to sit and vote in the parish vestries. A dissenter, if a patron of a church, may also exercise his own judgment in appointing a clergyman of the Church of England to a vacant living. (See Stephen's *Eccles. Law.*)

A similar amount of religious liberty is enjoyed in Scotland, not so much derived from or guarded by special statute, but fully recognized by decisions of courts, as belonging to the law of the land.

DISSEPIMENT (Lat. *dissepio*, I separate), in Botany the partition between two Carpels (q. v.) in an ovary or fruit composed of a number of carpels. A dissepiment is formed by the union of the sides of two carpels. Sometimes dissepiments meet in the center or axis, completely dividing the ovary or fruit into cells; sometimes they are partial, appearing as mere projections from the outer walls of the ovary or fruit, and leaving it one-celled. Many ovaries and fruits exhibit partitions not formed by the union of the sides of carpels: these are sometimes called *spurious dissepiments*.

DISSOLVING VIEWS are pictures painted upon glass, and made to appear of great size and with great distinctness upon a wall by means of a magic lantern with strong lenses and an intense oxyhydrogen light, and then—by removal of the glass from the focus, and gradual increase of its distance—apparently dissolved into a haze, through which a second picture is made to appear by means of a second slide, at first with a feeble, and afterwards with a strong light. Subjects are chosen to which such an optical illusion is adapted, such as representations of the same object or landscape at different periods. Dissolving views were invented and first exhibited as a popular entertainment in England.

DISSONANCE is the opposite of consonance, and is applied to those intervals in music whose relative proportions are to a certain extent unsatisfactory to the ear, and produce a degree of disquietude. In a special sense, the term dissonance is applied to the interval causing the unpleasant effect; which sound is not always, as some think, the upper note, but may be the middle or the lowest note. Many believe that the feeling of dissatisfaction produced by the dissonances of music, arises from the mind not being able without difficulty to comprehend at once the arithmetical proportions of the vibrations. The foundation of dissonance, however, is generally allowed to be more æsthetical than intellectual, as through the vibration of a sounding body the air is put into a similar state of vibration, which is communicated to our ear, and so to our whole nervous system, through which we obtain the inward feeling representing the sound. In music, dissonance may be called a necessary æsthetical evil, which is used in the finest musical works for the purpose of producing pleasing contrasts, with their resolutions. In modern music, dissonance is divided into *essential* and *accidental*; the former arising fundamentally, the latter arising from passing notes, anticipations, suspensions, &c. See HARMONY.

DISTEMPER (Fr. *détrempe*), a coarse mode of painting, in which the colors—of a commoner kind than those usually employed for artistic purposes—are mixed in a watery glue, such as size and whiting. The chief purposes for which distemper is now used are scene-painting and staining-papers for walls. But it is known that the old masters frequently executed pictures and portions of pictures in distemper, and then oiled them, by which means they acquired the character of being painted originally in oil. It is said that Paul Veronese sometimes began his pictures in distemper, and finished them in oil, and that he frequently painted his skies in distemper. Distemper is often ignorantly supposed to be identical with Fresco (q. v.). The difference is, that whilst in the former the colors are laid on a dry

surface, in the latter they are put on wet mortar or plaster. See GELATINE.

DI'STAFF, the staff on which the flax or wool is fastened, and from which the thread is drawn in spinning. A distaff of very elegant construction is represented in art, and was no doubt generally used in antiquity. It is made of a cane-stick, the top of which is slit in such a manner as that the portions, when bent downwards, form a receptacle for the flax or wool. A ring was put over the top, for the purpose of keeping the divided ends of the cane together. The accompanying illustration is from Fairholm's *Dictionary of Terms in Art*. The distaff was dedicated to Pallas; and the Fates are always represented with it, and engaged in spinning the thread of life. It has ever been considered as the peculiar emblem of feminine as opposed to male occupations, and has come to be used figuratively for a woman.



Distaff.

DI'STANCE. The limit of view in a picture, or *point of distance*, as it is called in perspective, is that portion of the picture where the visual rays meet; the *middle distance* being the central portion between the extreme distance and the foreground. The art of producing on the eye the effect of real distance, in so far as it is not accomplished by mere mechanical rules, is one of the most subtle branches of landscape-painting, and cannot be acquired otherwise than by long experience, and a careful study of the effects of light and shade.

DISTEMPER is a typhoid inflammation affecting the upper air-passages of young dogs, and resembling in many respects the strangles of young horses, and the scarlatina and other such complaints of children. Like these, it is generally contagious, occurs only once in a lifetime, runs a definite course, is accompanied by low fever and debility, and is most successfully treated by good nursing and attention to diet and regimen. The eyes are red, weak, and watery; the nose dry and hot; draughts of air or movements of the animal readily excite sneezing or cough; there is dulness, fever, and loss of appetite. The thickened slimy mucus which the inflamed membrane, after some days, secretes, accumulates about the eyes and nostrils, and lodging in the bronchial tubes, prevents the free access of air, and the proper purification of the blood. Hence ensue distressed breathing, increasing weakness, and symptoms of nervous disturbance, such as staggering gait, Chorea (q. v.), and fits.

All dogs are liable to distemper, but the delicate, highly bred, and artificially treated varieties suffer most severely, and amongst them the mortality is very great. Bleeding, physicking, and all irritating and reducing remedies, must be carefully avoided, and a good dry bed in a comfortable airy place provided. The stomach, which is generally overloaded, should be relieved of its contents by an emetic, which, for an ordinary sized English terrier, may consist of two grains each of tartar emetic and ipecacuanha, with eight or ten grains of common salt, given in a wine-glassful of tepid water. If no effect is produced, the dose must be repeated in twenty minutes. Constipation, if present, should be corrected by half an ounce each of castor and olive oil, to which, in large dogs, a few grains of gray powder is a useful addition. The febrile symptoms, if acute, may be alleviated by giving four times daily, in cold water, two drops of tincture of aconite, and five grains each of nitre and extract of belladonna. Distressed breathing will be relieved by applying to the chest and sides, for an hour or two continuously, a thick flannel cloth, wrung at short intervals out of hot water. The throat may also be rubbed with hartshorn and oil, and the nostrils sponged and steamed occasionally. Give frequently, and in small quantities at a time, milk and bread, or any other such simple and digestible food; and when recovery is tardy, and weakness ensues, endeavor by nursing, Tonics (q. v.), and Stimulants (q. v.) to support the strength.

The term distemper is sometimes applied to influenza (q. v.) in horses, and epizootic pleuro-pneumonia (q. v.) in cattle.

DI'STICH (Gr. *distichos*, consisting of two rows or ranks) is the classical name given to any two lines, but especially to a hexameter and pentameter, making complete sense. It was much used by the Greeks and Romans as a vehicle for the expression of single thoughts and sentiments; and hence became almost exclusively employed for the classical epigram. The great poets of modern Germany, Goethe, Schiller, &c., have also shown a fondness for the distich, and remarkable skill in the use of it. A collection of moral maxims in Latin, ascribed to a certain Cato, Dionysius (q. v.), are called *Disticha*, and were highly popular during the middle ages.

DISTILLATION is an important process in the arts. It consists essentially in converting a liquid into vapor in a close vessel, by means of heat, and then conveying the vapor into another cool vessel, where it is condensed again into a liquid. When applied to a solid, the process is called *Sublimation*. The object of distillation is to separate one substance from others with which it may

be mixed. In distillation proper, no chemical decomposition takes place; when any of the substances are decomposed, it is called **DESTRUCTIVE DISTILLATION** (q. v.). The possibility of separating substances by vaporizing them depends upon the fact, that very few substances are volatile at the same temperature. Thus, water boils or becomes rapidly converted into vapor at 212° , alcohol at 173° , sulphuric ether at 94.8 , while oil of turpentine must be raised to 318° , and mercury to 662° ; and some substances, again, are altogether *fixed*. By applying the proper degree of heat, then, and *no more*, the more volatile of two substances may be expelled from the less volatile; and supposing the vapors of the two to rise mixed, as they are gradually cooled, that of the less volatile will be condensed before the other, thus affording another opportunity of separation.

It is often, however, not so easy to obtain a perfectly pure product by distillation as might at first appear, owing to another fact in chemistry—namely, that many bodies which, when pure, require a high temperature to vaporize them, become more easily vaporized when mixed with substances more volatile than themselves. Owing to this, it is impossible to obtain, by distillation alone, alcohol perfectly free from water. The circumstance, on the other hand, is sometimes turned to good account in another way. By distilling, for instance, parts of plants with water, the essential oils pass over with the steam, and are then separated from the condensed water by other processes.

The applications of distillation are numerous both in chemistry and in the practical arts. Pure water is obtained by distillation, the most of the substances dissolved in natural waters being fixed. Sea-water may thus be rendered drinkable, and there are apparatus for the special purpose. But wherever there cooking-utensils, a distilling apparatus might be improvised. The pure water that descends from the clouds is produced in a way which is just the process we are speaking of on a large scale. See **EVAPORATION**. It is no figure of speech to say that the dews are 'distilled.'

The extraction of zinc from the ore is a distillation; the metal, when reduced, passes over in vapor, and is condensed in a separate vessel. When the zinc ore contains cadmium, this metal being more volatile, comes over in the first portions, and may be removed. When mercury is used to extract particles of gold from sand, the mercury is distilled off from the amalgam, leaving the gold, which is fixed. The mercury being condensed, is again ready for use.

The most extensive application of distillation is in the manufacture of intoxicating spirits, and in ordinary language this is the most common use of the word. Strictly speaking, indeed, the spirits are not produced by the act of distillation; that is done by the previous step of Fermentation (q. v.); and distillation merely separates the spirits from the mixture in which they already exist. But it may be as well to give some account of the whole process under this head.

All the intoxicating drinks used in ancient times seem to have been the products of fermentation merely. The art, as it has been called, of evoking the fiery demon of drunkenness from his attempered state in wine and beer, is a discovery of modern times. It is first mentioned by an Arabian physician of the 11th c., Abulkasem, though the invention is attributed by some to the northern nations. The name *aqua vite*, given to distilled spirits by early physicians and alchemists, shows what an estimate they made of the discovery. Raymond Lully declares this admirable essence to be an emanation of the Divinity, an element newly revealed to man, but hid from antiquity, because the human race were too young to need this beverage, destined to revive the energies of modern decrepitude. Sadly have these anticipations been belied!

Spirits were first distilled from wine, and hence called spirits of wine. An endless variety of substances are now used in this extensive manufacture. Alcohol (q. v.) is the essential ingredient of all spirits, and it results from the decomposition of sugar, which, by the process of fermentation, is resolved into carbonic acid and alcohol. Sugar, then, is the direct source of alcohol, and accordingly all vegetable products containing sugar, such as grapes, the sugar-cane, sweet fruits, beet-root, &c., may be used in the manufacture of spirits. But there is another more abundant vegetable substance—namely, *starch*—which is easily convertible into sugar, and thus becomes indirectly a source of alcohol. In malt, and in germinating seeds generally, there is found a substance called *diastase* (q. v.). If a small quantity of this, or of an infusion of malt, be added to a paste of starch, it will in a short time become thin and sweet, the whole of the starch being transformed into sugar. See **BEER**. It is thus that grain of all kinds, potatoes, and other substances which contain little or no free sugar, are yet capable of yielding alcoholic spirits.

All substances, then, containing either sugar or starch, or both, will yield spirits. With sugar, the manufacture consists of two processes—fermentation and distillation. When starch is the original source, as is more commonly the case in the distilleries of

this country, the first step, is to convert it into sugar, or to *saccharify* it. This is the object of what is technically called *mashing*, which consists in mixing the materials in a triturated state with water at the temperature of about 160° . It is mostly from barley, oats, and rye that spirits are manufactured; wheat is less used, owing to its cost. Raw grain is ground to meal; malt is only bruised. A certain proportion of malt is always used, even in distilling from raw grain or potatoes, as the diastase of the malt is necessary to set agoing the saccharine fermentation. After being agitated for two or three hours, the saccharine infusion, called *wort*, is drawn off from the grains, and cooled. To this wort is now added a certain quantity of yeast or barm, which induces the vinous fermentation, and resolves the saccharine matter into alcohol and carbonic acid, accompanied by a rise of temperature. The alcoholic mixture which results is called the *wash*, and is now ready for distillation. This takes place in an apparatus called a still, or Alembic (q. v.). In its older and simpler form, the still consists of a copper vessel, into which the wash is put. This vessel is provided with a close head, terminating in a bent tube, which passes, in a spiral form (the worm), through the refrigerator, filled with cold water. See **STILL**. When heat is applied to the still, the spirit begins to rise in vapor at 176° , along with more or less steam; these vapors pass through the worm, become condensed by the cold, and drop or trickle in the form of liquid into a receiver. The product of this first distillation in a simple still is called *low wines*. This is then redistilled at a lower temperature, in order to deprive it of part of the water and of the fetid oils that had passed over with the alcohol. To obtain great purity and strength, repeated distillation is used.

A great improvement in distilling was invented in 1801 by a workman of Montpellier, of the name of Adam. By making the vapors arising from the still pass through a series of winding passages, maintained at a determinate degree of heat, and deposit part of their water and other impurities, he was able to obtain from wine a spirit of any required cleanness and strength *at one operation*. This principle has been adapted, by Pistorius of Berlin (1817), to the distillation of the coarser washes of grain and other materials.

Absolute or anhydrous Alcohol (q. v.) cannot be obtained by distillation alone. Rectified spirit, or spirit of wine, for burning in a lamp, still contains, when of ordinary strength, about 25 per cent. of water. Alcohol is considerably lighter than water, its specific gravity being 793 (water 1000). The stronger any spirit is, then, the less will be its specific gravity; and thus the strength of spirits may be ascertained by an instrument which measures their specific gravity, the *Aërometer* (q. v.) or *hydrometer*. The excise of Great Britain has established one degree of strength as the legal standard, and this is called *proof*. The specific gravity of proof-spirit is 918.6, and it contains nearly equal weights of water and alcohol.

If only alcohol and water passed over in distillation, all spirits, from whatever extracted, would be the same; but this is not the case. Brandy which is distilled from wine, has a peculiar essential oil derived from the grape, and also some acid; rum is impregnated with an essential oil from the sugar-cane, and with other impurities; malt liquor has the essential oil of barley, &c. It is these essential oils that give to the various spirits their distinguishing flavors. Some of the oils and other impurities are disagreeable and positively noxious; and it is one of the objects of *rectifying* to remove these. The mellowing effect of age upon spirits is owing to the evaporation or spontaneous decomposition of the essential oils. Newly distilled spirits are in general fiery, and specially unwholesome.

Sugar, when fermented, resolves itself into nearly equal weights of carbonic acid and alcohol; a pound of sugar, therefore, should yield upwards of half a pound of proof-spirit. The quantity of spirit afforded by different grains depends upon the proportion of starch they contain; 100 pounds of starch is calculated to yield 35 pounds of alcohol, equal to nearly 8 gallons of proof-spirits. Of the various grains, wheat is the most productive. Taking the average of wheat, barley, rye, oats, and maize, 100 pounds of corn yield 40 pounds of spirit of specific gravity $942 = 3.47$ gallons proof. A distiller of malt whisky, says Dr. Ure, calculates on obtaining two gallons of proof-spirits from one bushel of malt in ordinary years. The highest yield is 20 gallons per quarter of 8 bushels.

The principal intoxicating beverages produced by distillation are: 1. Brandy (q. v.), which name is applied properly only to spirits distilled from wine. 2. Rum is manufactured from molasses and other uncrystallizable products of the sugar-cane. 3. Corn or malt spirit, under the various names of British spirits, gin, whiskey, &c. The Dutch distillers give a peculiar flavor to their spirits (Hollands) by adding a portion of juniper-berries to the other ingredients. From the French name of the juniper, *genièvre*, come *geneva* and *gin*. 4. Spirits from various vegetable substances. In Germany, a great quantity of spirit is distilled from potatoes, which contain about five per cent. of starch. Beet-root and carrots are also used in the same way. The Swedes

make a kind of spirit from the sap of the birch, and the maple and other trees are turned to a similar account. We have, besides, cherry-brandy, peach-brandy, cider-spirit, &c. 5. Arrack (q. v.) is the East Indian name for all ardent spirits. See SPIRITS.

DISTILLATION, DESTRUCTIVE, is the term applied to the process of heating vegetable and animal substances in retorts or similarly closed vessels, at a temperature sufficient to decompose the original substance, and obtain therefrom products possessing different properties from the material which yielded them. Examples of this process are, the heating of coal in gas-works at a red heat, when it resolves itself into coke, which is left in the retort, and coal-gas, naphtha, tar, &c., which distil over into suitable receivers; the treatment of coal at and below a low red heat, when it yields much paraffine oil; the distillation of wood in close vessels, at a red heat, when charcoal is left in the vessel, and wood-vinegar, wood-spirit, tar, &c., pass over in vapor, and are condensed; and the heating of bones in similar retorts, when animal charcoal is left in the retort, and Dippel's animal oil distils over.

DISTILLED WATER is the condensed product obtained by the distillation of water. All natural waters, even rain-water, contain certain saline matters (common salt, &c.) in a state of solution, from which they can only be completely freed by the process of distillation. The characters of distilled water are, that it possesses a mawkish, insipid taste, without odor or color, and when evaporated to dryness in a vessel, it ought to leave no residue. The other properties of distilled water will be noticed under WATER.

DISTILLED WATERS are obtained by distilling water along with the parts of plants containing essential oils. Rose-water and lavender-water are familiar examples.

DISTORTION. The rules of perspective impose certain conditions in the delineation of natural objects, and when the image formed by a lens on the focusing screen of a camera obscura does not fulfil those conditions, it is said to be distorted. The effect of distortion is to render all straight lines, which do not pass through the center of the lens, curvilinear, and also so to alter the relative proportions of objects in the picture as to be opposed to the principles of true perspective. Distortion, in the camera obscura, is generally produced by the eccentric incidence of the oblique pencils.

DISTREIN. See DISTRESS.

DISTRESS, in English law, is the common-law remedy by which a man may remunerate himself for non-payment of rent or other duties, or may impound another's cattle trespassing upon his land. Distress is defined to be the 'taking of a personal chattel out of the possession of the wrong-doer into the custody of the party injured, to procure a satisfaction for the wrong committed.'—*Stephen's Com.* iii. 342. Distress is a remedy of the feudal law. It was an incident quite inseparable from the fealty to the lord; so that, as Lord Coke lays down, a lord granting the rent to another, and retaining the fealty, the grantee of the rent could not distress.—*Co. Litt.* 150 a. Distress was incident to every service; hence it might be put in force for failure to do suit in the lord's court, or for non-payment of the duties awarded in a court leet. In modern days, distress is practically enforced chiefly for non-payment of rent, for non-payment of certain public rates, and upon cattle straying upon land not belonging to their master. Cattle so straying may be impounded and retained as security till their owner make satisfaction. Distress for public rates is allowed by the statutes imposing the rates. In this species of distress, and distress for non-payment of rent, the articles are not merely kept as security, but may be sold to pay the amount due. Whatever goods the landlord finds on the premises, even goods belonging to a stranger, may be distrained; but animals *feræ naturæ*, and goods delivered to the tenant by way of trade, may not be taken. A landlord may, by special statute, 11 Geo. II. c. 19, distress goods fraudulently carried off the premises; and by the same statute he may, with the assistance of the peace-officer of the parish, break open doors to obtain the goods so removed.—See *Stephen's Com.* iii. 341—350.

DISTRIBUTION OF SPECIES. See SPECIES.

DISTRIBUTIONS, STATUTE OF, the statute 22 and 23 Car. II. c. 10, explained by 29 Car. II. c. 3. This statute regulates the division of the estate, according to the law of England, of a person dying intestate. A widow is by this act entitled to one-third of the estate in case there are children, the remainder being divided between the children in equal portions. If there be no children, the widow has half, and the other half is divided among the nearest of kin, or their representatives. If no widow, the children take all. If neither widow nor children, the estate is divided amongst the next of kin. In this case, the father (or, if he be dead, the mother) excludes brothers and sisters of the deceased; but by 1 Jac. II. c. 17, the mother of an intestate must take equally with the brothers and sisters of the deceased.

DISTRICTS, MILITARY, are certain regions into which the United Kingdom is divided for military purposes, to facilitate command and organization. Before Mr. Cardwell's Act of 1872, England was divided into four districts and Ireland into five, while Scotland formed one. Now there are nine general districts in England—namely, the northern, with York as its headquarters; the eastern, with Colchester; the southern, Portsmouth; the south-eastern, Dover; the home district, London; the Chatham; the Woolwich; the Aldershot. In Ireland there are four—Belfast; Dublin; Cork; and the Curragh. Scotland is still one district, with Edinburgh as headquarters. Jersey is a military district; and Guernsey and Alderney form another.

DISVE'LOPED, or **DEVE'LOPED**, is applied to the colors of a regiment or army, which are said, heraldically, to be disve'loped when flying.

DITCH, in Agriculture, is a trench usually made along the sides of fields, so that all the drains may be led into it. A hedge is often planted along the side, and the two form a better fence for cattle. In cold undrained lands, the earth thrown out of the trench forms a mound of dry earth, which is particularly serviceable for the growth of thorn-hedges. Accordingly, this is the common mode adopted in planting hedges in such districts, where the subsoil is often close, tenacious, and not well suited for their growth. Various forms of ditches are made, sometimes a double ditch is adopted, and the hedge planted between. In arable lands, however, since the general use of small and large pipes, ditches have been converted into underground drains, which has effected a great saving of land, as well as giving to the fields a tidy appearance.

DITCH is one of the most important of the defence-works of a fortified place. It is a broad and deep trench that may either be kept dry or filled with water; in practice, it is generally dry.

In permanent works, such as the regular fortifications of a town, the *rampart* and the *ditch* are the most important; the former being inside the latter, and formed mainly of the earth excavated from it. The ditch is often 120 feet wide, 12 feet deep below the natural level of the ground, and 24 feet beneath the parapet of the rampart. See COVERT WAY.

DITHYRA'MBUS, originally a surname of Bacchus, of uncertain derivation and meaning, was subsequently applied to a species of lyric poetry cultivated more particularly at Athens, and characterized by loftiness and vehemence of style, which, however, at a later period, degenerated into bombast and extravagance. The D. was originally a passionate hymn, sung by one or more revellers to the music of a flute; but Arion (q. v.) invented for it a regular choral or antistrophic form. It is this form which is generally spoken of as the dithyramb. It subsequently received various alterations but no specimens of it have survived.

DIT'TANY (*Dictamnus*), a genus of plants of the natural order Rutaceæ, having a short 5-partite calyx, five somewhat unequal petals, ten stamens, and five 1—3 seeded follicular capsules cohering at the base. The COMMON D., also called **BASTARD D.**, or **FRAXINELLA** (*D. albus*), a native of sunny mountains and rocks and dry mountain-forests of the south of Europe, especially in calcareous soils, is very generally cultivated as a garden-flower. It is a perennial, with stem $1\frac{1}{2}$ —3 feet high, perfectly unbranched, bearing a few pinnate leaves, which have 3—5 pair of leaflets and an odd one, and terminating in a beautiful erect raceme of 10—20 flowers. The flowers are of a fine rose color, with darker veins, more rarely white. The plant diffuses a powerful fragrance from its numerous oil-glands when in flower, and during dry hot weather exhales such a quantity of volatile oil, that its sudden combustion makes a slight flash when a candle is brought near it on a warm summer evening. The root is thick, white, and very bitter, and was formerly in high repute in medicine as a tonic stimulant, but is now neglected.—D. of Crete, used as febrifuge, is a very different plant (*Origanum Dictamnus*) a kind of Marjoram (q. v.).



Dittany:
a, top of stem, with leaves and flowers; b, fruit.

DIT'MARSH, NORTH and SOUTH (*Norher and Süder Dithmarschen*), the name given to the western district of the German duchy of Holstein, lying between the Eider and the Elbe. The

entire area is 500 square miles. Pop. 75,000. In old German times, D. formed a part of Saxony beyond the Elbe, and is worthy of special notice, because the inhabitants have preserved to the present day the peculiarities of antiquity. It has its own collection of laws, known as the *Ditmarsh Landbook*, which originated in 1321 from 48 judges; was altered in 1447, first printed in 1497, amended in 1567, and finally enjoined anew in 1711. Whatever authentic, notices, traditional and otherwise, we possess of D., we owe to Joh. Adolphi (b. 1559, d. 1629), whose *Chronik des Landes D.* (Ditmarsh Chronicle), written in the Lower Saxon dialect, was published in the original text, with 23 dissertations by Dahlmann (Kiel, 1827).

DITTAY, a technical term in the criminal law of Scotland, now little used, signifying the ground of indictment or substance of the charge. By *taking up dittay* was understood the collecting of information in order to trial, which is now effected by what is called a precognition.

DIU', a seaport, situated at the eastern extremity of an island of the same name off the south coast of Guzerat, in Hindustan; is well fortified, having a tolerably safe harbor, with a general depth of three or four fathoms. The anchorage, however, is said to be gradually becoming shallower. Pop. of town about 11,000. The place has been in possession of the Portuguese ever since 1515; but, from its detached and isolated position, its trade is of little consequence.

DIURETICS, medicines having the property of increasing the secretion or excretion of urine, and on this account much employed in dropsies, as well as in a variety of other diseases. The principal diuretics are the salts of potash, especially the nitrate, acetate, and bitartrate (cream of tartar); squill, in powder, vinegar, or syrup; digitalis or foxglove, in powder or infusion; the decoction or infusion of broom-tops (*scoparium*); the decoction of the American winter-green or pyrola; the alcohols and ethers, with most of the volatile oils, especially that of juniper, as in gin; the berries of the common elder; the tincture of euntharides or Spanish flies; turpentine, &c. The last named (from the alcohols onwards in the above enumeration) are more or less irritating in their effects on the urinary organs, and should not be used without due consideration as to the requirements of the particular case. Cream of tartar and the broom-decoction form one of the safest and best diuretic mixtures which can be employed for domestic purposes; or cream of tartar may be given alone, either dissolved in hot water, and allowed to cool, or in substance along with syrup.

DIVA'N is a Persian word, having various significations. It is used in the sense of a muster-roll, a register of payments or account; it is also applied to a collection of poems or songs by one and the same author. Goethe uses it in this sense in his *Westöstliche Divan*. Divan means next an administrative board; the highest council of state at Constantinople is called *Divani humûjân*, most illustrious divan. Finally, Divan is the name for the state or reception room in palaces and the private houses of the richer citizens. Along the walls of the room are ranged low sofas, covered with rich carpets, and provided with many cushions. Hence the name divan has been transferred in the west of Europe to a kind of sofa.

DIVEL ON THE NECK, an instrument of torture used against the Lollards. It is thus described by Fox, in his *Acts and Monuments*: 'Certain strait irons called the divel on his neck being after an horrible sort devised, straitening and winching the neck of a man with his legs together, in such sort as the more he stirreth in it, the straiter it presseth him, so that within three or four hours, it breaketh and crusheth a man's back and body in pieces.'—Cowel's *Interpreter*.

DIVER, or **LOON** (*Colymbus*), a genus of birds of the family *Colymbidæ* (q. v.), having a strong, straight, rather compressed

IMMER or **EMBER GOOSE** (*C. glacialis*), is a bird about two feet and three-quarters long, exhibiting no little beauty of plumage; the upper parts black, spotted with white; the head black, with tints of green and blue; the belly white. It is a winter visitant of the British coasts, even to the furthest south, and is occasionally seen in inland districts; is found in like manner in most parts of Europe, the north of Asia, and North America, as far south as Texas, but it breeds chiefly in the more northern regions, as Labrador, Iceland, and Spitzbergen. It is not exclusively marine,



Great Northern Diver (*Colymbus glacialis*).

being often seen on large rivers, and making its nest on the shores of fresh-water lakes. Its cry is very peculiar and wild, has been likened to the howl of a wolf, and is in some countries superstitiously regarded as ominous of evil. It is easily tamed, and becomes very familiar.

The **BLACK-THROATED D.** (*C. arcticus*) is another northern bird, of similarly wide geographic distribution, but much smaller size, being only about twenty-six inches in length. It is found at intervals distributed round the coasts of Britain, and it occasionally breeds in the freshwater lochs of the north of Scotland. The **RED-THROATED D.** (*C. septentrionalis*) is also found in all the northern parts of the world, is more common in Britain than either of the other species, and is the bird generally called Loon on the British coasts. In size it scarcely equals the Black-throated Diver. Its back is brownish-black, the belly white, the throat red. The flesh of all the Divers is dark, though, and unpalatable.—The name D. is sometimes extended to all the *Colymbidæ* (q. v.), sometimes to all the *Brachyptera* (q. v.).

DIVERGENT. See **CONVERGENT**.

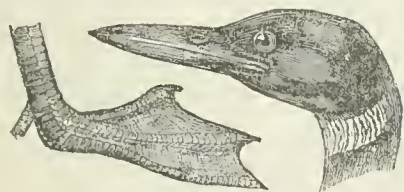
DIVERTIMENTO, or **DIVERTISSEMENT**, a species of musical composition consisting of different movements, arranged in an easy style for one or more instruments, but not so elaborately wrought out as the sonata, or other more regular compositions. The divertimento has generally no fixed character, being merely a musical picture without any attempt at artistic effect, or other aim than to please the ear, and may be said to take its place between the *Etude* and the *Capriccioso*. The divertimento was greatly in vogue during the last half of the 18th century; until then, the word had never been used to denote a musical composition. In France, divertimento is the name given to certain dances and songs introduced between the acts of an opera, or play, for the amusement of the public during the pause, and as such it was used there much earlier than in Italy or Germany.

DIVIDEND, the sum apportioned to creditors from the realized assets of a bankrupt estate, and which is at the rate of so much per pound of the claims. The half-yearly interest on the public funds, and periodical profits on shares in joint-stock undertakings, are also called the dividends, the latter being usually declared half-yearly, by order of the directors. Occasionally the dividends do not exhaust the profits, and the surplus is allowed to accumulate, until it is paid to the shareholders as an extra dividend called a bonus.

DIVIDING ENGINE. See **GRADUATION**.

DIVIDIVI, or **LI'BIDI BI**, the curved pods of *Cesalpinia coriaria* (see **CESALPINIA**), a tree which grows on the coast of Curaçoa, Carthage, and other parts of tropical America. They have been long used there for tanning, but have recently acquired importance as an article of commerce. A considerable quantity is now annually brought to Britain. Dividivi is one of the most astringent substances known.

DIVINATION (Lat. *divinatio*), is the act of discovering the hidden, but more particularly the future, in a supernatural way. Men have at all times set their own imagination above the causes



Head and Foot of Great Northern Diver.

pointed bill, about as long as the head; a short and rounded tail; short wings, thin compressed legs placed very far back, and the toes completely webbed. They fly well, but are particularly expert in diving. They prey upon fish, which they pursue under water, making as much use of their wings as of their legs and webbed feet in their subaqueous progression. They are scarcely capable, however, of walking on land, and the name *Loon* is supposed to refer to this incapacity, and to be from the same root with *lame*. The **Great Northern D.**, or **Loon**, also called the

of nature, and by a curious subjective process, have endeavored to draw out of themselves what could in reality be only derived from a study of the laws of nature. Thus, there have been instituted systems of superstition among almost all nations of the world at one period of their history, which the march of scientific discovery and the beneficent influences of a national religion have failed to wholly eradicate, so that, even among comparatively enlightened peoples, there lurks a deep substratum of this old-world feeling. A more special use of the term is to denote fortune-telling or sorcery (middle-age Latin *sortarius*, one who reads the future by means of lots or *sortes*). It was a maxim with the nations of antiquity, that if there are gods, they care for men; and if they care for men, they will send them signs of their will. This, with some variations, has been a universal sentiment in all ages and countries. But it was the first step in this journey which presented the whole difficulty. How was man to know the will of the gods? The variety of answers which this question has drawn forth constitutes the history of divination. Thus, among the Greeks, the word for divination was *mantike*, which signified more than the Latin *divinatio*; inasmuch as it was applied to any means by which the Deity discloses himself to man, while the Latin word denoted more the power which man is supposed to possess of discovering the future. With the Greeks, the seer was passive; with the Romans, he was active. See SEER and ORACLE. Astrology was a favorite method of divination among the ancient Chaldeans, as well as in the middle ages. *Auguries* and *auspices*—both words derived from *avis*, a bird—were systems brought to perfection by the Romans as means of knowing the will of the gods. See AUGURIES and AUSPICES. The sacrifice of beasts, besides, the casting of the horoscope, and the observing of the constellations, were all favorite modes of guessing at the future practised by the Romans. But the belief was not confined to the Old World. The Araucanians, a warlike nation of South America, seem to have placed as implicit faith in the divination of birds as did the Romans, and they practised this art in a way not very dissimilar. Even among ourselves, the merry-thought bone of fowls is known to possess a curious virtue, and boys need not be told the omens connected with the magpie.

An extensive set of omens have been taken from observing what first happens to one, or what animal or person one meets first in the morning, or at the commencement of an undertaking—the *first-foot*, as it is called. To stumble, has been universally held to presage misfortune. Some semblance of a reason might be found for this belief, inasmuch as stumbling may be supposed to indicate that that self-possession and conscious courage, which are in themselves half a victory over circumstances, are lacking—the want of them, therefore, being half a defeat; but in most cases the interpretation seems altogether arbitrary. The dread of a hare crossing the path seems to be widely prevalent; while to see a wolf is a good omen. This feeling is probably a remnant of warlike times, when the timid hare suggested thoughts of cowardice and flight; while the bold wolf, sacred to Odin, was emblematic of victory. The character of the hare for being unlucky is also connected with the deep-rooted belief, that witches are in the habit of transforming themselves into hares. That to meet an old woman is unlucky, is another very general belief; arising, without doubt, from the same causes that lead to their being considered witches. In some places, women in general are unlucky as first-foot, with the singular exception of women of bad reputation. This belief prevailed as far back as the age of Cræsus. Priests, too, are ominous of evil. If hunters of old met a priest or friar, they coupled up their hounds, and went home in despair of any further sport that day. This superstition seems to have died out, except in the case of sailors, who still consider the clergy a 'kittle cargo,' as a Scotch skipper expressed it, and anticipate a storm or mischance when they have a black-coat on board. This seems as old as the days of the prophet Jonah.

The observation of *lucky* and *unlucky* days was once an important matter, and was often the turning-point of great events. It is now confined to the one subject of marriage. In fixing the wedding-day, May among months, and Friday among days, are shunned by many people both in the higher and lower orders; for in this matter, which is the exclusive province of women, and in which sentiment and fancy are in every way so much more active than reason, the educated and uneducated are reduced to a level. Perhaps half the superstitious beliefs that yet survive among civilized and Christian communities, group themselves round the subject of love and marriage—of such intense interest to all, yet so mysterious in its origin, and problematical in its issue. The liking or passion for one individual rather than any other, is so unaccountable, that the god of Love has been fabled blind; it is of the nature of fascination, magic, spell. And then, whether happiness or the reverse shall be the result, seems beyond the reach of ordinary calculation. All is apparently given over to mystery, chance, fortune, and any circumstances may, for what we know, influence or indicate what fortune's wheel shall bring round. Hence the innumerable ways of prognosticating which of

two or more persons shall be first married, who or what manner of person shall be the future husband or wife, the number of children, &c. It is generally at particular seasons, as at the Eve of St. Agnes and Hallowe'en, that the veil of the future may thus be lifted.

Sneezing, likewise, has long been looked upon as supernatural, for this reason, that it is sudden, unaccountable, uncontrollable, and therefore ominous. The person is considered as possessed for the time, and a form of exorcism is used. A nurse would not think she had done her duty if, when her charge sneezes, she did not say: 'Bless the child,' just as the Greeks, more than two thousand years ago, said: 'Zeus protect thee.'

One general remark, however, it is important to make in regard to omens. An omen is not conceived to be a mere sign of what is destined to be, it is conceived as causing in some mysterious way the event it forebodes; and the consequence, it is thought, may be prevented by some counteracting charm. Thus the spilling of salt not only forbodes strife, but strife is conceived as the consequence of the spilling of the salt, and may be hindered by taking up the spilled salt and throwing it over the left shoulder.

An important exercise of the diviner's art is to determine the innocence or guilt of parties. This will be treated under ORDEAL. But it would be impossible to enumerate the endless modes of divination for which learned names have been found. Some of the principal are—*Azinomancy* (q. v.), *Belomancy* (q. v.), *Bibliomancy* (q. v.), *Botanomancy*, or divination by means of plants and flowers (it was practised by the ancients, who were wont to bruise poppy-flowers betwixt their hands, under the conviction that they could thereby discover their loves. Hence Theocritus calls the poppy *Teliphilos*, quasi *Deliphilos*; i. e., a tell-love. Goethe has made a beautiful use of another form of this superstition, which existed among the Teutonic races no less than among the old Greeks. The child-like Marguerite, in *Faust*, seeks to discover whether or not Faust loves her by plucking the leaves from a star-flower, and murmuring alternately, 'He loves me,' 'He loves me not,' and finds to her joy that the last leaf comes away while she is saying, 'He loves me'); *Capnomancy* (q. v.), *Cheiomancy* (q. v.), *Coscinomancy* (q. v.), *Crystallomancy* (q. v.), *Cup*, *Divination by* (q. v.) *Geomancy* (this was anciently practised by casting pebbles on the ground from which conjectures were formed; but the Arabian Geomancy was more recondite, being founded on the effects of motion under the crust of the earth, the chinks thus produced, and the noises or thunderings heard); *Hydromancy*, divination by water or by a mirror, in which the diviner shows the image of an absent person, what he is doing, &c. (this mode of divination plays an important part in the Arabian romances); *Lithomancy*, a species of divination performed by stones, but in what manner it is difficult to ascertain; *Oneiromancy* (see DREAMS); *Pyromancy*, or divination by flame (it was common among the Greeks and Romans; if the flame of the sacrifice was vigorous and quickly consumed the victim, if it was clear of all smoke, and did not crackle, but burn silently in a pyramidal form, the omen was favorable; otherwise, it was not); *Rabdomancy* (see DIVINING-ROD); and *Teraphim* (q. v.).

DIVINE RIGHT. A term applied to describe the source of the power claimed for the monarch, by the royalist party, in the great controversies between the monarchical and the parliamentary or commonwealth parties in England in the 17th century. The monarch was held to be the immediate representative of the Deity to whom alone he was responsible for all his actions—a principle which, of course, relieved him from all human responsibility. The idea was little known in this country until the quiet transfer of the crown from the Tudor to the Stewart dynasty showed that the hereditary principle was firmly established. It was found by some ecclesiastics in the doctrines of the civil law, which, in imitation of the practice of oriental nations, flattered the Roman emperors by attributing to them a power founded on divine institutions. Throughout a long and miserable contention, divine right was on the one side maintained to be the source of political power, while on the other it was maintained that that power emanated from the will of the people, expressed in what was called 'the social contract.' The chief writers on the side of divine right were Salmasius and Sir Robert Filmer; on the other Milton, Algernon Sydney, and Harrington. The controversy revived in the discussions which caused the French revolution, long after the settlement of the crown on William and Mary and the Hanover dynasty had settled it in Britain.

DIVINE SERVICE, a tenure by which the tenant was bound to do some special divine service, as to sing so many masses to distribute a certain sum of alms, or the like. It differed from Frankmoigne (q. v.) in this, that the lord could distrain for the former, not for the latter, which, being an indefinite service, could be enforced only by a complaint to the ordinary or visitor.

DIVING. The 'treasures of the deep' have at all times been the subject of much visionary exaggeration, and the accounts of the exploits of divers equally extravagant. We could name a popular school-book, still in extensive use, where children are seriously informed that the pearl-divers of the East acquire by practice the power of remaining under water from 15 to 20 minutes. Such statements are common enough in narratives of ancient date, in some of which the time is extended to two hours. It need scarcely be said that these accounts are absurd, no such endurance being possible. The more skillful divers may remain under water for two, or even three minutes; some modern accounts say four, and even six, but this is very doubtful. In a swimming and diving contest between some North American Indians and Englishmen in a London swimming-bath, one of the Indians, a renowned swimmer and diver, remained under water just one minute and a half, but a London artisan beat him by a few seconds.

In the *Encyclopædia Britannica*, Professor Faraday describes an interesting fact to which his attention was directed by a gentleman connected with the Asiatic Society, who, according to Professor Faraday, was the first to make the observation. It was observed that by breathing hard for a short time, as a person does after violent exercise, the breath could then be held much longer than otherwise.

Professor Faraday found that he could only hold breath for three-quarters of a minute, if he attempted it without preparation, but that after eight or ten of such forced inspirations, he could hold breath for two minutes. This he explained on the supposition that, ordinarily, a considerable quantity of carbonic acid remains in the involved passages of the lungs, but that it becomes completely expelled by the forced breathing, and its place supplied by atmospheric air. As regards the novelty of the observation, Professor Faraday was mistaken, as the writer of this can testify, for when a boy, he and his companion bathers in the Serpentine, in Hyde Park, commonly practised it. The Red Indian and the artisan above referred to also did the same; it is, in fact, a sort of preparation that a practised diver would make almost instinctively. After a few deep inspirations of this kind, a sense of giddiness is felt, and it is not prudent to carry the experiment far beyond this stage, as a fit of insensibility not unlike apoplexy is apt to result.

This giddiness, which is always produced, and the possible insensibility, indicate a different explanation from that of Faraday. The mere removal of residual carbonic acid from the lungs is not sufficient to explain these; we should rather suggest that all the phenomena result from an excessive oxygenation of the blood, and a consequently accelerated circulation similar to that produced by breathing nitrous oxide. It will be easily understood, that if the blood be forced to take an excess of oxygen, a longer time should elapse before a fresh supply would become necessary—that is, before suffocation would take place; and the giddiness, flushing of the face, and the insensibility, are results to be expected from such an excess.

Most divers suffer severely from the continual efforts in holding the breath; bloodshot eyes and spitting of blood are common among them. This rude mode of diving is now but little used except for pearl and sponge fishing; and even for these purposes, only an uncivilized people, with very little capital and knowledge, would continue to use it, as the modern applications of science afford such immense advantages for all kinds of subaqueous operations, as will be seen by the next article.

DIVING-BELL. From what has been stated in the preceding article **DIVING**, it will be at once understood that for all such purposes as subaqueous works upon the foundations of piers, bridges, &c., or the exploration and raising of sunken vessels, the efforts of the unaided diver would be almost valueless, and accordingly various contrivances for supplying air to the diver have been made. The *cacabus aquaticus*, or aquatic kettle, described by Taisnier as having been used by two Greeks in Spain, at Toledo, in 1538, in the presence of the Emperor Charles V. and a multitude of spectators, is one of the earliest reliable accounts of a diving-bell. From his description, this must have been similar in principle and construction to the modern diving-bell, but of clumsy dimensions, and wanting in efficient means of renewing the supply of air. Dr. Halley's diving-bell, about 1720, was a wooden chamber of about sixty feet internal capacity, open at the bottom, where it was loaded with lead, to keep it perpendicular in its descent. Strong pieces of glass were set in the upper part, to admit light.

Casks filled with air, and loaded with lead, were let down with the bung-hole downwards; and from these a supply of air was drawn by means of a hose. The form of diving-bell now in use was first constructed by Smeaton for the works at Ramsgate harbor, 1788. It was of cast iron, and weighed 50 cwt.; its height, 4½ feet; length the same; and width, 3 feet. It sunk by its own weight, and was lighted by stout pieces of bull's-

eye glass, firmly cemented in brass rings near the top. The principle of the diving-bell will be easily understood by floating a piece of lighted candle or a wax-match on a cork, and then covering it with an inverted tumbler, and pressing it downwards; the candle will descend below the level of the surrounding water, and continue burning for a short time, although the tumbler be entirely immersed. The reason is obvious enough: the air in the tumbler having no vent, remains in it, and prevents the water from occupying its place, so that the cork and candle, though apparently under water, are still floating, and surrounded by the air in the tumbler; the candle continues burning until the oxygen of the air is exhausted, and then it goes out, as would the life of man under similar circumstances. If vessels full of air, like the barrels of Dr. Halley, were submerged, and their contents poured into the tumbler, the light might be maintained; but this could be better done if a tube passed through the tumbler, and air were pumped from above through the tube into the tumbler.

The modern diving-bell, which is made of cast iron like Smeaton's, is supplied with air in this manner. It must be remembered that air is compressible, and diminishes in bulk in proportion to the pressure, so that at a depth of about 33 feet in water, it would occupy half the space it filled at the surface; if the inverted tumbler were carried to this depth, it would be half-filled with water. A considerable quantity of air has, therefore, to be pumped into the diving-bell, merely to keep it full as it descends; the air thus compressed exerts a corresponding pressure, and would rush up with great force if the tube were open and free. This is prevented by a valve opening downwards only.

When the diving-bell has reached its full depth, the pumping is continued to supply air for respiration; and the redundant air overflows, or rather *underflows*, by the open mouth, and ascends to the surface in great bubbles. The diving-bell is provided with a platform or seat for the workmen, and suspended from a suitable crane or beams projecting from a barge or pier; men above are stationed to work the pumps, and attend to the signals of the bellman. These signals are simply made by striking the sides of the iron diving-bell with a hammer, and as sound is so freely communicated through water, they are easily heard above. One blow signifies 'more air;' two blows, 'stand fast;' three, 'heave up;' four, 'lower down;' five, 'to eastward;' six, 'to westward;' &c. These, of course, may be modified as agreed upon. Messages are also sent up, written on a label attached to a cord. The workmen accustomed to subaqueous existence suffer no inconvenience from being below water. Novices feel pains in the head and ears, and sometimes a sense of deafness; but these effects pass away after a short initiation.

DIVING-DRESS. In Schott's *Technica Curiosa*, published in 1664, is described a *lorica aquatica*, or aquatic armor, which consisted of a leathern dress, to protect the diver from the water, and a helmet. In 1721, Halley describes a contrivance of his own of nearly the same kind; its object was to enable the diver to go out from the bell and walk about; he was to be provided with a waterproof-dress, and a small diving-bell, with glass front, as a helmet over his head, which was to be supplied with air by means of a tube from the diving-bell.

The modern diving-dress is made of India-rubber cloth; a strong metal helmet, with round pieces of plate-glass in front, rests upon a pad on the shoulders; the air is supplied to this helmet from above, in the same manner as for the diving-bell, but instead of the waste air passing out below, a second tube carries it up. Leaden weights are attached to the side of the diver, and thus he may descend a ladder and walk about below. He carries with him one end of a cord communicating with the assistants above, and by pulling this, makes a series of signals.

In the diving-dress invented by Mr. Fleuss, and patented by him in 1880, the diver is independent of supplies of air from above. In the helmet is a store of compressed oxygen, set free by degrees at the will of the diver; the carbonic acid exhaled by him is absorbed by caustic soda in a receptacle of the dress; while the nitrogen is breathed over and over again. In this dress a man may remain below the surface for several hours without harm.

DIVINING-ROD—often called the *Virgula Divina*, the *Baculus Divinatorius*, the Caduceus or wand of Mercury, the Rod of Aaron, &c.—is a forked branch, usually of hazel, and sometimes of iron, and even of brass and copper, by which it has been pre-



Diving-bell:
a, section showing inside;
b, top.

tended that minerals and water have been discovered beneath the surface of the earth. The rod, when suspended by the two prongs, sometimes between the balls of the thumbs, will distinctly indicate, by a decided inclination, it is alleged, the spot over which the concealed mine or spring is situated. Other powers are ascribed to the divining-rod, but this is the chief. Many men, even of some pretensions to scientific knowledge, have been believers in the occult power ascribed to this magic wand. Agricola Sperlingius, and Kirchner, all believed in its supernatural influence. So did Richelet, the author of the Dictionary. The learned Morhoff remained in suspense, while Thonvenot and Pryce, in the latter part of the 18th c., gave ample records of its supposed power. Bayle, in his Dictionary, under the word *Abaris*, gives some ingenious arguments both for and against the divining-rod. In a work published by Dr. Herbert Mayo in 1847 and 1851, entitled, *On the Truth contained in Popular Superstitions*, he gave some curious illustrations of the art, supposed to be possessed by one in forty of the Cornish miners. At Weilbach, in Nassau, he likewise met with one Edward Seebold, who, he says, possessed the power, but afterwards lost it. Arthur Phippen, in 1853, published a pamphlet containing an account of two professional diviners or dowzers. One of them, named Adams, gave remarkable indications of being able to detect water underground. He not only was able to discover the particular spot where water might be found, he could even perceive a whole line of water running underground.

Scientific men, who have bestowed any care on the examination of nature, regard this alleged power of the divining-rod as an unconscious delusion, ascribing the whole phenomenon to the effect of a strong impression on the mind acting through the agency of the nerves and muscles. See ANIMAL MAGNETISM.

DIVIRIGI (anc. *Tephrene*), a town of the province of Siras, Asia Minor, on the Kurner-Su, a branch of the Euphrates, 28 miles north-west from Arabkir. Pop. supposed to be about 10,000.

DIVISIBILITY is that property of quantity, matter, or extension, through which it is either actually or potentially separable into parts. Whether matter is or is not indefinitely divisible, is a question which has occupied the minds of philosophers since very early times. See ATOM. There is no doubt that, abstractly speaking, it is indefinitely divisible. We cannot conceive any body or space so small but that we can subdivide it in imagination, and thus figure to ourselves bodies and spaces still smaller; and practically, we know that the subdivision of matter is carried in nature far beyond appreciation either by our senses or by calculation. The diffusion of odors through the air for long periods from odoriferous bodies without their suffering any sensible change of weight, and the tinging of great quantities of fluid by very minute portions of coloring matter, are cases commonly appealed to in proof of the extreme fineness of certain material particles; while, by experiment, it is shown that there is no practical limit to the divisibility of even the most solid substances. Thus, an ounce-weight of silver, gilt over with eight grains of gold, has been drawn out into a wire 13,000 feet long, which was all its length covered with the gold; and a tube of glass presented to the blow-pipe has been drawn out till it became as fine as a silk fibre, or $\frac{1}{25000}$ th of an inch thick, still retaining its character as a tube with a distinct interior and exterior surface. In fact, in theory, great and small are mere terms of relation, under the microscope, objects invisible to the eye appear of considerable bulk; and as Sir John Herschel, in his celebrated *Introduction to the Study of the Physical Sciences*, has put it, there is no reason why a mote in a sunbeam should not be in itself a world. With regard to the infinite divisibility of space, it may be demonstrated geometrically; and perhaps, after all, it is the feeling that space is infinitely divisible, which compels our minds most strongly to resist the notion of ultimate atoms with definite forms, as conceived in the corpuscular theory.

DIVISIBILITY, in the Theory of Numbers, means the capability of any number of being divided by another without remainder. To find the condition of divisibility of one number, N , by another, D . Let $N = b_m r^m + b_{m-1} r^{m-1} + \dots + b_1 r + b_0$. See NOTATION. Then $N = b_m (D + (r-D))^m + b_{m-1} (D + (r-D))^{m-1} + \dots + b_1 (D + (r-D)) + b_0$. Expanding the different terms of the right-hand side of this equation, it will appear that $\frac{N}{D}$ will be a whole number, if $b_0 + b_1 (r-D) + \dots + b_m (r-D)^m$ be divisible by D . Hence, if $r = 10$, or the number be in the denary scale, and $D = 9$, and therefore $(r-D) = 1$, any number will be divisible by 9, if $b_0 + b_1 + b_2 + \dots + b_m$ is so, or if the sum of its digits is divisible by 9.

DIVISION, one of the four principal rules of arithmetic, is that by which we find how often one quantity is contained in another. It is a compendious method of subtraction, by which

we can at once take one number from another as often as it is contained in it. There are three numbers concerned in division: the dividend, or number to be divided; the divisor, or that by which the dividend is to be divided; and the quotient, or the number expressing how often the divisor is contained in the dividend. The symbols of division are $b) a$ ($\frac{a}{b}$ or $a \div b$, where a is the dividend, and b the divisor.

There are various methods of division, such as the English, Flemish, Italian, Spanish, German, and Indian methods, which differ merely in the manner of arranging and disposing the numbers. The English method will be found explained in all the ordinary text-books of arithmetic. There are also rules of division for the division of integers, fractions and algebraical quantities. The general rule for the division of vulgar fractions is, to multiply the one by the reciprocal of the other. The division of decimal fractions is performed in the same way as the division of integers. And, in algebra, division is practically performed as in arithmetic, either by making a fraction of the dividend and divisor, and reducing the numerator and denominator by the parts common to both, or else by dividing the former by the latter, after the manner of long division. See any text-book on Algebra. For division by logarithms, see LOGARITHMS.

DIVISION, BENEFIT OF. By the law of Scotland, co-cautioners are each ultimately liable for the whole debt which they have guaranteed. Each, however, is liable only for his own proportion, so long as the others are solvent, provided he has not expressly renounced that privilege, or is not bound conjunctly and severally with the principal debtor, and the debt must thus be divided amongst them. The law of division is not affected by the Mercantile Law Amendment Act; and it is therefore necessary, where there are more cautioners than one, that all should be proceeded against.

DIVISION, in Military matters, is one section of an army, indefinite in point of numbers, but established as a matter of convenience. It often comprises infantry, cavalry, and artillery, and is in effect a small army in itself, commanded by a general officer. In the Crimean war, for instance, a British division comprised two brigades, each of three or four battalions.

DIVISION, NAVAL, was a secondary group of ships in a large fleet, generally three to a squadron. In a very large and complete fleet, there might be as many as nine admirals or flag-officers commanding nine divisions, in three squadrons of three divisions each. The distinction of squadron has now been abolished, and individual ships are too gigantic to allow of large numbers being manœuvred in one fleet.

DIVISION OF LABOR, or **DIVISION OF EMPLOYMENT**, a term often used by political economists to express a means by which labor is economized, or, as another method of stating the same result, by which production is increased. The problem in division of labor is so to adjust matters in any given community that each member of it shall work, or be able if he pleases to work, with the greatest possible results. In practice it is, like most other arrangements, apt to be too broad or too narrow. The old term, 'jack of all trades and master of none,' expresses the truth, that people who try too many things are not likely to be adepts in any. On the other hand, few people can do any sort of work to great perfection, unless it is part, as it were, of a group of functions for which they are more or less prepared. A good dentist will be in some measure a surgeon; a conveyancer or a special pleader will know something of the other departments of legal practice; a shipwright will be able, on occasion, to do other kinds of carpentry, and he will be the better of a general knowledge of the mechanical powers. That division of labor, in fact, which is really productive, is where a man who can do several things selects one as that which he can do best, or has most opportunity of doing. By constant practice at that one thing, and the withdrawal of his attention from other matters, he achieves perfection and rapidity of execution. There is an important difference between this selection of a special pursuit, and the inability to do anything more than one thing, which is often confounded with it. In the former case, the worker, whether with head or hand, has great resources, for his adopted pursuit is the best, out of several others, on which he can fall back. The man who can do only one thing is in a precarious condition, because that one thing may be superseded. Indeed, as the one thing which can be so done is generally a very simple thing, it is almost a law in political economy that it will come to be superseded by machinery. Such was the fate of the hand-loom weavers, whose function, especially in the plainer and lighter fabrics, was too easy to last. Of the division of unskilled and easy labor, there is an excellent illustration in Adam Smith's description of pin-making: 'One man draws out the wire, another straightens it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on is a peculiar

business; to whiten the pin is another; it is even a trade by itself to put them into a paper; and the important business of making a pin is in this manner divided into above eighteen distinct operations, which in some manufactories are all performed by distinct hands.' This division was doubtless useful, so long as pins were made entirely by human hands. It prompted serious inquiries, however, how far such functions were of an improving or a deteriorating character, and essays were written to prove that in manufacturing countries human beings were deteriorating, as no one of them had the faculty of self-support in separation from his fellows, and none could even make one single article by himself, all being dependent for their bread on a complex co-operation, which might break down any day.

The answer to such fears may be found in the pin-making of the present day, where one man tends a machine, feeding it with wire at one end, while the pin drops out at the other. This, too, is the fruit of division of labor, for many skillful heads and hands have been occupied in bringing to perfection the different parts of the machinery. It is of the highest importance to the working-classes of a country, to keep in view that though the division of labor does sometimes create functions which, while they are extremely simple and easy, are of value as helping other functions to go on, yet this kind of easy and uniform work has no stability in it, and the possession of the facility for doing it acquired by practice is no permanent industrial endowment, since it is pretty sure some day to be superseded by machinery.

DIVISOR. See **DIVISION.** See also **PRIME NUMBERS.**

DIVORCE, is defined by a Scottish writer to be 'the disruption, by the act of the law, of the conjugal tie, made by a competent court on due cause shown.'—Fraser, *Pers. and Domestic Relations*, i. 645. This definition correctly expresses the law of divorce as it now stands in the United Kingdom. There are some differences of detail in the working of the law in England and Scotland, which will be noticed below.

The desire to obtain a release from the matrimonial bond has existed at all times and under all legal systems. In heathen nations, this release was often granted on the slightest grounds. Even among the Romans, marriage was regarded as little more than a conventional union, to be observed so long only as it suited the mutual convenience of the spouses. Christian nations, on the other hand, adopting as the basis of their systems the Scriptural law, as declared Matt. xix. 9, Mark x. 9—11, Luke xvi. 18, and 1st Cor. vii. 10, 11, are agreed in considering marriage as a sacred tie, not to be dissolved except on the ground of unfaithfulness to the marriage vow. Even this limited ground for dissolution of marriage is denied by a large portion of the Christian world. By the civil law, as it existed for some centuries after Christianity, a greater laxity was allowed in regard to divorce. The Emperor Constantine was the first to prohibit dissolution of marriage by simple consent of the parties. This practice was again revived under the Emperors Theodosius and Valentinian; and though those emperors subsequently rescinded this edict, yet the rule as to the grounds on which marriage might be dissolved continued to fluctuate.

By the canon law, marriage was regarded as a sacrament; and though marriages contracted in disobedience to certain rules might be declared null *ab initio*, a marriage validly contracted would not be dissolved except by papal dispensation. But the rule of the canon law was not uniformly adopted by the states of Europe, and it was not till the famous Council of Trent issued a decree, in its 24th session, in 1562, declaring marriage indissoluble even after the adultery of one or both of the parties, that a uniform rule on the subject was established. But before this decree was issued, the reformation had made progress throughout Europe, and thus a change again took place in regard to the law of divorce. It should be observed, that though by the canon law divorce *a vinculo matrimonii* was unattainable, parties might obtain a separation *a mensâ et thoro*. The nature of this remedy will be explained below.

Roman Catholic countries adopted the principle laid down by the Council of Trent, and this rule continues to be in force in most countries which are in the Roman Catholic communion. But by the Code Civile of France, divorce is allowable on the ground of adultery and certain other causes. Countries which adopted the reformed religion, have varied greatly in the rules established in regard to the question of divorce. In Holland, divorce is permitted on the ground of adultery and desertion. In America, the practice varies in different states. 'In several of them no divorce is granted but by special act of the legislature, according to the English practice; and in others, the legislature itself is restricted from granting them, but it may confer the power on courts of justice. So strict and scrupulous has been the policy of South Carolina, that until recently there was no means of obtaining a divorce of any kind, either by sentence of a court of justice or by act of the legislature. In all other states, divorce *a vinculo* may be granted by courts of justice for adultery. In New York, the

jurisdiction of the courts as to absolute divorce for causes subsequent to marriage is confined to the single cause of adultery; but in most of the other states, in addition to adultery, intolerable ill-usage or wilful desertion, or unheard-of absence, or habitual drunkenness, or some of them, will authorize a decree for divorce *a vinculo* under different modifications and restrictions.'—Kent, *Comm.* iv. 105. In England, previous to the passing of the late Divorce and Matrimonial Act, marriage was by the common law indissoluble. It was, indeed, competent to obtain a declaration of nullity of marriage on the ground of relationship, previous marriage of one of the parties, mental or physical incapacity, or coercion. But the judgment so obtained was not a decree of divorce, but a declaration that the marriage tie between the parties had never really been contracted. A wife may now obtain a divorce on the ground of the husband's incestuous adultery; or of his bigamy with adultery; or of rape; or of sodomy; or of adultery coupled with gross cruelty; or of adultery coupled with desertion without reasonable excuse for two years.

The husband may obtain a divorce on the ground of the wife's adultery. But neither party can obtain a divorce on the ground of mere desertion alone, however long continued. The court may order the husband to pay a divorced wife a certain sum for her maintenance during their joint lives. A decree of divorce does not come into full force until six months after it is pronounced. The bars to a divorce are condonation, connivance, or collusion. When divorced, the parties are at liberty to marry with third parties. When the divorce is on the ground of adultery, both parties may be examined as witnesses, 32 and 33 Vict. c. 68.

In Scotland, divorce may be obtained on the ground of adultery or wilful desertion. Immediately after the reformation, the courts in Scotland recognized the right of either spouse to obtain a divorce on the ground of adultery. And in the year 1573, a statute was passed declaring that, in case either husband or wife should desert without due cause for four years, the injured party might raise an action of adherence, and, in case redress was not obtained, a decree of divorce might be pronounced. In Scotland, it is not permitted that a marriage should take place between the offending parties. The effect of a decree of divorce on the pecuniary interests of the parties, is to cause the offender to forfeit all benefit which might accrue to him or her from the marriage. Separation *a mensâ et thoro* may also be obtained in Scotland on the ground of ill-usage, and perhaps desertion (q. v.). Condonation and collusion, but not recrimination, are, in Scotland, a bar to obtaining a dissolution of marriage on the ground of adultery.

DIVORCE AND MATRIMONIAL COURT. An Act of Parliament of 1857, with amending acts, changed the law of England on the subject of divorce. By the first of these acts, the jurisdiction in divorce causes is transferred from the ecclesiastical courts to a new court constituted for the purpose, which, since the Judicature Act (1873), is included in the Probate, Divorce, and Admiralty Division of the High Court of Justice. It is provided that either spouse may obtain a divorce on the ground of adultery; but in case the wife is petitioner, the adultery must be accompanied by cruelty or desertion. By 23 and 24 Vict. c. 144, the power to pronounce a decree of divorce, which was at first reposed in the whole court, is given to the judge who hears the cause; but in this case the decree so pronounced is a decree *nisi*, and cannot become final for at least six months. After decree of divorce, the offending party is free to marry again even with the paramour. But it is enacted, 20 and 21 Vict. c. 85, sect. 57—58, that no clergyman shall be compelled to solemnize the marriage of any person who has been divorced. He must, however, allow another clergyman, if willing to do so, to perform the marriage. A party applying for a divorce will not be allowed to obtain judgment, should it appear that he or she has been guilty of recrimination by committing the same offence, or that there is collusion between the parties in order to procure the divorce. Parties also who have condoned the offence—that is, who after it has been discovered have consented again to live as husband and wife—will not be allowed to obtain a divorce.

In order to guard against fraud by parties conniving to procure a divorce, power is given to the Queen's proctor, by 23 and 24 Vic. c. 144, to interpose, in case he have reasonable ground to suspect collusion or recrimination, in order to oppose a petition for divorce. By these acts, parties are also entitled to obtain a judicial separation on the ground of adultery, cruelty, or desertion. Judicial separation is declared to be in place of a separation *a mensâ et thoro*. A married woman, having obtained decree of judicial separation, is declared to be in all respects as a *feme sole* in regard to any property that she has or may acquire. Even before obtaining a separation, a woman deserted by her husband may obtain from the court a protection for any property which she may acquire by her own industry.

From the conflict of laws in various countries on the subject of divorce, questions have frequently arisen as to the competency of a sentence of divorce by a tribunal having power according to the *lex loci* to pronounce such sentence, to annul a marriage contracted

in a country where such divorce is not allowed. It appears now to be the generally received opinion, that wherever parties are domiciled they will be allowed to avail themselves of the laws of this domicile. But the courts will not recognize a transient visit to a foreign country as sufficient ground to sustain a divorce. On the subject of this article, see Paterson's *Compendium of English and Scotch Law, Fraser's Personal and Domestic Relations* and Swabey *On the Divorce and Matrimonial Act*.

DIXON, WILLIAM HEPWORTH, an English author, was born in the West Riding of Yorkshire 1821, and settled in London in 1846, where he soon acquired a considerable reputation by his writings. A series of papers, published in the *Daily News*, 'On the Literature of the Lower Orders,' and another on 'London Prisons,' attracted considerable attention. The latter reappeared in a volume published in 1850. Before this, but in the same year, he published *John Howard, and the Prison World of Europe*. It was with difficulty he could induce a publisher to accept it, yet when published, it went through three editions in one year. D. now devoted himself principally to historical biography. In 1851, appeared the first edition of his *William Penn*, a work called into existence by the onslaught made by Macaulay on the eminent Quaker, in which D. undertook to disprove Macaulay's charges. In 1852 was published his *Life of Blake*; and in the same year an anonymous pamphlet, entitled *The French in England*, designed to allay the fear of a French invasion then prevalent. In 1853, D. was appointed editor of the *Athenaeum*—a chair he vacated in 1869. In 1860 he published his *Life of Lord Bacon*, and in 1863, *The Holy Land*. He gave the public *New America* in 1867; *Spiritual Wives* in 1868; *Free Russia* in 1870; *The Switzers* in 1872; *History of Two Queens* in 1873-74; *White Conquest* in 1875; and *British Cyprus* in 1879. *Her Majesty's Tower* (4 vols.), begun in 1870, was followed by *Royal Windsor*, *Diana Lady Lyle* (1877) and *Ruby Grey* (1878) were novels. D. died 27th Dec. 1879.

DIXON ENTRANCE, a strait on the west coast of the Dominion of Canada, separates Queen Charlotte Island from the Prince of Wales Archipelago, and so divides British territory from a part of the U. S. domains.

DIZFUL, a town of Persia, on the river Dizful, in lat. 32° 10' N., and long. 49° 34' E. It is the capital and principal mart of its province (Khuzistan). A handsome bridge of twenty arches crosses the river here. The foundation is of stone and of ancient date, the upper portions are brick and are modern. Pop. estimated at 15,000.

DIZIER, ST., a town of France, in the department of Haute-Marne, 10 miles north of Vassy, is situated on the Marne, which here begins to be navigable. It is a very long and narrow, but well-built town, the streets being wide, clean, and regular. In 1544, D. resisted for a month the assaults of a Spanish army under Ferdinand de Gonzaga; a resistance of the greatest consequence to the French ruler, Francis I., the delay enabling him to collect his forces to oppose the march of the Spaniards upon Paris. In 1814, the French twice defeated here the invading army of the allies. The chief industrial features of the place are iron forges and foundries, boat-building yards, in which a great number of river and canal boats, generally of about 100 tons, are constructed, and cotton factories. There is also a considerable trade in wood, iron, and grain. Pop. (1876) 9453.

DJE'ZZAR, i. e., *Butcher*, the name given, on account of his cruelty, to Achmed Pasha, famous for his obstinate defence of Acre against Napoleon I. He was born in Bosnia about 1735, and rose, through murder and treason, from the condition of a slave to the pashalic of Acre. In the beginning of 1799, the French entered Syria from Egypt, and advanced from victory to victory till they reached Acre, which was laid siege to on the 20th March. By the advice of Colonel Philippeaux, a French émigré, and of Sir Sydney Smith, the commander of the British fleet in the Levant, D. was induced to hold out; and such was the savage doggedness of his resolution, that Bonaparte was obliged to retire on the 21st of May. It is said that during the siege he sat on the floor of his palace surrounded by a heap of gory skulls, distributing money to all who brought in the heads of Frenchmen. He died at Acre in 1804. D. was at times maniacal in his cruelties. He whipped off the heads of his wives without the slightest ceremony—seven at a time! But he had also moments of remorseful tenderness, in which he helped the poor and provided for those he had injured. He is said to have possessed the sharpest discernment, and was a very vigorous ruler.

DMITRO'V, an ancient town of Russia, on the Jakhrama, an affluent to the Volga, 40 miles north of Moscow. It covers a large area, a considerable part of which is occupied by gardens, but as a whole is poorly built. It contains a college and seven churches, and has manufactures of silk and cotton goods, tanneries, &c. Pop. (1867) 8042.

DNIE'PER, one of the large rivers of Europe, has its source in certain swampy forest-lands in the north of the Russian government of Smolensk. Its general direction, till it reaches Kiev, is south. From Kiev, its course is south-east to Ekaterinoslav, where it turns directly south past Alexandrovsk, below which town it sweeps round to the south-west, and pursues that direction until it debouches in the Black Sea, between the government of Kherson and Taurida, its embouchure forming a gulf of about 50 miles in length, with a breadth of from 1 to 6 miles. Its principal affluents are the Desna and Soj from the east, and the Pripet, the Beresina, and the Druz from the west. The total length of the D. is upwards of 1000 miles, and it is navigable almost from its source, its breadth at Dorgobush, about 50 miles below its source, being 210 feet. Some of the finest governments of the Russian empire lie within its basin, with all of which its navigable branches and canals enable it to hold communication. In its upper part, it flows through a marshy forest territory; its middle and lower course is rocky. Below Ekaterinoslav, indeed, there are no less than 13 rapids in the course of about 40 miles; but these impediments to navigation have been overcome in part by blasting, and by splendid hydraulic-works erected by the Russian government. The produce of the provinces, consisting for the most part of corn, timber, iron, salt, hemp, and linen, are usually conveyed down the river to ports on the Black Sea, but many vessels pass annually from the D. to the Baltic by the Beresina and the Dwina. At Smolensk, the waters of the D. are frozen from November to April; at Kiev, they are ice-bound only from January to March. Sturgeon, carp, and pike abound in the river. As the *Borysthenes* the river was known in the 7th c. before Christ to the Greeks, who regarded it as the most valuable river on earth next to the Nile.

DNIE'STER, a river of Europe, flowing chiefly through Russia, but having its rise in the Carpathian Mountains, in the Austrian crown-land of Galicia, about lat. 49° 10' N., long. 23° E. Its general course, until it reaches the Russian territory, is south-east; it then runs east for a short distance, and thence south-south-east, forming the boundary between Bessarabia and Kherson, past Mohilev, Dubossari, and Bender, to the Black Sea, which it enters by a shallow shore lake, 19 miles in length and 5 in breadth, between Akerman and Ovidiopol. The total length of the D. is between 500 and 600 miles, its current throughout being rapid. Until it reaches the Russian frontier, its right bank is skirted by offsets from the Carpathians; but at that point, the country, which above has been level on only one side, opens into a broad flat plain, through which the river, broken at intervals by masses of rock, rushes muddy and turbid. The downward navigation is interrupted by a series of falls and whirlpools. Wood and grain are the chief products conveyed down the river.

DOA'B, a word of Sanscrit origin, signifying primarily 'two rivers,' but applied, like the Gr. *Mesopotamia*, and the Lat. *Inter-amma*, to the country between two rivers. The two roots of the word are common to all the Aryan languages: the first appears in Lat. *duo*, Eng. *two*; the second in Celt. *aron*, a river, and in *Danube* or *Donau*. Punjab ('five rivers') is a term of the same kind; but while Punjab exists merely as a proper name of one particular region, Dōab is used as the common appellation of any region in general that fulfils the conditions. When introduced, however, without local reference of any kind, the Dōab means the space enclosed by the Jumna on the south-west and the Ganges on the north-east—a space extending from Allahabad to the base of the Himalayas, a distance of upwards of 500 with an average breadth of 55 miles. The fertility of this region has been much increased by the Ganges Canal (q. v.).

DO'BCHICK. See GREBE.

DOBELL, SYDNEY, a modern English poet, was born in London in 1824. His father, who was a wine-merchant, removed to Cheltenham in 1835. Here D., whose education was entirely private, lived till 1850, when the *Roman* was published, and received with favor by the literary world. After the publication of this poem, D. resided for some time in Switzerland. Shortly after his return, the delicate state of his wife's health brought him to Edinburgh, where he remained till 1857. He afterwards resided at Cotswold Hills, near Gloucester. Besides the *Roman*, D. published *Balder* (1854), *Sonnets on the War*, in conjunction with Mr. A. Smiler (1855), and *England in time of War* (1856). His poems exhibit a singular mixture of the philosophical and the poetical spirit. Many of his passages are as spiritual in conception and lavish in imagery as the finest portions of Shelley; others again, are as obscure, intricate, and involved as the rhymed enigmas of Cowley or Donne. In 1865, D. published a political pamphlet advocating a graduated suffrage and plurality of votes; and in 1871, *England's Day*, a lyric. He died in 1874. A collected edition of his poems was published in 1875; and in 1876, *Thoughts on Art, Philosophy, and Religion*. See *Life and Letters of Sydney Dobell* (1878).

DO'BELN, a town in Saxony, 36 m. S.E. of Leipsic, is situated on an island formed by the Mulde. It is well built, and contains a richly endowed hospital. Its chief manufactures are linen, woollen, and cotton cloth, brass-ware, and hats. D. has also several bleach-fields and worsted-mills. Pop. (1875) 10,969.

DOBROW'SKI, JOSEPH, the founder of Slavic philology, was born August 17, 1753, at Gyermet, near Raab in Hungary, where his father, a Bohemian by birth, was stationed in garrison. He studied at the gymnasium of Deutschbrod, and subsequently at Klattau and Prague. In 1772 he entered the order of the Jesuits at Brünn, but on its dissolution ten months after, he returned to Prague, to continue his theological studies, and in 1776 became tutor in the family of the Count von Nostitz. During the years 1780—1787, he edited a critical journal of Bohemian and Moravian literature. This soon involved him in various strifes, and ultimately the review was 'stopped' by the authorities, but not before it had added largely to D.'s reputation. In 1792, at the expense of the Royal Bohemian Scientific Society, he made a journey to Denmark, Sweden, and Russia, to search after the fate of those Bohemian books and MSS. which the Swedes had carried off from Prague during the Thirty Years' War. Two years after, he traveled through Germany, Italy, and Switzerland. On his return, he manifested symptoms of a disordered mind, and in 1801 had to be confined for some time. He speedily recovered, but was subject to intermittent fits of insanity until his death, which happened January 6, 1829. D. is reckoned one of the highest, if not the very highest, authority on all matters connected with Bohemian history and literature. His principal productions are—*Scriptores rerum Bohemicarum* (Prag. 2 vols., 1783—1784); *Geschichte der Böhm. Sprache vno ältern Literatur* (Prag. 1792); *Die Bildsamkeit der Slaw. Sprache* (Prag. 1799); *Deutsch-Böhm. Wörterbuch* (2 vols., Prag. 1802—1821), in which he was largely assisted by other eminent Bohemian scholars; *Lehrgebäude der Böhm.-Sprache* (Prag. 1809); and *Institutiones Linguae Slavonicae Dialecti Veteris* (Vienna, 1822).

DOBRU'DSCHA, or DOBRUDJA (anciently *Scythia Minor*), a region formerly Turkish, now belonging to Rumania, lies between the lower Danube and the Black Sea; the Berlin Congress of 1878, in transferring it to the principality, fixed the southern limit formerly somewhat indefinite, at a line from Silestria on the Danube to Mangalia on the sea-coast. The north-east of this region is occupied by marshes and the delta of the Danube; the rest of the area is partly steppe and partly cultivated corn-land. The inhabitants comprise a few Bulgarians and Rumanians, Tartars, Circassians, Osmanli Turks, Greeks, Armenians, and Jews. Salt is manufactured, and fishing carried on.

DOCETÆ (from the Gr. *dokeo*, to appear or seem) was the name given in the early church to those heretics who held that the human nature of Jesus Christ was a semblance and not a reality. The philosophers of polytheism, as well as of Judaism, had explained the appearances of divinities and of angels by holding that the assumption of bodies was only momentary, or in appearance. And when the Gnostic Christians found it impossible to conceive the essential union of the divine nature with a body composed of matter, which they held to be the seat of all evil, they had recourse to the same expedient.

The difficulty was got over in one of three ways: the body of Christ was either considered a real earthly body, but not belonging essentially to his nature, and only assumed for a time; or it was declared to be a mere appearance or illusion; or, finally, it was believed to be a heavenly body, composed of ethereal substance, though having the appearance of being material. All the Gnostic heretics held Docetism in one or other of these three forms, with the exception of those who were led by the same difficulty to deny the divine nature of Jesus Christ, and reduce him to a mere human sage. While the first of these alternative forms of heresy seems to have completely died out, the last, under various names, has continued to the present time. For a clear and learned account of Docetism, consult Neander's *Dogmengeschichte* (History of Doctrine). English by J. E. Ryland; published by H. G. Bohn, in 2 vols., 1858.

DOCK (*Lapathum*), a sub-genus of the genus *Rumex*, the other species of which are generally called *SORREL* (q. v.), containing those which are not acid, and of which the flowers are hermaphrodite. They are large perennial herbaceous plants, natives chiefly of temperate climates, with large generally lanceolate or ovate leaves, and panicles of small greenish flowers. They have great tap-roots, and are with difficulty eradicated from pastures. They also multiply rapidly by seed. The best mode of dealing with them, is generally found to be repeated cutting away of their leaves and shoots, by which the plants are killed. Many of the species prefer watery places. A number are natives of Britain, and several of the European ones have found their way to North America, where they have become troublesome weeds, a number of really indigenous species being also found there. Useless and even troublesome as the D. is generally esteemed, yet the large

astringent roots are capable of being beneficially employed in medicine; and those of the great Water D. (*R. hydrolyapathum*) in particular—for which the Druids entertained a superstitious veneration—are administered as an antiscorbutic. They are also employed in rheumatism, and sometimes as a styptic, sometimes to form an astringent gargle, and sometimes as a dentifrice. *R. alpinus* is called *MONK'S RHUBARB*, and its root was formerly employed instead of rhubarb, but is less powerful. It is a native of the Alps, and has been found in several places in Britain.—The roots of docks have been sometimes used in dyeing, and give 'a great variety of shades, from straw-color to a pretty fine olive, and a fine deep-green to cloths which have been previously blued.'

DOCK, an enclosure for the accommodation of shipping, and of which there are three kinds—viz., wet or floating; tidal, which may with more propriety be called harbors or basins; and dry or graving. Wet Docks are for the purpose of maintaining a level nearly uniform with that of high-water, so as to keep vessels always afloat, and to save them from rubbing up and down the quays with the rise and the fall of the tide, and being sometimes too high and at other times too low for convenience in shipping or discharging cargoes.

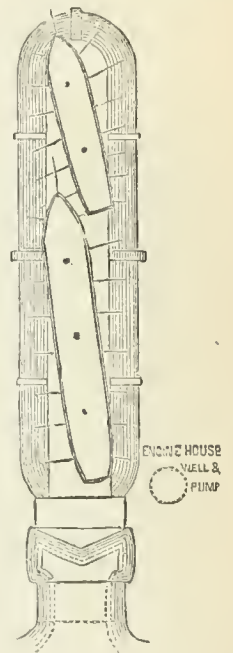
Wet docks are generally surrounded by quay or wharf walls of masonry or brickwork, but where they are wanted chiefly for laying up vessels in, and not for loading or unloading, their margin is sometimes only a natural sloping beach. They are of most importance in places where there is a great rise and fall of tide, such as at Bristol or Liverpool, where they are almost indispensable; while, again, in the Clyde, where the tides are small, they have not long been erected, and are on a much more limited scale. Wet docks are generally entered by means of what is called a lock (see LOCK), having two gates, in one leaf, or more frequently in two folding leaves each, which enables vessels to enter or depart for a considerable time before and after high water; but frequently for the sake of economy both in space and in cost, they have only one gate, so that vessels can only enter or depart at or very near high water, unless the water in the dock be run down considerably below that level.

The water in wet docks is sometimes kept, by means of pumping permanently at as high a level as that of the highest tides, when a supply of pure water can be procured, to prevent the silting caused by the admission of any considerable body of turbid water by the gates, but that involves the necessity of locking up or down always except at the highest tides. The tendency to silt up by deposits of fine mud is of common occurrence, and dredging, or some other plan, must be resorted to for the purpose of keeping the dock reasonably clear. In almost all cases, wet docks require to be occasionally emptied for the purpose of cleaning.

Dock-gates are generally opened and shut by means of chains worked by hand, either by winches or capstans; but of late years they have in some cases been moved by hydraulic machinery, as at Great Grimsby, the Victoria Docks in the Thames, and Albert Dock, Leith.

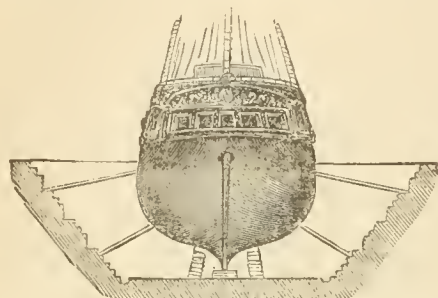
Tidal docks require no particular description; they are merely basins surrounded by quay walls, and having open entrances permitting the free flow and ebb of the tide, as at Greenock and Troon, and they have the advantage of requiring no opening or shutting of gates. With small tides, they answer very well, and they are sometimes made deep enough to keep vessels afloat at low water; but with tides of considerable range they are attended with the disadvantage of large vessels grounding at low-water, and from the large volume of water, generally more or less turbid, which enters at every tide, they are much more liable to silt up than wet docks are. For ridding them of muddy deposits, the plan is sometimes resorted to of letting out a reserve of water with a sudden gush from an enclosure at the inner end, at the time the tide has receded. This is called scouring. Such is the process pursued at Boulogne and elsewhere.

The quays of wet and of tidal docks must have mooring-ports or rings for making vessels fast to. They are generally provided with sheds to keep goods dry, with cranes (see HYDRAULIC CRANE) for shipping or unloading heavy articles, and with staiths or drops in the case of coal-shipping ports, and now they very frequently have rails laid along them.



Plan of Dry Dock.

Dry docks are used for the purpose of laying vessels dry for examination or repairs. They may have their entrance either from a wet dock or from a tidal harbor; but the former is by much the better arrangement, as it admits of vessels being docked or taken out at any time of tide, and it keeps a more equal pressure on the gates, thereby making them less liable to leak. They require to be built of good water-tight masonry. The entrance has generally a pair of folding-gates pointing outwards, to exclude the water; but sometimes it is closed by means of a caisson—viz., a vessel shaped something like the hull of a small ship, and having a keel and two stems, which fit into a groove in the masonry. The caisson is sunk into the groove by admitting water into its interior, and is floated out again by pumping out the water. When the tides are very large, the bottom of the dock may sometimes be placed above low-water, so that it may be run dry without pumping; but generally the bottom of a dry dock for the re-



Section of Dry Dock

ception of any but very small vessels is below that level, in which case a steam-engine and pumps, with a well and water-channels leading to it, are required for emptying the dock. The floor is nearly level, and the keel of the vessel to be docked rests on wooden blocks fastened down to prevent them floating, and of such a height as to admit of the shipwrights getting under the vessel's bottom. Side-shores are put in, to keep the vessel in an upright position, and blocks are fitted in under the bilges as soon as possible after the water has been got out of the dock. The sides generally consist of stone steps called altars, for the purpose of fixing the lower ends of the shores, and also for the convenience of supporting the workmen's scaffolds. Dry docks are frequently made long enough to hold three or four vessels of considerable size at one time, in which case they are placed, not in the center line of the dock, but obliquely across, so as to give more available length.

The use of the graving dock is frequently superseded by that of Morton's patent-slip. See SLIP. Graving-docks of large dimensions are very expensive works, and the difficulty of making them water-tight is very great. In many cases, therefore, recourse is had to a pontoon or floating-dock, sometimes termed a 'camel.' See FLOATING-DOCK. The use of the floating-dock, together with the application of hydraulic pressure for the raising of ships, is to be seen at the 'Thames Graving-Docks,' where there are two rows of cast-iron columns, five feet diameter, and 16 in each row. The rows are 60 feet apart, and the practical working length is 350 feet. Each column encloses a hydraulic press of 10 inches diameter, with a length of stroke of 25 feet. There are cross-heads on the top of each ram, from the ends of which cross-girders extend across the dock to the corresponding column on the opposite side, which girders form a large wrought-iron gridiron or platform, which is raised or lowered at pleasure with the vessel upon it. When a vessel is to be repaired, an open pontoon is selected to suit its dimensions, which is sunk in position to the bottom of the dock, and resting on the iron gridiron. After the vessel is floated over the pontoon, the whole is raised by the hydraulic presses, and the pontoon being emptied of water, sustains the weight of the vessel to be repaired, and is then floated away into some convenient part of the dock-yard.

Liverpool has twenty graving-docks, many of them being 600 feet, and some 750 feet in length. No docks in the world are on so splendid a scale as those of London, Liverpool, and Birkenhead, which are of immense area, covering hundreds of acres. Surrounded with substantial stone quays, provided with gates, placed under a proper police, and otherwise managed in a costly manner, these, as well as nearly all other docks in Great Britain, require to be supported by rates levied from the vessels resorting to them; and for levying these rates, powers are taken in the acts of parliament authorizing the construction of the respective docks. Sometimes the dock dues or rates are imposed on vessels in bulk according to tonnage, and in other instances, the rates are so much per ton, according to the nature of the goods. The Liverpool dock receipts are above £1,000,000 a year. Generally, the dues are

complained of as being a heavy burden on commerce; but so enormous is the cost of constructing docks, that the joint-stock companies by which they are for the most part owned do not often realize good returns for their investments. The most remarkable circumstance connected with English docks, is the rapid extension of the dock-system on the Mersey at Liverpool. The original old dock contained an area of 3 acres 1200 yards, and 557 lineal yards of quay space. The total quay space is now above 20 miles.

DOCK WARRANTS are orders or authorities for the removal of goods and merchandise warehoused in the various docks. The orders are granted by the proper officer at the docks, on application of the importer, in favor of any one whom the latter shall name. Careful rules as to obtaining warrants are laid down by the East and West India Dock and the London Dock Companies. These rules are, in a great measure, followed by the other dock companies in the kingdom. Unless the rules are complied with, goods will not be delivered from the docks. Warrants may be obtained for either the whole or a part of a cargo consigned. A warrant may be assigned by the holder. A single warrant may also, at the desire of the holder, be divided into smaller warrants, and these also may be assigned. In case a warrant is lost, a new warrant will not be issued till the loss has been advertised, and the holder furnish the company with an engagement to indemnify them for any loss which may arise.

DOCK-YARD BATTALIONS, prior to the establishment of volunteer corps, formed a special element in the British military service, intended chiefly for the defence of the royal dock-yards. It was in 1847 that an item first appeared in the estimates of £20,000 for training and exercising about 9000 men in these battalions. Clerks, artisans, and laborers formed the body. The colonel was a naval officer, and commissions were given to the other officers. The men received remuneration for the time lost in drilling. A few hours per week in summer were set apart for drilling under the management of sergeants and corporals of marines. At first, the enlistment was voluntary; afterwards, compulsory. These battalions were abolished in 1861.

DOCK-YARDS, ROYAL. Under the names of the several towns where the royal dock-yards are situated, will be found brief notices of those establishments. Under the present heading, a few remarks may be useful concerning the whole of them collectively.

Most of the royal ships are built by the government, at one or other of the dock-yards at Portsmouth, Plymouth, Sheerness, Chatham, or Pembroke. Each of these establishments comprises covered slips on which the ships are built, docks in which they are kept, and all the appliances for rigging them out for sea. Boat-building and mastmaking are also carried on; and in some, though not all of the yards, rope-making, sail-making, anchor-forging, block-making, and other manufacturing operations connected with the finishing and furnishing of ships. There are also arrangements connected with the storing of guns and other munitions of war. The yards at Plymouth, Gosport, and Deptford are limited to large establishments for victualling the navy; while, of the dock-yards proper, some have appliances for supplying seamen's clothing and necessities; some for repairing steam-machinery for war-steamer; one (at Chatham) for making most of the articles in copper and brass required by the navy. To enable our ships to be repaired and refitted abroad, there are royal dock-yards at Gibraltar, Malta, Halifax, Bermuda, Jamaica, the Cape of Good Hope, Ascension, Trincomalee, and Hong-kong.

Since the creation of a steam-navy, and the large substitution of iron for wood in ship-building, an increasing proportion of the royal ships are built in private yards. All the dock-yards are under the Admiralty, and each is governed by a distinct set of officers responsible only to that department. The chief officer, called the superintendent, is generally an admiral, but sometimes only a captain; and the office is deemed an honorable recognition of past services. The superintendent controls all the other officers, and all the artificers and laborers employed; examines the accounts, authorizes the payments, and is responsible for the stores. When a new ship is to be built, or other work executed, the superintendent receives general instructions from the Admiralty while special instructions are conveyed to other officers more immediately concerned with the actual working. In yards where steam-machinery is repaired and fitted, engineers form an important part of the establishment. The artisans of the dock-yards comprise shipwrights, caulkers, joiners, smiths, millwrights, block-makers, sailmakers, ropemakers, &c.; while under these is a large body of laborers.

In 1879—1880, £1,355,000 was voted for the dock-yards at home and abroad, chiefly salaries and wages to artificers. These charges are exclusive of all materials, and are for the dock-yards only, as distinguished from the victualling yards; which latter cost £76,570 in 1879—1880. There is a separate vote for stores and materials for building and fitting out vessels for the fleet. Severe strictures have been made from time to time upon the management of our dock-yards. Several committees and commissions have been ap-

pointed to investigate the causes of defects, and to suggest remedies; and the reports issued on the subject have been from time to time laid before parliament.

DOCTOR (Lat. *docere*, to teach), a teacher. Originally, the word doctor was used, in accordance with its etymological derivation, to signify a teacher in general, and it was not till the 12th c. that it became a title of honor for the learned, irrespective of the function of communicating knowledge. It had frequently appended to it, in those early days, some additional expression intended to characterize the peculiar gift of its possessor. Thus, Thomas Aquinas was called the Doctor Angelicus; Bonaventura, the Doctor Seraphicus; Alexander de Hales, the Doctor Irrefragabilis; Duns Scotus, the Doctor Subtilis; Roger Bacon, the Doctor Mirabilis; William Occam, the Doctor Singularis; Gregory of Rimini, the Doctor Authenticus; Joseph Gerson, the Doctor Christianissimus; Thomas Bradwardine, the Doctor Profundus; and the like. The word had long been used, even in the universities, as a general expression for a teacher before it came to designate a degree or rank in the learned hierarchy to which only the united body of the teachers could advance or promote the candidate. These formal promotions commenced at Bologna in the 12th c., and the learned Irnerius, the regenerator of the Roman law at that period, is said to have introduced the ceremonial which was afterwards universally adopted.

Irnerius, however, is a sort of mythical hero in university history, and such statements with regard to him must be received with caution. See **PROMOTION**. The university of Paris almost immediately followed in the footsteps of Bologna, the first reception of doctors having taken place in the year 1145, in favor of Peter Lombard and Gilbert de la Porrée, the greatest theologians of the day. Subsequently to this period, the emperors were in use expressly to confer upon the universities the right of appointing doctors of laws by their authority and in their name. The example of the emperors was speedily followed by the popes, who conferred corresponding rights with reference to the canon law. From the 11th to the 13th c., there seems reason to believe that, both in Italy and France, the terms master and doctor were pretty nearly synonymous. In the German universities, the professors of theology were more commonly known as masters; and in the beginning of the 15th c., in accordance with the practice of the university of Prague, the distinction was pretty consistently made between doctors of law and medicine, and masters of theology and philosophy. In modern times, the title of Doctor has been applied almost everywhere to the three faculties of Theology, Law, and Medicine. In Germany, it extends to that of philosophy, in which, in this country, the older title of Master is still retained. The doctor's degree is, in general, conferred at the instance of the dean of the faculty to which it appertains. It is granted either on examination, and after the ancient form, at least, of publicly defending a learned thesis in Latin has been observed, or else it is an honorary degree, conferred in consideration of the general reputation of the recipient for eminence in some particular branch of learning, philosophy, or science. See **DEGREE**. In Germany, the doctor ranks before the untitled nobility and next to the knight; and amongst themselves, doctors take the rank of the faculties to which they respectively belong, the first being theology, the second law, and the third medicine. In Oxford and Cambridge, and recently also in the German universities, doctors of music have been created. In the latter country, also, learned ladies have occasionally shared the honors of the doctorate. Dorothea Schlözer received the degree of doctor of philosophy from the university of Göttingen in 1787; Mariane Charlotte von Siebold, that of medicine from Giessen in 1817; and Johanna Wittenbach, in philosophy, from Marburg in 1827. Of the four ancient degrees of Bachelor (q. v.), Master of Arts (q. v.), Licentiate (q. v.), and Doctor, the modern university of France has retained only those of bachelor, licentiate, and doctor. Up to the period of the revolution, the highest consideration attached to the title of Doctor of the Sorbonne (q. v.)—that famous theological faculty, which was called 'the perpetual council of the Gallican church,' and of which the present faculty of theology of the Academy of Paris is but a feeble and lifeless reproduction. But though the degrees of the Sorbonne continued to enjoy, and apparently to merit, some degree of respect, such was by no means the case with those of the other schools of learning in France. Furettiére, in his Dictionary, defines a bachelor as a man who learns, and a doctor as a man who forgets. The ridicule of Voltaire, La Fontaine, Le Sage with his Doctor Sangrado, and Molière in the *Malade Imaginaire*, will readily occur to our readers as illustrating the position which was then held very generally by French doctors.

In England, the doctor's degree was not introduced into the universities till the reign of John or of Henry III. At first it was a very rare and highly prized honor, and the ceremony of conferring it was attended by scenes of feasting and revelry, of which curious accounts will be found in Antony a Wood's *History and Antiquities of the University of Oxford*. Colored engravings

of the dresses worn by doctors of the several faculties at Oxford and Cambridge are given in Ackermann's Histories of these Universities. As to professional uses of the degree of Doctor of Civil Law, see **DOCTORS COMMONS**.

DOCTORS COMMONS, formerly the college of the doctors of civil law in London, wherein the Court of Admiralty and the principal ecclesiastical courts were held. It was founded by Dr. Henry Harvey, Dean of the Arches, previous to which time the doctors had lived in Paternoster Row. The original building was burned in the great fire in 1666, when the doctors removed for a time to Exeter House. After some time the Commons was rebuilt, and the doctors returned to their former quarters. The courts which had been wont to hold their sittings at Doctors Commons are—the Court of Arches, the Archdeacon's Court, the Prerogative Court, the Faculty Court, the Court of Delegates, and the Court of Admiralty. The Prerogative Court is now amalgamated in the Probate Court (q. v.), and the Court of Delegates (q. v.) is transferred to the Judicial Committee of the Privy Council. At the time when these courts were all in full operation, their times of session were regulated by terms, as in the courts of equity and common law, a certain day in the week being assigned to each court for hearing its causes. The Court of Arches, the Archdeacon's Court, the Faculty Court, and the Court of Admiralty, have been changed, and no longer continue to exercise their functions in this once famous spot. The Court of Arches (so called from having sat in *Arcubus*, or under the arches or bows of Bow Church, Cheapside) is the court of appeal belonging to the Archbishop of Canterbury. The judge in this court is styled Dean of the Arches, and he has jurisdiction, as the archbishop's principal official, in all ecclesiastical causes within the province of Canterbury. He has original jurisdiction, also, in certain causes by *Letters of Request* (q. v.). It was by virtue of letters of request that matrimonial causes were tried in the Court of Arches; but this branch of its jurisdiction is now removed to the Divorce Court (q. v.). The Archdeacon's Court is an inferior court for the consideration of ecclesiastical questions occurring within the archdeaconry. For an account of the other courts mentioned in this article, see the several heads to which they refer. The practitioners in the several courts to which we have alluded were the doctors of civil law, called in the ecclesiastical courts advocates and proctors, who performed similar duties to those of attorneys or solicitors in the courts of law and equity.

Both classes of practitioners required, in order to their admission to practice, to obtain the fiat of the Archbishop, and afterwards to be duly admitted by the Dean of the Arches. The form of admission was in both cases attended with much ceremony. The doctor elect was introduced to the presiding judge by two doctors habited in their scarlet robes. The candidate then made a short Latin speech, and was admitted to practise in the courts. The habit of the doctors is a scarlet robe with a hood, trimmed with taffeta or white miniver. The proctors were, in like manner, introduced by two senior proctors. In 1857 power was given by 20 and 21 Vict., c. 77, to dissolve the College of Doctors Commons and sell the property. The proctors received compensation, and all solicitors are allowed to act as proctors, and all proctors were turned into solicitors, all being alike solicitors of the Supreme Court, 21 and 22 Vict., cc. 95, 108; 23 and 24 Vict., c. 27; 33 and 34 Vict., c. 28, s. 30; 40 and 41 Vict., c. 25, s. 17. Nevertheless the old names continue, and will no doubt only by degrees cease to be used in reference to ecclesiastical courts and proceedings. For a full account of Doctors Commons, see Stowe's *London*.

DOCTRINAIRE (a French term derived from doctrine) signifies, properly, the scientific taking up and exposition of a subject, as opposed to a treatment which is merely external, and which rests on accidental characteristics. In general, however, it is used as a term of reproach, to characterize views which are pedantic, schoolmasterly, and unpractical. In this sense it was applied in France, during the Restoration, by the reactionary court-party to the fraction of the parliamentary opposition, who supported scientific doctrines of constitutional liberty against the arbitrary will of the monarch. This party, which had its rallying-point in the salons of the Duc de Broglie, was led in the chamber by Royer Collard, and supported in the press and before the public by Guizot, and the younger members of what afterwards became the Orleans party. The development of the constitution on the basis of the *charte* of Louis XVIII., was the watchword of those men; but their real inspiration was derived from England. When the revolution of 1830 occurred, they became the advisers and ministers of the king of the French, and were more deeply imbued with the principles of constitutional monarchy than any other political party that has ever existed in France. The true fathers of the *doctrinaires* were Mounier, Lally Tollendal, Clermont Tonnerre, Talleyrand, and the Abbé Montesquieu; and the cradle of the party was the original *comité* of the constitution, which, about twenty-five years before, elaborated the *charte* of 1814. Its later representations

sentatives found a center in the court of the exiled Queen Marie Amalie at Claremont, and a vigorous supporter in her gifted son, the Duc d'Angoulême.

DOCTRINE. See DOGMA.

DODD, THE REV. WILLIAM, LL.D., was born in 1729 at Bourne, in Lincolnshire; was educated, in the first place, at a private school; and was admitted, in 1745, as a sizar to Clare College, Cambridge, where, after five years of study, he took his degree of B.A. Shortly after, he removed to London, received orders from the bishop of that city, and soon afterwards gained a reputation as a popular preacher and as a successful littérateur. Through his celebrity as a divine and man of letters, and by means of flattering the great, he succeeded well in London, and in 1763 was appointed tutor to Philip Stanhope, the fifth Earl of Chesterfield. His habits, however, were very expensive, and an income of £800 per annum, even when augmented by the produce of his literary labors, was not sufficient to supply his wants. This extravagance proved his ruin, as it tempted him to forge the signature of his former pupil, the Earl of Chesterfield, to a bond of £4200. For this crime he was arrested in February 1777, and though he refunded the money, he was tried, convicted, and executed on the 27th of July. His writings are numerous and varied. His *Beauties of Shakespeare* (2 vols., Lond. 1753) is well known, as are also his *Reflections on Death* (1763), and *Thoughts on Death*, a poem composed during the time that intervened between his conviction and execution.

DO'DDER (*Cuscuta*), a genus of plants referred by some botanists to the natural order *Convolvulaceæ*, and regarded by others as the type of a small distinct natural order, *Cuscutaceæ*; which differs from *Convolvulaceæ* in the habit of the plants, leafless climbing parasites, with flowers in dense clusters; in having scales on the tube of the corolla alternate with its segments; and in having a spiral thread-like embryo, lying in a mass of fleshy albumen, whilst the cotyledons are so small that the embryo has been described as destitute of them. There are about fifty known species of *Cuscutaceæ*, chiefly found in the warmer temperate parts of the globe. The name D. is often extended to all of them. One or two species of *Cuscuta* are natives of Britain, parasitic on leguminous plants, heath, thyme, hops, nettles, &c. A species of D. is very injurious to crops of flax in Germany, and leguminous crops often suffer from this cause in the south of Europe. The seed of D. germinates in the ground, but the stem soon seeks to attach itself

Flax Dodder (*Cuscuta Epilinum*).

to plants by little rootlets which it sends out, and the original root dies. The appearance of D. has been described as resembling 'fine, closely tangled, wet catgut.'

DO'DDRIDGE, PHILIP, D.D., an eminent dissenting preacher and author, was born in London in the year 1702, and educated for the ministry at a theological academy at Kibworth, in Leicestershire, presided over by a Mr. John Jennings. In 1722, he became pastor of the dissenting congregation at Kibworth, and in 1729 received a call to Northampton, where he also became president of the theological academy now removed from Kibworth to that town. Here he continued to preach and train young students for the ministry till within a short period of his death, which occurred October 26, 1751, at Lisbon, whither he had gone for the benefit of his health. D. was a man of the most amiable character, deep piety, and extensive accomplishments. His principal work is *The Rise and Progress of Religion in the Soul* (1750). It has been translated into Dutch, German, Danish, and French. Besides this, may be mentioned *The Family Expositor* (6 vols., 1760—1762); his *Course of Lectures*, delivered to the students under his charge, and published by the Rev. Samuel Clarke (1763); and a great variety of sermons on miscellaneous religious topics. D. also wrote a considerable number of hymns, which hold a high rank among those used by English and Scotch dissenters.

DODECAGON. A regular polygon of twelve equal sides and angles. See REGULAR PLANE FIGURES.

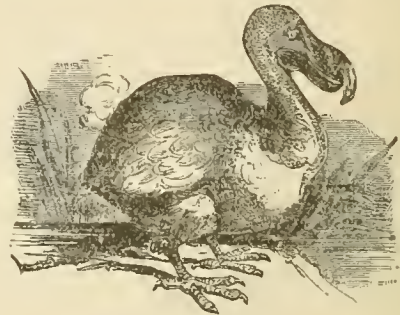
DODECAHEDRON, one of the five regular solids, is bounded by twelve equal and regular pentagons. See REGULAR PLANE FIGURES.

DODERLEIN, LUDWIG, a German philologist, was born at Jena, 19th December 1791; studied at Munich, Heidelberg, Erlangen, and Berlin; and in 1815 was appointed professor of philology at the academy of Berne. About the year 1820, he went

to Erlangen as second professor of philology, and in 1827 became first professor and also director of the philological seminary. He died in 1863. His principal works are *Latinitische Synonymen und Etymologien* (6 vols., Leip. 1826—1838); *Latinitische Wortbildung* (Leip. 1838); *Handbuch der Lat. Etymologie* (Leip. 1841); *Homeric Glossarium* (3 vols., 1850—1855). D. also edited several classical works, such as the *Ædipus Coloneus* of Sophocles, and the *Opera* of Tacitus.

DO'DO (*Didus*), a large bird, one ranked among the *Brevipennis* (along with the Ostrich, &c.), now commonly placed in a sub-family of the *Columbida* (the Pigeons), although exhibiting very anomalous peculiarities; but still more interesting because, whilst it appears to be now completely extinct, its extinction has taken place very recently, and through the agency of man. The D. (*D. ineptus*) was the only species of its genus, and is known to have existed less than two hundred years ago. It is described by several voyagers of the 16th and 17th centuries, and seems to have been brought alive to Europe. It was entirely confined to the island of Mauritius; the Solitaire (*Pezophaps solitaria*) of Rodriguez, also extinct, being a very different bird.

The D., according to the descriptions given of it by those who saw it, and which are confirmed by pictorial representations, apparently not unworthy of confidence, was a bird larger than a swan; of a very heavy, clumsy form and corresponding gait, with short thick scale-covered legs; three rather short toes before and one behind; large head, very large bill, the upper mandible longer than the under, and much hooked at the point; the wings so short as to be of no use for flight, and furnished only with a few black feathers; the general plumage a kind of grayish down; the tail merely a tuft or bunch of curiously curled feathers. The D. was so abundant when some of the first voyagers visited Mauritius, that they became satiated with its flesh, although they describe it, particularly the breast, as good for food. The birds were easily killed, being wholly unable to fly, and running slowly. Their speedy extinction after the island began to be visited and settled, is thus easily accounted for. The D. seems to have been adapted for living in tropical woods, where the luxuriant vegetation afforded



Supposed figure of the Dodo.

it a ready supply of food, and its powerful hooked bill, which has led some naturalists to assign it a place among birds of prey, was probably intended for tearing vegetable and not animal substances. However singular this bill is in a struthious bird, it has been well remarked that it is not more so than the very different bill of the *apteryx*.

There are rude figures of the D. in several works of the 17th c., and in particular one, evidently superior to the rest, in Bontius (edited by Piso, 1658)—who calls the bird *Dronte* or *Drodaers*—which perfectly corresponds with the description given of it, with a painting preserved in the British Museum, said to have been drawn in Holland from the living bird, and with a representation of it discovered by Professor Owen in 1838 in Sawyer's picture of Orpheus and the Beasts at the Hague, which he thinks 'must have been copied from a study of the living bird. The skeleton has been partially reconstructed, and described by Professor Owen. Many bones of this extinct bird were discovered in 1865, when extensive marshes in the island were partially drained. There are bones at Paris, Copenhagen, and Haarlem. A foot of the D. is amongst the valued treasures of the British Museum. In the Ashmolean Museum at Oxford are a head and foot; but the stuffed specimen formerly there was allowed to decay, and finally destroyed in 1755 by order of the curators.

DODONA, a city of Epirus, the seat of the oldest Grecian oracle there, is situated in one of the wildest districts south-west of the Lake of Janina. The Greek and Egyptian accounts of its origin differ. The priest of Jupiter in Egyptian Thebes related that two holy women were carried off from that city by a party of Phœnicians, one of whom was sold in Libya, the other to the Greeks, and that these women founded the oracles at D. and Ammon. The inhabitants of D. related that two black doves took their flight from the city of Thebes, in Egypt, one of which flew

to Libya, the other to D.; that the latter perched upon an oak, and with a human voice commanded that an oracle should be founded on the spot.

Herodotus is of opinion, that if the Phœnicians did actually carry off the two women already alluded to, one of them was probably sold into Greece; that the strange language and dark complexion had caused them to be likened to birds; and that when they became acquainted with the Greek tongue, they were said to have spoken with a human voice. Later authors ascribe the founding of the city to Deucalion. The sanctuary itself was dedicated to Jupiter, who manifested himself from the boughs of an oak, probably by the noise of the wind through the tree. This was explained by the priests, who were termed Selloi or Helloi. The goddess Dione, by some said to be Aphrodite, by others Hera, afterwards appeared by the side of Jupiter, and the place of the priests was occupied by priestesses, who announced the will of the deity. D., though not equal in renown to Delphi, was yet frequently consulted on occasions of importance both by the Spartans and Athenians. Though the city of D. was destroyed in 219 B.C. by the Ætolians, it recovered at a later period, and was in existence in the 6th c. A.D. See *Dodone et ses Ruines*, by Carapanos (1878).

DO'DSLEY, ROBERT, author and publisher, was born in 1703 near Mansfield, in Nottingham. His father, who is said to have been a schoolmaster, apprenticed him to a stocking-weaver; but finding this employment unsuitable, D. ran away, and was afterwards engaged as footman. While thus employed, he devoted his leisure moments to reading and the cultivation of letters, and eventually published in 1732, a volume of poems, entitled *The Muse in Livery, or the Footman's Miscellany*. His next production, *The Toy Shop*, a dramatic piece, was submitted in manuscript to Pope, who undertook to recommend it to Rich, the manager of Covent Garden Theater. It was acted under Rich's management in 1735 with great success. The proceeds resulting from the publication of these his first two works enabled D. to commence business as a bookseller, in which trade he was very successful. In 1737, his *King and the Miller of Mansfield* was brought out at Drury Lane, and met with an enthusiastic reception. This was followed by *Sir John Cockle at Court*, *The Blind Beggar of Bethnal Green*, and *Rex et Pontifex*, which were republished in a collected edition of his dramatic works with the title of *Trifles* (1748). Meantime, he was conducting his business with such ability and spirit, that in the course of three years after commencement he was in a position to buy copyrights. In 1738, he bought Johnson's *London*, giving for it no more than ten guineas. His most successful work was a tragedy called *Cleone*, which was acted at Covent Garden with extraordinary success. On its publication, 2000 copies were sold the first day, and within the year the work ran through four editions. With *Cleone* he closed his career of dramatic authorship. D. was connected either as contributor or publisher, and occasionally as both, with several magazines. He is, however, chiefly remembered now on account of his *Select Collection of Old Plays* (12 vols. 8vo, 1780); and his *Collection of Poems by Several Hands* (4 vols. 12mo, 1748). Besides the volume entitled *Trifles*, another volume of his collected works was published in 1772 under the title of *Miscellanies*. He died in 1764.—See Knight's *Shadows of the Old Booksellers* (1865).

DOE, JOHN, the fictitious plaintiff in ejectment, whose services are dispensed with since the abolition of the fiction. See EJECTMENT.

DO'FFER is that part of a carding-machine which takes the cotton from the cylinder when carded. See CARDING.

DOE'SBOROUGH (*Drususburg*), a town in the Netherlands, province of Gelderland, lies 11 miles east-north-east from Arnhem, on the right bank of the Yssel. It was formerly fortified, but the walls have been broken down, planted with trees, and formed into pleasant promenades. An entrenched camp has been constructed on the north-east side, between the Yssel and Old Yssel, which here unite. The streets are broad, and many of the houses handsome. There are several benevolent institutions, a grammar-school, boarding-schools for boys and girls, and good public schools. The trade is considerable. Ship-building, book-printing, the making of Eau de Cologne, preparing mustard, &c., are carried on. Pop. (1877) 4517.

DOG (*Canis*), a genus of digitigrade (q. v.) carnivorous (q. v.) quadrupeds, which, as defined by Linnaeus, included all that now form the family *Canidae* (q. v.), and also hyenas. In the genus as now restricted, wolves and jackals are generally included by naturalists, along with those animals to which alone the name Dog is popularly applied, and a distinctive character of principal importance is found in the pupil of the eye, which is always round—contracting circularly, whilst in foxes it assumes the form of a section of a lens when contracted. The present article is limited to dogs in the common acceptation of the term, wolves and jackals being the subjects of separate articles; and only remarks relative to dogs

in general will here find a place, many of the particular kinds being sufficiently important to be separately noticed.

At the very outset we encounter one of the most perplexing and difficult questions in natural history, as to the number of *species* of dog, and the origin of the domestic dog; two questions in appearance but rather one in reality, and one on which the opinions of the most eminent naturalists are very much divided. According to some, all domestic dogs are to be regarded as of one species; and as in the case of some other valuable domestic animals, that species is not certainly known to exist in a truly wild state, all the wild dogs which must be admitted to belong to the same species, being viewed as the offspring of domestic dogs which have returned to a wild state, and in which, however, it is supposed that the original type or characteristics of the species, modified by domestication, have in a great measure reappeared. According to others, there are numerous species of dog, originally distinct, which have been domesticated by the inhabitants of different countries, but which, however, are very nearly related not only in their physical characters but in their dispositions and in some of their principal instincts, and which were capable of intermixing, not perhaps indiscriminately, but within certain limits, and so as to produce new races.

By some who hold the first of these opinions, it is further maintained that the wolf and the dog are one species, and that all domestic dogs are derived from the wolf; whilst others advocate the claims of the jackal to be regarded as their original parent and type. By some of those who hold the species to be numerous, it is supposed not improbable that the blood of wolves and of jackals may be mixed in some of the domestic races with that of the original dogs.—It is impossible for us to do more than state these different views, and a few of the principal arguments by which they are supported.

It is admitted on all hands, that there is great diversity among the different kinds of domestic dogs, many distinct races having long existed, which differ not only in size and other physical characters, but to a notable extent also in dispositions and instincts; it is further admitted that there appear to be no definite limits to the possible intermixture of these races with each other. So great is the diversity of physical characters, that naturalists of the greatest eminence almost acknowledge themselves incapable of pointing out any that are common to all dogs, and yet distinguish them all from the different species of wolves and jackals; and in fact, the *recurved tail*, not apparently a character of the first importance, is named by Cuvier himself as the most certain and unvarying specific distinction. The obliquity of the eyes of wolves is also contrasted with the more forward direction of those of dogs, which is accounted for—in favor of the theory of wolfish origin—by the supposition that it results from 'the constant habit, for many successive generations, of looking forwards to their master, and obeying his voice.'—Bell's *British Quadrupeds*. This, on the other side, is treated with ridicule; it is certainly a transition from the region of observation and ascertained fact to that of mere theory and conjecture. In size, dogs differ so widely that one is not as large as the head of another; the difference in form of body, head, or limbs, is almost equally great between the Newfoundland Dog or the Mastiff and the Greyhound. The gradations, however, from one form of character to another, render it impossible to draw a fixed limit. In some races of dog, the hind-feet as well as the fore-feet have five toes, instead of four, which is more common; but this has not been much insisted on as a ground of specific distinction. Greater value ought perhaps to be attached to the want in some, as the Dholes (q. v.) of India, of the second tubercular tooth in the lower jaw; the hairiness of the soles of the feet of some is perhaps also not unimportant; and in favor of the opinion that domestic dogs have originated from an intermixture of several species, it has been urged that the number of teats in the female varies, and that there is sometimes even a difference between the number on one side and on the other, which has never been observed to be the case in wild dogs, and in them the number in the same kind is always uniform. Some of these points, however, have not received the investigation necessary to a confident determination of the measure of importance which ought to be assigned to them.

It seems to have been too hastily taken for granted, in favor of the opinion that there is only one species of dog, that all the wild races, even the dholes and the dingo, have sprung from domestic progenitors. There is certainly no evidence of this; and the fact that wild races exist, exhibiting marked diversities of character, in countries widely remote and of very different climates, is referred to with confidence on the other side, as affording at least a strong presumption in favor of the supposition that man has, in different countries, domesticated the species which he found there. We do not yet know enough of the amount and limits of the changes which circumstances and climate may produce, to warrant any confident conclusions on that ground. And if we were to adopt the views of those who ascribe least to such causes, we might yet demand them to show why, although

from certain original types no mixed race can originate, there may not yet be other original types capable of such combination, or why the limits must be held equally impassable between all that were framed by an original act of creation. That there was only one original pair of the human race, may be held, without our of necessity holding that there was only one original pair of dogs. But to this consideration due place has, perhaps, scarcely been given.

That the common fox—or any species of fox—is a parent of any race of dogs, is not the opinion of any naturalist. Some dogs have a somewhat fox-like appearance, and indeed it is now generally admitted that the dog and fox will breed together, but as it has not been proved that the individuals of the cross will breed together, this fact does not warrant the assertion that the dog and fox belong to the same species. Instances of commixture between the dog and wolf have occurred in greater numbers, and without the compulsion of confinement, but in this case, too, the only recognized proof of identity of species—namely, the permanent fertility of the progeny—is wanting.

In favor of the specific identity of the dog and wolf, one of the strongest arguments is drawn from the equality of the period of gestation—63 days. But it may be remarked that an inequality of the period would have afforded a much stronger argument on the other side.

Against the identity of the dog and wolf, the difference of disposition has been strongly urged. In reply, it is shown by well-authenticated instances that the wolf is very capable of that attachment to man which so remarkably characterizes the dog. There is greater value, perhaps, in the argument of Colonel Hamilton Smith, that 'if domestic dogs were merely wolves modified by the influence of man's wants, surely the curs of Mohammedan states, refused domestic care, and only tolerated in Asiatic cities in the capacity of scavengers, would long since have resumed some of the characters of the wolf.'

Buffon's notion, that the shepherd-dog is the original type of the whole species, from which all dogs are derived, is merely fanciful, and his endeavor to support it by a comparative view of the different kinds, only exhibits a certain amount of ingenuity.

The shepherd's dog is one of the kinds of dog having greatest development of brain, but it is still greater in the spaniel. The skulls of dogs, however, neither exhibit very marked distinctions when compared with each other, nor when compared with those of wolves and jackals.

It is universally believed that the diversity of color exhibited by many dogs is a result of domestication, as it is neither found in those which may be supposed to exist in a state of original wildness, nor in those wild races which are certainly known to be the progeny of domestic dogs, a return to uniformity of coloring being apparently one of the most speedy consequences of a return to wildness. Black, reddish-brown, and white, the uniform colors observed in wild dogs, are, however, the colors which chiefly appear mixed in domestic races.

Pendulous ears are generally regarded as another result of domestication in dogs, as in rabbits; and it is certain that the wild races known have erect and pointed ears; but no wild race has been discovered at all corresponding to the mastiff in some of its other most notable characters, particularly the shortness of the muzzle, and depth of the chops, and it has therefore been conjectured that this and kindred races may have derived their origin from some wild dog of the interior of Asia, which has not yet come under the notice of any scientific observer.

The dog has been a domestic animal from a very early period. The earliest allusions to it are in the books of Moses, but they indeed correspond with the dislike and contempt still commonly entertained for it by many of the nations of Southern Asia. By Homer, however, it is very differently mentioned; and 'there is not a modern story of the kind which can surpass the affecting simplicity with which the poor dog's dying recognition of his long-lost master is related by one who wrote, probably, not less than 2700 years ago.' The sculptures of Nineveh, and the hieroglyphics of Egypt, attest the very early domestication of the dog, and the existence of races similar to some of those which exist at the present day; and the high value attached to it by many nations is further attested by the place assigned to it, or its image, as emblematic of the attributes which they ascribed to their gods. We do not now set so high a value on the dog, in consideration of mere usefulness to man, as on some of the other domestic animals; yet to the savage it is perhaps the most important of all, and some have supposed that by its aid the subjugation of other animals may have been first accomplished. Cuvier makes the strong assertion, that the 'dog is the most complete, the most singular, and the most useful conquest ever made by man.' The dog, far more than any other animal, becomes a humble friend and companion of man, often seeming actually to know and sympathize with the joys and sorrows of his master; and on this account it is, that he is alike 'the pampered minion of royalty and the half-starved partaker of the beggar's crust.'

The uses to which the dog is applied are numerous, and correspond, in some measure, not only with distinct physical characters, but with remarkably distinct instincts of different breeds. Thus, whilst in some countries dogs are chiefly employed as beasts of draught, particularly for sledges in the frozen regions of the north; and in other countries chiefly for the chase, the exquisite scent of some kinds, and the remarkable fleetness of others, variously recommending them for this use; we find them also rendering important services in the care of sheep and other cattle, and endowed with hereditary instincts wonderfully fitted for this purpose, and we find them, with like adaptation of instinct, highly valuable in watching and protecting the abodes and properties of their masters. Not the least interesting of the employments to which the dog has been devoted by man, is that of leading about the blind, which is often done with an intelligent and affectionate solicitude highly worthy of admiration.

Anecdotes illustrating not only the instincts, but the intelligence and affection of dogs, are familiar to every one, and form one of the most pleasing parts of many a book of natural history. Attractive to children, they are worthy of all the consideration which they can receive from the most philosophic mind. Volumes have been filled, and more volumes might easily be filled, with anecdotes well authenticated, and well worthy of preservation.

The dog produces usually from six to ten young ones at a birth. They are born blind, open their eyes about the tenth or twelfth day, attain their full growth in about two years seldom live more than twelve or fifteen years, and almost never more than twenty.

No satisfactory classification of the different kinds of dog has ever been made. What some naturalists regard as types of species, others pronounce to be mere mongrel races. Nor can any principle of arrangement be found in form, roughness or smoothness of fur, or other such character, which will not associate kinds that are in other respects widely dissimilar, and separate some that are nearly allied.

Colonel Hamilton Smith arranges domestic dogs in six groups or sections: 1. 'The Wolf Dogs,' including the Siberian Dog, Esquimaux Dog, Iceland Dog, Newfoundland Dog, Nootka Dog, Sheep Dog, Great Wolf Dog, Great St. Bernard Dog, Pomeranian Dog, &c. 2. 'The Watch and Cattle Dogs,' including the German Boar-Hound, Danish Dog, Matin, Dog of the North American Indians, &c. 3. 'The Greyhounds,' including the Brin-jaree Dog, different kinds of Greyhound, Irish Hound, Lurcher, Egyptian Street Dog, &c. 4. 'The Hounds,' including the Bloodhound, Old Southern Hound, Staghound, Foxhound, Harrier, Beagle, Pointer, Setter, Spaniel, Springer, Cocker, Blenheim Dog, Water Dog or Poodle, &c. 5. 'The Cur Dogs,' including the Terrier and its allies. 6. 'The Mastiffs,' including different kinds of Mastiff, the Bull Dog, Pug Dog, &c. Colonel H. Smith does not include in any of these groups the dholes, dingo, &c., which he even separates from the genus *Canis*.—Mr. Richardson arranges dogs in three great groups, indicated by the least variable part of their osteological structure, cranial development.'

1. Including the Irish Wolf Dog, Highland Deerhound, all kinds of Greyhounds, and the Tiger Hound, characterized by *convergent* parietal bones, an elongated muzzle, and high and slender form. 2. Including the Great Dane, the French Matin, the Pariah of India, the Bloodhound, Staghound, Foxhound, Harrier, Beagle, Pointers, Terriers, Turnspit, Newfoundland Dog, Labrador Dog, Pomeranian Dog, Esquimaux Dog, Siberian Dog, Iceland Dog, Shepherd's Dog, &c., characterized by *parallel* parietal bones, and generally by much acuteness of smell. 3. Including Mastiffs, the Great St. Bernard Dog, Bull Dog, Pug Dog, &c., characterized by sensibly *divergent* parietal bones, bulk of body, robust structure, and combative propensities.

DOG (in Law). The keeping of vicious or destructive dogs, or other animals, except under proper precautions, is illegal; and the proprietor is liable for the damage which they occasion in all cases in which it cannot be clearly shown that the fault lay with the party injured. Even before the injury occurs, it is competent to enforce measures of precaution. If a man have a dog which he knows to be of a savage nature, and addicted to bite, and he allow it to go in a frequented place without being muzzled or otherwise guarded so as to prevent it from committing injury, he may be indicted in England as for a common nuisance. If the dog be of a ferocious kind, as a mastiff, it has been held that he must be muzzled (1 Russ. 303); and it will be no defence in an action of damages against the master, that the person injured trod on the dog's toes, for he would not have trodden on them if they had not been there (3 Car. and P. 188). The harboring of a dog about one's premises, or allowing him to resort there, will warrant indictment (McHone and Wood, 5 C. and P. 2). If a dog known to his proprietor to have previously bitten a sheep, be retained by him, the proprietor will be liable to all subsequent injuries even to other animals, as, e. g., a horse. (Burn's *Justice of the Peace*, vol. ii. p. 333.) In Scotland, a warrant may be obtained, on proof of

vicious practices and danger to the public, either from the sheriff or the justices, on a summary complaint, to have a dog secured or slain, and the owner found liable in expenses. The complaint may be at the instance either of the fiscal or of a private party, with or without the fiscal's concurrence. An interdict may be granted against the dog going loose pending the discussion of the question as to whether or not he ought to be killed. Many local police acts contain provisions as to shutting up or muzzling dogs during the prevalence of weather likely to produce hydrophobia; and where such do not exist, the subject may be dealt with by the magistrate at common law. Formerly, the common law of England held that it was not larceny to steal any of the baser animals, in which class all dogs, except those of value, were included. But by 7 and 8 Geo. IV. c. 29, dog-stealing was declared to be an offence punishable by fine. This act was repealed, and new regulations of a more stringent kind made by 8 and 9 Vict. c. 47. By that enactment dog-stealing is a misdemeanor, punishable, on summary conviction, for the first offence, by six months' imprisonment and hard labor, or fine not exceeding £20 beyond the value of the dog.

The second offence is an indictable one, punishable by fine or imprisonment and hard labor not exceeding eighteen months, or both. Similar punishment is provided for persons found in possession of dogs or dogs-skins knowing them to have been stolen. A dog going into a neighbor's field does not afford ground for an action of trespass unless he does mischief; and even then the person who kills him in certain circumstances, may be liable in damages (2 Marsh. 584). The use of dogs for purposes of draught was prohibited under a penalty by 2 and 3 Vict. c. 47. The Dogs Act of 1871 provides that stray dogs may be detained and sold or destroyed by the police.

Tax on Dogs.—The duty charged on every dog above the age of six months is 7s. 6d., but there are exemptions in favor of sheep-dogs used for herding, blind men's dogs, and young hounds till over twelve months old. From 1868 to 1878 the dog-tax was 5s., no exemption being allowed save to dogs under six months old: before 1868, it was 12s., shepherds' dogs being exempt.

DOG'BANE (*Apocynum*), a genus of plants of the natural order *Apocynaceæ*, having bell-shaped flowers, no style, and the fruit a long linear follicle. Some of the species are shrubby, some herbaceous; some extend into colder climates than is usual for plants of this order. The D. of North America (*A. androsaemifolium*), a perennial herbaceous plant about four feet high, with smooth stem, much milky juice, smooth ovate leaves and whitish rose-colored flowers, growing in open barren places from Georgia to Canada, is valued for the medicinal properties of the bark of its root, which is emetic, diaphoretic, and in small doses tonic. The root of CANADIAN HEMP (*A. cannabinum*) a plant noticed on another account in the article *Apocynaceæ*, possesses similar properties, and is frequently used in the United States.

DOG-DAYS. See CANICULAR DAYS.

DOG-DRAW. An apparent apprehension of an offender against venison in the forest. Dog-draw is where any man hath stricken or wounded a wild beast by shooting with a cross bow, long-bow, or otherwise, and is found with a hound or other dog drawing after him to receive the same.—Cowel's *Interpreter*.

DOGE (equivalent to *duke*) was the name of the chief magistrate, possessing princely rank, in the republics of Venice and Genoa. Dogate or dogado, both from the Latin *ducatus*, duchy, is used to indicate the dignity of doge. We find doges of Venice elected by the people, but enjoying almost the rights of absolute monarchs, as early as the beginning of the 8th century. Their power, however, was considerably reduced towards the end of the 12th c., through the creation of a Great Council, composed of 470 members, chosen from nobles as well as citizens, and invested with legislative power. These afterwards appointed six of their own number to superintend the doge in the exercise of his executive power. Further, the *pregadi*, or nobles, who formerly were admitted by the doge to a share in the public affairs, were organized into a regular board of administration, numbering 60 members. By the new constitution, the people, too, lost the most essential of their rights—viz., the right of electing the doge. This right was now changed into a privilege belonging exclusively to the Great Council, whose members elected 24 from among themselves, and these latter again elected, by ballot, 12 of their own number, upon whom devolved the

right of appointing a doge. Sebastiano Ziani was the first doge thus elected, 1177; and on the occasion of his elevation to office, he scattered money among the people, to console them for the loss of their rights—an act which was imitated by his successors, and soon became a recognized custom, as was also the case regarding the manner in which he went through the ceremony of wedding the Adriatic Sea. The Pope Alexander III., whom, during his quarrels with the Emperor Frederic I., the doge had faithfully supported, sent him, together with other privileges, a ring, as the symbol of domination the republic had acquired over the Adriatic. Accordingly, a marriage-ceremony took place on Ascension Day—a ring being thrown from the ship *Bucentaur* into the sea, to show that as the wife is subject to her husband, so is the Adriatic Sea to the republic of Venice. The practical bearing of the ceremony soon appeared in the shape of stringent measures, regulating the navigation of the Adriatic, and imposing tribute upon all foreign ships. The power of the doge underwent, in 1179, a signal modification; the Treble Quarantia—a high court of justice, composed originally of 40 members—having been erected, as also the board of *Adveogadori*, for the settlement of fiscal questions instituted. During the reign of Jacopo Tiepolo (1229—1249), a new restriction arose from the creation of an independent police, and a still greater one from the formation of a tribunal consisting of three inquisitors and five correctors, who, on the demise of a doge, had to examine his conduct, sifting the minutest particulars of his private life. All these changes were effected by the Great Council, to the thorough exclusion of the people.

In 1268, the Great Council, in order to cut short all family influence upon the affairs of the state, devised a curious and extremely complicated mode of election; but notwithstanding the limitations new and old, the power of a doge continued great, if he was only wise enough to profit by the contentions between nobles and citizens, the disputes of the different authorities, and especially by his own position as commander-in-chief of the forces and high-admiral of the navy. This last prerogative of the doge remained in vigor up to 1628, when, by a formal enactment, the doge was prohibited the exercise of such command, unless he were authorized by the Council of Forty. Other privileges, however, belonging originally to the dogate, were abrogated or circumscribed long before this, and especially during the period 1289—1311. Thus, at the instigation of the doge, Gradenigo, who was actuated by jealousy towards the mighty family Tiepolo, the famous law of 'closing the Great Council' was passed, and by it the whole legislative and judicial power made the heirloom of those families whose names were inscribed in the Golden Book, or *Libro d'Oro*. About that time (1309), ecclesiastics of any degree were declared unfit for political or judicial functions. To counterbalance the influence of discontented nobles, a public feast was instituted—to come off yearly—at which the doge gave a dinner to the fishermen, fraternizing with them in testimony of equality. Shortly before Gradenigo's death, that terrible tribunal, the Council of the Ten, was erected, which was to be the highest in the state, irresponsible, and entitled to pass judgment upon the doge himself. In the meanwhile, the Great Council managed to get the functions, public as well as private, of the doge circumscribed in the minutest way. It was ordered that the doge should not announce his accession, except to the princes of Italy; neither was he permitted the opening of dispatches emanating from the popes or from princes; the kissing of his hands, or kneeling down in his presence, was strictly interdicted. He could not leave town, be possessed of real property abroad, or allow his children to contract matrimonial connections with foreign houses, accept donations, &c. He had to submit to the continued presence of two *adveogadori*, to be fined for the least mistake, and bear the expenses of the ducal dignity from his own purse. To all these restrictions and burdens the doge declared himself liable on the occasion of his coronation, by signing a document headed 'Promissione.' The state costume and retinue of the doge were minutely defined, and a trifle fixed as his salary. As a symbol of princely dignity, the doge wore a horned cap, and had the title of Serenity. The credentials of ambassadors were written in his name, but signed by a secretary of state, and sealed with the arms of the republic. The money was struck in his name, but not with his stamp or arms. All the magistrates rose and saluted the doge when he came into council, and the doge rose to none but to foreign ambassadors. His family was exempt from the jurisdiction of the Master of the Ceremonies; and his children, though excluded from public offices, were allowed to have staff-officers, and gondoliers in livery.

After the death of And. Dandolo, 1354, on a motion from the correctors, the three presidents of the quarantia, and later six ministers, were joined to the six privy-councillors of the doge, who, together with the above-named, has formed henceforward the so-called Signoria Serenissima. At that stage the rank of doge could no longer be an object of ambition, and as early as 1339 a law was necessary to prohibit the doge elected from resigning his place. And. Contarini, 1367, accepted the proffered



Dogbane:

a, end of branch, with leaves and flowers; b, a flower cut open; c, fruit.

dignity only upon the threat of being declared a traitor to the country. In 1413, by a law emanating from the Great Council, the doge was even denied the title of Signoria, that of Messere being substituted instead; at the same time he was deprived of the right of convening an *arengo* or meeting of the people. With the fall of the Venetian republic, 1797, the dignity of doge also disappeared. There were in all 73 doges at Venice, the first of whom, Anafeste (Paoluccio), was elected 697; the last, Manin (Lodovico), 1788. In the Palazzo Ducale, the celebrated frieze of the doges is to be seen round the Sala del Maggior Consiglio, exhibiting 72 portraits, and one space covered with a black veil, with an inscription, indicating that Faliero (Marino) was beheaded for high treason.

The republic of Genoa elected, after a victory gained by the party of the people (1339), Simon Boccanera for its first doge. He was elected for life, and with absolute power, of which, however, he allowed a share to 12 aldermen (*anziani*), the one-half being chosen from the *cittadini* (citizens), the other among the *nobili* (nobles). In the long run of centuries, the power, duration, and splendor of the ducal seat underwent frequent changes, arising from the vicissitudes of the state and the hostilities between the popular and aristocratic parties. A constitution for defining the functions and prerogatives of the doge was framed in 1528, after the great victory of And. Doria over the French. According to this constitution, which, with slight modifications, remained till the end of the Republic, the dignity of doge was of two years' duration, under restrictions similar to those at Venice. The candidate was to be a noble, and at least 50 years of age. The doge presided, with the right of veto, in the sittings of the Great Council, composed of 300 members, as also in those of a smaller one, consisting of 100. These two councils exercised the legislative power, whereas the executive was vested in the doge, together with 12 *governalori* and 8 *procuratori*, among these latter being always the doge retiring. During the time of his government, the doge resided in the state palace, where he was liable to the same restrictions and ceremonies which were in use at Venice. When, in 1797, Genoa was occupied by the French, the dogate ceased to exist; in 1802, the Genoese Republic being, conjointly with the Ligurian, re-established, the ducal dignity was once more resuscitated; but in 1804, it disappeared for ever, the Republic itself having been dissolved.

DOG-FISH. the popular name of some of the smaller species of shark; apparently owing its origin—like the names Porbeagle, Hound, &c., bestowed on others of the same family—to their habit of following their prey like dogs hunting in packs. Of the species to which the name D. is given on the British coasts, one of the most abundant is that sometimes called the COMMON D. (*Acanthias vulgaris*), also known as the PICKED (i. e., spiked or spined) **DOGFISH.** It belongs to the family *Spinacidae*, of which one characteristic is the presence of a spine before each of the two dorsal fins; and which is further characterized by having spiracles or spout-holes; by having five gill-openings on each side all before the pectoral fins; and by having no anal fin, and no nictitating membrane of the eye. The body is long and tapering; the head flat; the snout conical; the teeth in both jaws sharp-edged, and formed for cutting. The tail-fin is longer than it is broad. The upper parts are slate-gray, the under parts are yellowish-white; the skin very rough when rubbed from tail to head, but seeming quite smooth when rubbed in the contrary direction. This fish uses its spines in a remarkable manner, bending itself into the form of a bow, and unbanding with a powerful spring; and 'if a finger be placed on its head, it will strike it without piercing its own skin.' It attains the length of three or four feet. It is very widely distributed, being found in the Atlantic, the Mediterranean, and the South Seas. It causes great annoyance to fishermen, by cutting the hooks from their lines, and still more by frightening away the shoals of herring, in which other kinds of D. share the blame with it. It sometimes appears in prodigious numbers; 20,000 have been taken in a net at one time on the coast of Cornwall; and the fishermen of the Orkneys and Hebrides sometimes load their boats to the water's edge with them. The flesh, although coarse, is dried and eaten; the livers yield oil, and the refuse parts are used as manure.—The other British dogfishes belong to the genus *Scylium*, of the family *Scyllidae*, which have an anal fin, and two dorsal fins placed far back. They resemble in general form the species just

described, and like it, they have a tail-fin longer than it is broad—they have five gill openings on each side—the last of which,

however, is over the base of the pectoral fin. They have spout-holes, and no nictitating membrane; but their teeth are very different, having a long central point, with shorter points on each side. The SPOTTED D. of two species (*S. canicula* and *S. catulus*), both of a generally reddish-brown color, and marked with dark spots, is often taken with bait on all parts of the British coasts; and although almost never brought to market, is much used for food in the Orkney Islands. It has been suggested that the fins of these and other sharks might be used for making gelatine soup, as in China.

DOG-FOX, a name sometimes given to certain small animals of the family *Canidae*, allied to the *Corsac* (q. v.), and, like it, referred to the genus *Cynalopex*. They have a sharp muzzle, not unlike that of a greyhound, rather large, erect, pointed ears, the pupil of the eye contracting circularly as in the dog, the tail bushy like that of a fox. They inhabit warm parts of Asia and Africa; and some, if not all of them, burrow.

DOGGER is a vessel something like a galliot or a ketch, used by the Dutch as a fishing-boat in the German Ocean. It is not certain whether these were named after the Doggerbank, or *vice versa*.

DOGGERBANK, an extensive flat sand-bank in the middle of the German Ocean, between England and Denmark, in lat. 54° 10'—57° 24' N., and long. 1°—6° 7' E. It stretches 320 miles east-north-east, from 12 leagues east of Flamborough Head to within 20 leagues of Jutland. A prolongation runs east towards Horn Point, Denmark. The bank is in some parts 60 miles broad, but the average breadth is 40. Towards the English coast, it is only 9 fathoms deep, in some parts it is 30, but the average depth is 15 to 20. The surrounding sea is in many parts 24 to 60 fathoms deep. The surface of the bank consists chiefly of fine sand and ooze. It is the seat of important English and Dutch cod-fisheries. At the south end of D., in 1781, occurred the indecisive naval fight between the Dutch and English fleets, under Admirals Zoutman and Parker respectively.

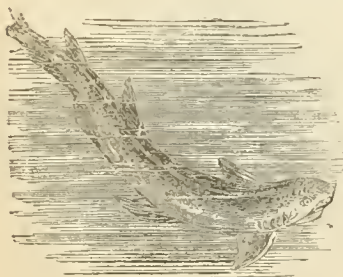
DOGGET'S COAT AND BADGE. These form a prize at a rowing-match on the Thames every year on the 1st of August. The prize is a bequest of Thomas Dogget, an actor of Drury Lane Theater, who desired to signalize the accession of George I. to the throne (August 1, 1715) by a prize of a waterman's coat and badge. Such is the account usually given; it would appear, however, from the following notice in the *Times* newspaper (August 2, 1861), that there are several prizes rowed for on this occasion. 'The first prize is a livery and badge given by Mr. Thomas Dogget, deceased, to which the Fishmongers' Company add a guinea. The second and third prizes are respectively five-eighths and three-eighths of the interest on £260, 17s. 3d., formerly £200 South Sea Stock, left in the will of Sir William Jolliffe, the amounts respectively being £4, 17s. 9d., and £2, 18s. 9d. The prize for the fourth man is £1, 11s. 6d., and for the fifth and sixth men each £1, 1s., the last three given by the company.' Besides these prizes, additional sums are occasionally given by private individuals to the winner, or to the first, second, and third in the race. The competition is by six young watermen whose apprenticeships have expired the previous year; each being in a boat by himself, with short oars or sculls. The barge-master of the Fishmongers' Company is ordinarily the umpire. The competition takes place when the current of the Thames, by recession of the tide, is strongest against the rowers; and the race, which is from London Bridge to the Old Swan at Chelsea, always excites much local interest, being one of those manly sports in which the English take much pleasure.

DOG-GRASS. See COUGH-GRASS.

DOGLIA'NI, a town of Piedmont, Northern Italy, is situated in a mountainous district on the left bank of the Rea, 12 miles north-east of Mondovì. D. has the remains of an old castle, but no other buildings worthy of note. Here five annual fairs are held, at which cattle, hemp, and victuals are chiefly sold. Pop. 2000.

DOGMA (Gr.), meant originally an opinion or proposition, put in the form of a positive assertion, its truth being supposed to have been previously shown. In theology it was understood to signify a doctrine founded on Scripture, and advanced not for discussion but for belief. But as this method of stating truth easily degenerates into the assertion of opinions without ground, and without regard to the aspect they may present to others, *dogma* and *dogmatism* have come in English to be almost synonymous with assertion without proof.

In continental theology, however, the word is still used without implying any censure, Dogmas (Ger. *dogmen*) meaning simply doctrines; and this is the case in our own expression, Dogmatic Theology, or Dogmatics, which is that branch of theology that treats of the systematic arrangement of the doctrines of Christianity. Older names for the same thing were *Loci Theologici* and *Theologia Positiva*.—The first attempt to give a connected view of Christian doctrine was made in the 3d c. by Origen in his work *De Principiis*. He was followed in the 4th c. by Augustine, who in his



Dogfish.

described, and like it, they have a tail-fin longer than it is broad—they have five gill openings on each side—the last of which,

book *De Doctrina Christiana*, and others, treated of the whole body of doctrine held by the church, though without any very scientific arrangement. The contributions to Dogmatic, made in the 5th, 6th, and 7th centuries, were mere collections of 'sentences.' In the East, in the 8th c., the doctrines of the Greek Church were treated by John of Damascus in a form already Aristotelian, and his work may be considered the first systematically arranged treatise on Dogmatic. He makes no mention of purgatory. His book was as influential in the Greek Church as the writings of Augustine in the Latin. The regular systematizing of doctrines began with the SCHOLASTICS in the 11th c., but degenerated often into hair-splitting. The first cultivators of Dogmatic theology among the Scholastics were Hilbert of Tours and Abelard, who were followed by Petrus Lombardus, Alexander de Hales, Thomas Aquinas, Duns Scotus, &c.

The era of the Reformation awoke Dogmatic to a new life, leading it back from Aristotle to biblical theology. But the controversies between the different churches in the 17th c., and the too great importance attached to Confessions of Faith, cramped anew its freedom, and gave it again a Scholastic turn. Many of our still standard treatises on systematic divinity wear traces of these fetters, and contrast strikingly with the independence and vigor of inquiry displayed in the similar works of Melancthon, Calvin, and other reformers.

A fresh revival followed in Germany the spread of the critical philosophy of Kant, when biblical theology rose up in contradistinction to the theology of confession, and dogmatic was grounded on the critical interpretation of Scripture rather than on traditional formulas. Hence, however, have sprung widely diverging views. One party still held fast by the existing confessions; another looked chiefly to the contents of Scripture; while a third subjected confessions and Scripture alike to the test of reason. Besides these, there arose in more recent times, a school of dogmatic theologians, formed on the philosophical systems of Jacobi and Schelling, who looked for the essence of religion in the human soul itself, and considered Christianity as the historical revelation of it. Of this school, Schleiermacher, and in some respects Neander and Rothe also, may be considered the representatives; and of all the German schools, it is that which seems to be exercising the greatest influence on the speculative theology of Britain. An important contribution to this department of theology was Peter Lange's *Philosophische Dogmatik* (2 vols., Heidelberg, 1849—1851). The Dogmatic of D. F. Strauss is constructed from the Hegelian point of view, and in its leading results comes back to the system of Spinoza.

It deserves remark that Christian dogmatic and morality, which it had been the custom to discuss separately since the 17th c., have recently been treated in combination by Nitsch and Beck. The scientific investigation of Christian doctrine in Germany has not been confined to the Protestant churches. A number of Catholic theologians have occupied themselves with this branch of sacred science; some, as G. Hermes of Bonn, inclining to freedom of investigation, and others, as Liebermann, to the defence of the usual formulas.

The HISTORY OF DOGMAS OR DOCTRINES has been raised in Germany to the rank of a distinct branch of sacred science. In this country, the facts with which it deals have received only passing notice in treatises on systematic theology, and in ecclesiastical history have been considered as the 'internal history of the church.' The pursuit of this branch of inquiry is characteristic of Protestantism; in the Catholic Church, it is considered as endangering the unity of the faith. Many Protestants even dislike the idea of a 'development' of Christian doctrine, which seems to be involved in its having a history. It is not necessary, however, to believe that doctrines hitherto absolutely unknown or denied, came from time to time to be embodied in the orthodox creed of Christendom. See DEVELOPMENT. Though this may be denied, it remains an indisputable fact that the several doctrines came one after the other into prominence in the consciousness of the church; and that in each period of her history there is some one leading doctrine which assumed an importance, as if it were the mainstay of Christianity. To depict this succession or evolution of views with their struggles and modifications, and trace the different ways in which the several doctrines were at different periods formulated and embodied in the creeds, is the object of a History of Doctrines (Ger. *Dogmengeschichte*). There is, of course, room for great variety in the method of treating such a subject. Among the most important works on this subject is Neander's, edited by J. L. Jacobi, 1856 (English transl. 1858), and that of F. C. Baur (1847), whose name marks an era in this branch of study.

DOGS, ISLE OF, or *Poplar Marshes*, a small peninsula in the county of Middlesex, England, formed by a circuitous winding of the Thames, is situated in the vicinity of London, distant three and a half miles east-south-east from St. Paul's Cathedral. It is about a mile long, and three-quarters of a mile broad. In what

may be called the isthmus of the peninsula are situated the West India Docks. It is said that the Isle of Dogs derives its name from the circumstance that the king's hounds were formerly kept here.

DOGS. See ANDIRON.

DO'G-SHORE. See LAUNCHING.

DO'G'S-TAIL GRASS (*Cynosurus*), a genus of grasses having a pretty close spike or ear, each spikelet with two equal glumes and 3—5 florets, and beneath each spikelet a comb-like bract or involucre. The species which are not very numerous, are chiefly natives of Europe and Asia. Two are found in Britain, but one only is common and valuable, the CRESTED D. G. (*C. cristatus*), which forms an important part of almost all good pastures, and is particularly esteemed for sheep pastures and lawns for the improvement of which it is often sown. Its herbage is fine and close, and its deep roots secure it against droughts, which cause many other grasses to wither; but the herbage is not sufficient in quantity to make it desirable for hay.—The comb-shaped bract connected with each spikelet for this common grass is a very interesting and beautiful object. The seeds are small, shining, and yellow, whence the name *Gold-seed* sometimes given to this grass by farmers.

DO'GWOOD, or DO'GBERRY, the name usually given to some of the arboreous and shrubby species of the genus *Cornus*. See CORNEL. The common D. of Europe (*C. sanguinea*), a native of Britain and many parts of the continent, and also of the north of Africa, is a shrub of 4—15 feet in height, with ovate leaves, and terminal cymes of greenish-white flowers, which have an unpleasant odor. The leaves become of an intense dark-red color before they drop off in autumn. The wood makes the very best charcoal for gunpowder. It is very hard, and is made into skewers for butchers and cooks, and into cogs for wheels. The young wood was, in former times, in request for the making of arrows. The fruit, which is small, dark purple, and very bitter, yields an oil said to be equal to that of the olive, and to the amount of 34 per cent. of its weight. This oil is used in France for lamps, and for the manufacture of soap.—The D. of North America (*C. florida*) is a small tree, found in the United States, from lat. 43° to Florida, with oval leaves, and small yellowish flowers, which are surrounded by large white roundish bracts. The berries are red, and remain on the tree most of the winter.

The flowers appear before the leaves, and their large white bracts are amongst the ornaments of the American woods in spring. The tree attains a height of 20—30 feet, with a trunk 8 or 10 inches in diameter. The wood is white, hard, fine-grained, much esteemed and used for inlaying and ornamental work. The bark is very successfully employed in the cure of intermittent fevers. It is also a valuable tonic. It is one of the most valuable medicinal products of North America. The barks of several other North American species of *Cornus* possess similar properties.—JAMAICA D. is *Piscidia erythrina*, of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, a good timber-tree, with hard and resinous wood, which lasts well either in or out of water; the bark of the root powerfully narcotic, used for stupifying fish, and also for relieving toothache, being applied to the tooth in the form of a saturated tincture, or taken into the stomach as a powerful sudorific.

DOI'LEY, or DOI'LY, a small napkin used at table for putting glasses upon during dessert. Some are highly ornamented. The name is said to be derived from the original maker; but more probably it is a modification of the Dutch *doek*, the same word as the English *towel*, and was introduced along with the article from Holland.

DOIT, a small copper coin current in Scotland during the reigns of the Stuarts. It was a Dutch coin (*duit*), and in value the 160th part of a guilder, which, estimated at 20*d.* sterling, would make the doit equal to the eighth of an English penny, or half a farthing. By some authorities it is said to have been worth only the twelfth of a penny; in reality, it is difficult to say what was its worth, for being imported, like many other coins of the period, from Holland, it would rise and fall in value according to the scarcity of money. The doit must have been common in the early part of the reign of James VI. The kirk-session of Perth



Common Dogwood :

a, branchlet, with leaves and flowers; b, fruit.

(16th April 1582) 'ordains James Sym to give the witch in the booth 8 doits in the day' for subsistence.

DO'KKUM, a town in the Netherlands, province of Friesland, lies 12 miles north-east from Leeuwarden, on the Ee (pronounced *ay*), which cuts it into two irregular parts. Within the town is a broad haven, suited both for sea-going and inland ships. There are several regularly built streets and many neat houses. The trade in flax, cattle, wool, and chicory is extensive. In the Dokkumerdiep, shrimps are largely taken. Ship-building, gin-distilling, beer-brewing, carding wool, &c., are principal industries. There are a grammar and other good schools. Pop. (1877) 4538.

DOLA'BRA, a rude ancient hatchet. They are represented on the columns of Trajan and Antoninus, and abound in all museums. When made of flint, which was their earliest and rudest form, they are usually called *celts* (q. v.).

DO'LCÉ, an Italian term in music, meaning softly and with tenderness.

DO'LCI, CARLO or **CARLINO**, a celebrated painter of the Florentine school, was born at Florence in 1616. He received his first instructions in art from Jacopo Vignali, a pupil of Roselli, and a remarkably skilful teacher. After an uneventful life spent entirely in his native city, D. died January 17, 1686. His works, which consist chiefly of madonnas and saints, exhibit the character attributed to him. The faces are full of a pleasing and tender softness, which, however, is often carried so far as to rob them of all character. D.'s drawing is generally correct, his coloring exquisitely delicate and transparent, and in the nicety and laborious care of his finish he approaches the most characteristic examples of the Dutch school. His works are numerous, and scattered over all Europe. Besides his madonnas, the most famous are his 'St. Cecilia,' 'Christ Blessing the Bread and Wine,' 'Herodias with the Head of John the Baptist,' and 'Christ on the Mount of Olives.'

DOLE (Lat. *dolus*, guile), in Scotland, the amount of conscious guilt or evil intention which is necessary to make a legal crime. A person incapable of consent is also incapable of *dole*—*doli incapax*, as it is technically called. The corresponding phrase in England is *felonious intent*.

DOLE, a well-built town of France, in the department of Jura, 28 miles south-east of Dijon. It is delightfully situated on a vineyard slope rising from the right bank of the river Doubs, and the environs are tastefully laid out in gardens and promenades. The principal building is an immense cathedral, named, in honor of the Virgin, *Nôtre Dame*. The chief manufactures of D. are hosiery, tiles, pottery, chemical products, and beer; there are also iron-smelting furnaces, flour-mills, and some trade in corn, wine, wood, marble, and iron. Pop. (1876) 12,009. D. is the *Dola Segunorum* of the Romans, of whose presence the ruins of two aqueducts, an amphitheater, several temples, and the 'street' or road which passed from Lyon through D. to the Rhine, still give indications. There are also the remains of a castle built by Frederick Barbarossa in the 12th century. D. is likewise memorable for having sustained several sieges.

DO'LE-FISH seems to be that fish which fishermen employed in the north seas do of custom receive for their allowance, 35 Hen. VIII. c. 7.

DOLES AT FUNERALS; these are of great antiquity. St. Chrysostom speaks of them as being given to procure rest to the soul of the deceased. On this ground, as well as on the score of general benevolence, the practice of making gifts to the poor at funerals was common until comparatively recent times; for it was continued, sometimes on a munificent scale, long after the custom of praying for the dead had been abandoned on the introduction of reformed doctrines. Nichols, in his *History of Leicestershire*, speaking of Strathern in Framland Hundred, observes of this usage: 'In 1790, there were 432 inhabitants, the number taken by the last person who carried about bread, which was given for *dole* at a funeral; a custom formerly common throughout this part of England, though now fallen much into disuse. The practice was sometimes to bequeath it by will; but, whether so specified or not, the ceremony was seldom omitted. On such occasions, a small loaf was sent to every person, without any distinction of age or circumstances, and not to receive it was a mark of particular disrespect.'

These doles, whether in money or in articles of food and ale, were at one time common not only in England, but in Wales, Ireland, and Scotland; and the custom may be said to have represented, in a simple state of society, that form of benevolence which, in the present day, consists of bequests to hospitals and other public charities. By some writers, the custom of making doles at funerals is traced to the sin-offering of the Hebrews. See Brand's *Popular Antiquities*, edited by Ellis.

DOLGE' LLEY ('dale of hazels'), the capital of Merioneth, North Wales, near the center of the county, and the largest town in it, is situated on the banks of the Wnion, 208 miles north-west by west of London. It lies in a rich and picturesque valley, at the foot of Cader Idris, and during the summer months is much frequented by English and foreign tourists. It has manufactures of coarse woollens and flannels; its Welsh Tweed is in great repute and demand throughout the kingdom; lamb and kid skins are tanned and dressed; and in the vicinity there are fulling-mills and bleach-greens. Pop. (1881) 2457. Here, in 1404, Owen Glendwr held a parliament, and signed a treaty of alliance with Charles king of France.

DO'LICHOS, a genus of plants of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, closely allied to *Phaseolus* (see **KIDNEY BEAN**), and chiefly distinguished by the extension of the base of the standard so as to embrace the wings of the corolla at their base. The genus includes a considerable number of species, some of them shrubby, some annual, and some perennial herbaceous plants. Some of them have beautiful flowers, and some of the herbaceous species are cultivated on account of their seeds, which afford a kind of pulse; or of their young pods, which, like those of the Kidney Bean, are boiled for the table. Among these are *D. Lablab*, a native of India and Egypt (which has been made the type of a separate genus, *Lablab*); *D. Nankinicus* (or *Lablab Nankinicus*), a Chinese species; *D. Lubia*, a native of Egypt; *D. sesquipedalis*, a native of America; *D. Soya* or *Soja hispida* (the Soy Bean), *D. Catjang*, and *D. unguiflorus* (Horse Gram), natives of India; *D. sphaerospermus* (Calavava or Black-eyed Pea), a native of the West Indies. In the climate of Britain, even the most hardy kinds require the aid of a little artificial heat, and they are reckoned inferior to other kinds of pulse or garden vegetables of easier cultivation. The well-known Chinese sauce or ketchup called **SOY** (q. v.) is made from the Soy Bean. Allied to D. is the genus *Canavalia*, to which belong the **SWORD BEANS** of India. *C. gladiata*, the commonly cultivated species, has pods two feet long. Another allied genus is *Psophocarpus*. The seeds of *P. tetragonolobus*, formerly *D. tetragonolobus*, are used in the Mauritius as peas are in Britain; and its pods and tuberous roots are common Indian esculents. Some species of *Pachyrhizus*, also an allied genus, are remarkable for their tuberous roots, as *P. angulatus* (formerly *D. bulbosus*), a native of India, now cultivated in South America and other warm countries, which produces pleasant turnip-like tubers; and *P. trilobus*, which has tubers two feet long and nearly cylindrical, much used as a boiled vegetable in China and Cochinchina.

DOLI'NA, a town of Austrian Galicia, in the circle of Stryi, 60 miles south from Stryi, on an affluent of the Swica. It has extensive salt-mines. Pop. of town and commune about 7000.

DOLL, an imitative baby used as a toy by girls. The word doll is of doubtful derivation; possibly from *idol*; in French, the name is *poupée*; in German, *puppe*, from Lat. *pupa*, a girl, a doll. The use of dolls dates from the most remote times, and is common in all countries, barbarous as well as civilized, because it springs from that love of nursing and fondling infants which is implanted by nature in the female character. Precisely as a child in a princely mansion in England fondles a finely dressed doll worth a guinea, so does the child of an African or Esquimaux take delight in a piece of wood or bone carved rudely in the form of a baby—in fact, girls in the humbler ranks may sometimes be seen hugging and talking to a bit of stick decorated with a few rags, as if it were a live child. This is not the place to discuss this curious psychological phenomenon; it is enough to say that the love of dolls is a perfectly legitimate feeling, and its exercise helps to cultivate not only tender affections, but taste as regards the making and management of children's dresses. Accordingly, the keeping of a doll becomes a part of the home-education of girls; and is recognized to be so by the universality of the practice.

As in the case of most other Toys (q. v.), dolls were at one time imported into Great Britain chiefly from the Netherlands; and hence not an unusual name for a doll was a Flanders baby. These old Flemish or Dutch dolls were made of wood, with neatly formed faces and flashy dresses, the cheaper kinds having slender wooden legs. Latterly, there have been great improvements in the making of dolls, and in England it has assumed the character of a manufacture; but there are still large importations from the countries on the Rhine, France, and Switzerland. In these continental countries, women and children are mostly engaged in the manufacture. Some carve the heads and bodies, others paint the faces and necks, others prepare legs and arms, and a different class cut out, sew, and put on the dresses. These operations are seldom executed in one manufactory. Usually, dealers buy the fragments so far prepared by villagers, and get them put together in a wholesale way. As the time employed in the preparatory processes is scarcely of any marketable value, the prices of fragments are most insignificant. Hence, as regards all the cheap kinds, with painted faces and ringlets, dolls can be imported at a

cost below that at which they could be executed by hand-labor in England.

When, however, we come to dolls of a superior kind, with moulded wax or composition faces, arms, and feet, glass-eyes, stuffed bodies, flaxen ringlets, and gauze dresses, the English, by their machinery and capital, carry off the trade. In London there is a considerable number of doll-makers, manufacturing dolls of wax, gutta-percha, india-rubber, &c. In this as in other trades, there is an economic division of labor; there are dolls' head-makers, dolls' leg and arm makers, doll sewers, doll stuffers, dolls' wig-makers, dolls' eye-makers, and doll dressers. For some dresses, remnants of calico, gauze, silk, and other materials, are procured from shops; but for fashionably dressed dolls, much in demand, it is necessary to buy goods on a large scale. The extent to which dolls' glass-eyes are manufactured appears surprising. Some years ago, in evidence before a committee of the House of Commons, a glass-manufacturer at Birmingham stated that he had received, at one time, an order for £500 worth of dolls' eyes. The cheaper dolls' eyes are simply small hollow glass-heads, made of white enamel, and colored with black or blue, but without any attempt at variety or effect; while those eyes of a higher quality have a ring of color to represent the iris. The introduction of wires and mechanism to make the eyes move or wink at pleasure, and also to cause the doll to utter the sounds 'papa' and 'mamma,' have been highly appreciated steps in advance, with a corresponding rise in prices. It is stated in the experience of the trade, that since Victoria came to the throne, blue eyes for dolls have been in the ascendant in England; but that black eyes find the best market on the continent, especially for Spanish dolls. Black dolls are made for export to America, where they are in request by girls of negro parentage, and the introduction of gutta-percha is favorable for this branch of the trade. Composition-heads are usually made of *papier mâché*, cast in a mould, and waxed and painted to represent the features.

One of the most attractive stalls at the Great exhibition in 1851, was that which contained the dolls of Madame Montanari, a London manufacturer. Referring to this stall, the Jury Report said: 'It consists of a series of dolls, representing all ages, from infancy to womanhood, arranged in several family groups, with suitable and model furniture. These dolls have the hair, eyelashes, and eyelids separately inserted in the wax, and are, in other respects, modelled with lifelike truthfulness. Much skill is also evinced in the variety of expression which is given to these figures, in regard to the ages and stations which they are intended to represent.' Some of those dolls were sold at five guineas undressed; and at a greatly increased price when richly attired. The same exhibition showed how much skill is now exercised in making rag-dolls, in which almost every part is formed of textile materials.

DO'LLAR is the name of a coin, and the unit in the monetary system of the United States. The origin of the name deserves notice. *Dollar* is a variety of the Ger. *thaler*, Low Ger. *dahler*, Dan. *daler*; and the word came to signify a coin thus: About the end of the 15th c., the Counts of Schlick coined the silver extracted from their mines at Joachimsthal (Joachim's Valley) into ounce-pieces, which received the name of Joachimsthalers—the Ger. adjective from the name of the place ('Joachimsthalers,' as it were). These coins gained such a reputation, that they became a kind of pattern; and others of the same kind, though made in other places, took the name, only dropping the first part of the word for shortness. The American dollar is taken from the old Spanish dollar or piastre, and is only slightly less. It was formerly only of silver; but in 1873 the gold dollar was made the unit of value in the United States. In 1878, however, silver was 'remonetized,' and so now shares with gold the rank of standard money. Since 1837, the silver dollar is required to contain 412½ troy grains, or 26.4246 Fr. grammes, the fineness of which is fixed at $\frac{17}{16}$, i. e., $\frac{1}{16}$ of it alloy. In the standard silver of Great Britain $\frac{1}{12}$ is alloy. The United States dollar is generally estimated in exchange at 4s. 2d. sterling. Besides dollars, there are coined in silver, *half-dollars*, *quarter-dollars*, *dimes* ($\frac{1}{10}$ dol.), *half-dimes* ($\frac{1}{20}$ dol.), and three-cent pieces. With regard to these, it was enacted in 1853 that the weight of the half-dollar shall be 192 grains, and that of the others proportional to this; and that such silver coins shall be legal tenders for all sums not exceeding five dollars. Accounts are kept in dollars and cents, or hundredths of a dollar, which are written thus: \$13.78—thirteen dollars and seventy-eight cents. The standard gold of the United States is of the same fineness as the silver—namely, $\frac{9}{10}$; and of this are coined double eagles, eagles, half-eagles, and quarter-eagles, of 20, 10, 5, and 2½ dollars, besides three-dollar and one-dollar pieces. The dollar or thaler in Germany had various values. That of Prussia, which was most current, was equivalent to 3s. sterling.

DO'LLAR, a village in Clackmannanshire, on the right bank of the Devon, ten miles east-north-east of Stirling. It lies in a plain under the Ochills (q. v.). Coal and iron occur in the vicinity. D. is noted for its academy, founded in 1818 under the will of

Captain McNab, a native of the parish, who bequeathed £80,000 for the purpose. The academy was incorporated by act of parliament in 1847, and has a Principal and 19 teachers in the classics, arts, modern languages, &c. The minister and kirk-session of D. were the original patrons and governors, but in 1847 the trust was extended so as to include the Lord-lieutenant, Vice-lieutenant, Convener and Sheriff of the county, the Principal of the University of Edinburgh, county gentlemen, two members of the Presbytery of Stirling, and two representatives appointed by the parliamentary electors of Dollar. Pop. (1871) 2123. The principal industrial feature of D. are its many famous bleacheries on the banks of the Devon. A mile north of D. are the fine ruins of Castle Campbell, in a wild romantic situation, on the top of a high almost insulated rock, in a hollow in the bosom of the Ochills, and mountain rivulets and bosky woods. It long belonged to the Argyle family. John Knox is said to have resided in the castle under the protection of Archibald, fourth Earl of Argyle, the first Scotch noble to embrace Protestantism publicly.

DO'LLART, THE, a gulf of the German Ocean, at the mouth of the river Ems, between Hanover and Holland. It is about ten miles in length by 7 in breadth, and was formed by inundations of the sea, the first of which took place in the latter half of the 13th c., and the last in the 16th century. By these watery invasions a large number of villages were submerged, and thousands of persons perished.

DOLLINGER, JOHN J. IGNATIUS VON, one of the most distinguished of the Roman Catholic divines of modern Germany, was born at Bamberg, February 28, 1799. He was educated at Würzburg, where he received holy orders. For a time he was engaged in parochial duties in his native diocese; but having manifested a peculiar fitness for a literary life, he was appointed a professor at Aschaffenburg, whence, in 1826 he was removed to the chair of Ecclesiastical History in the newly-established university of Munich. From the first he was distinguished as a ready and profound writer. He inaugurated his new professorial career by a work on *The Doctrine of the Eucharist during the First Three Centuries*, in 1826, and a *History of the Reformation*, being a continuation of Hertig's *Handbook of Church History*. He subsequently undertook a new *History of the Church* (vol. i. 1833, vol. ii. 1835), which was speedily translated into French, and also into English, and was carried down to the 15th c.; with a compendium which came down to the Reformation (1836—1843). His very learned and suggestive essay on *The History, Character, and Influence of Islamism* appeared in 1838, and *The Reformation, its Internal Development and Effects*, in 3 vols. in 1846—1848. The design of this work, which consists almost entirely of extracts (connected by a very slight thread of narrative) from writings of the leading reformers and other contemporary Protestant divines, is to present, in the words of the actors in the great religious drama of the 16th c., a picture, doctrinal, moral, social, and political, of the Reformation and its results; but as the great body of the authorities (exclusively Protestant) are German, the interest of the work is mainly national.

For a time, D. undertook the chair of Dogmatic Theology, in which capacity he delivered lectures on 'The Philosophy of Religion,' on 'Symbolism,' and on 'Patristic Literature,' none of which, however, have been published. He was a frequent contributor to the *Historisch-politische Blätter*; he published several pamphlets on subjects of occasional interest; and was one of the chief contributors to the Catholic cyclopaedia entitled *Kirchen-Lexicon*, in which his articles on Luther, on Bossuet, and on Duns Scotus attracted much attention. In the politico-religious movement of 1846—1847, D. was elected to represent the university of Munich in the Bavarian chamber; but being deprived of his professorship, he became disqualified to sit in the chamber. In the parliament of Frankfurt in 1848, he was recognized as the leader of the Catholic party. Most of the measures of importance bearing on the relations of church and state which (however ineffectively) were originated in that assembly were prepared or suggested by him. In 1849, he was restored to his professorship at Munich, and also to his place in the Bavarian chamber, which he held till 1852. Since that year, he has devoted himself entirely to theological literature. His work entitled *Hippolytus und Kallistus* (1853) is a masterpiece of patristic criticism; and his *Heathenism and Judaism, the Vestibule of the History of Christianity*, is a most masterly survey of the religious, moral, and social condition of the world at the advent of our Lord. It is quickly followed by *The First Ages of Christianity*, to which it had been designed as an introduction.

During the early discussions on Italian unity, D. delivered an address at Munich, which was represented as hostile to the temporal sovereignty of the pope. In order to explain his real opinions on that important question, D. published, in 1861, an elaborate work entitled *The Church and the Churches*, which was partly a comparative survey of the condition of the non-Catholic communions, and of the Church, and partly a *résumé* of the his-

tory and condition of the Papal States; showing that, while the temporal sovereignty was the means providentially established for maintaining the spiritual independence of the papacy, yet it was by no means essential; that the papacy long existed without it, and that even if it were overthrown, Providence would devise another means of attaining the same end. The second part was a criticism of the administration of the Papal States, which is understood to have given dissatisfaction to the authorities, as being, although well meant, inopportune, and from this inopportune, unfriendly. A similar feeling is said to have been drawn forth by the part taken by Dr. D. in reference to the 'Catholic Union,' some of the principles of which were supposed to trench dangerously upon the province of authority in matters of religious inquiry; but his orthodoxy and learning were unquestioned, and his influence, especially among Catholics of his own nationality, was very great until the approach of the time for the celebration of the council of the Vatican. It being understood that the doctrine of the infallibility of the pope would form a subject of discussion, D. took an active part in organizing an opposition. Articles which appeared in the *Augsburg Gazette*, in March 1869, and which were reprinted more fully under the *nom de plume* 'Janus,' were ascribed to him or to his influence; and during the discussions of the council, he was entirely identified with the party opposed to the Ultramontane view. On the publication of the decree of the council, which defined the infallibility of the pope in all doctrinal teachings on faith and morals addressed *ex cathedra* to the universal church, D. refused to accept the doctrine. In October, and in deprecation of the impending censure of excommunication by the archbishop of Munich, he published an address to the archbishop, in which he claimed to be heard in the synod of German bishops, or before a committee of the cathedral chapter. His declaration on papal infallibility called forth replies from Dr. Hergenrother and others, and was accepted, on the other hand, by the so-called Old Catholic party. D. was elected Rector of the university of Munich (February 29, 1871) by a large majority of votes. Persisting in his refusal to submit to the authority of the council, he was excommunicated by the archbishop of Munich on the 18th April, 1871. In 1874, Dr. D. presided over the 'Old Catholic' Conference at Bonn, where he frankly declared that he and his colleagues did not consider themselves bound by the council of Trent. He also introduced a declaration, adopted unanimously, that the Eucharistic celebration in the church is not a continuous repetition or renewal of the great propitiatory sacrifice. His literary activity is little diminished.

In relation to the prophecy of Orval, and other French prophecies supposed to bear upon the late war with Germany, he published recently an elaborate essay on *Prophecies and the Prophetic Spirit*, which has been translated into English by Alfred Plummer. In addition to his accomplishments in book-learning, Dr. D.'s attainments as a linguist, both in ancient and modern languages, are very remarkable. In 1871, D. received the honorary degree of D.C.L. from Oxford University; and in 1872, that of LL.D. from Edinburgh. In 1872, the King of Bavaria conferred on him the Order of Merit; and in 1874, the Emperor of Germany the order of the Red Eagle, second class. In 1873, he was appointed President of the Royal Academy of Science at Munich.

DO'LLOND, JOHN, a distinguished optician, inventor of the achromatic telescope, was descended from a French refugee family, and born in London, June 10, 1706. His father was an operative silk-weaver, in humble circumstances, and D. was also brought up to that occupation. Engaged at the loom all day, he devoted great part of the night to his favorite studies of mathematics, optics, and astronomy. Not content with these, he turned his attention to the most varied subjects, made himself acquainted with anatomy, and even theology, and went so far in the study of the classical languages as to translate the Greek Testament into Latin. French, German, and Italian also, he knew well. He apprenticed his eldest son, Peter, to an optician; and after the latter had established himself in business on his own account, he was joined by his father in 1752. John D. now devoted himself to the improvement of the dioptric telescope, in which he was encouraged by the most distinguished scientific men of the time. After a series of well-conceived experiments and researches, carried on for several years, he succeeded in constructing lenses that produced images without any colored fringe. See ACHROMATIC. This was undoubtedly the greatest improvement that the telescope had received since its first invention. The Memoir (published in the *Philosophical Transactions* for 1758) in which he gave an account of his investigations, was rewarded by the council of the Royal Society with the Copley medal. In 1761, D. was elected a Fellow of the Royal Society; his death took place on the 30th of November of the same year. His two sons continued to carry on the business with great reputation and success.

DO'LLY SHOP, the name popularly given in London to a shop where rags and other kinds of old articles are bought, and over the door of which a black doll is usually suspended. It is under-

stood that dolly shops are in many instances a kind of unlicensed pawnbroking concerns. For small articles, a few pence are given, on the understanding that the seller can buy them back at an advance some days after. In Edinburgh and Glasgow, shops of this kind are known as *vee pawns*, and give some concern to magistrates and police.

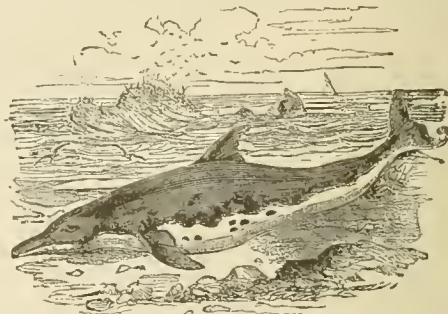
DOLMEN, the name given in France to what British archaeologists call a CROMLECH (q. v.). The dolmen, properly so called, consists of one large unhewn stone resting on two or more unhewn stones placed erect in the earth. But the name is sometimes applied to structures where several blocks are raised upon pillars, so as to form a sort of gallery. One of the most remarkable monuments of this kind is the *Pierre Couvert*, about a mile and a half from Saumur. It is 64 feet long, about 15 feet wide, and about 6 feet high. It has four stones on each side, four on the top, and one at each end. The stone at the east end has fallen down; all the others appear to be as they were originally placed. Some of them are of great size, one on the roof measuring 24 feet in length, and more than two feet in thickness. All are of the sandstone of the neighborhood. The floor is unpaved. Dolmen is believed to be a Celtic word, signifying a stone table. The monuments to which the name is given are supposed to be the sepulchres of the ancient Celts or Gauls.

DO'LO, a town of Northern Italy, in the government of Venice, and 12 m. W. from Venice, on the Brenta and Brentano. It is a station on the railway between Padua and Venice. In the vicinity are many villas of the Venetian nobility. Pop. 4468.

DO'LOMITE, BITTER SPAR, or MAGNE'SIAN LI'ME-STONE, a mineral consisting of Carbonate of Lime and Carbonate of Magnesia in somewhat variable proportions, sometimes nearly equal, the carbonate of lime often greatly preponderating; and usually containing also a little—sometimes nearly 20 per cent.—of carbonate of iron. It is softer than limestone; usually white; sometimes gray, yellow, or brown; and occurs compact, cellular, or porous, granular, foliated, and crystallized. Its crystals are usually rhomboidal, and its cleavage is rhomboidal. It is readily distinguished from limestone by its feeble effervescence in acids. It occasionally occurs in veins accompanied with quartz, calcareous spar, &c., but also as a rock, and forms mountain masses. It is often used as a building stone; the new Houses of Parliament are built of it. It is also burned and made into mortar, but the lime obtained from it remains much longer caustic than the lime from common limestone; and if spread on land in the same quantity, impairs rather than increases the fertility of the soil.—*Brown Spar* (q. v.) is a variety of Dolomite.

DOLOMITE MOUNTAINS. The distinctive peculiarities of dolomite mountain scenery may be seen on the grandest scale in the south-east of Tyrol and in the Carinthian Alp masses. When the Dolomites *par excellence* are spoken of, it is the D. M. of this region that are meant.

DO'LPHIN (*Delphinus*), a genus of *Cetacea*, the type of a fam-



Common Dolphin (*Delphinus delphis*).

ily, *Delphinidae*, which is characterized by a moderate size of head—differing in this from the *Catodontidae* or *Physeteridae* (see CACHOLOT)—and usually by having numerous simple and conical or nearly conical teeth in both jaws, although some of the species lose those of the upper jaw at an early age. The blow-hole is single. The family *Delphinidae* includes along with the dolphins, porpoises, grampus, &c., many animals, which on account of their larger size are very commonly called *whales*, as the Beluga or White Whale, the Casing Whale, the Bottlehead, &c. It contains also a few species which inhabit, not the ocean, but tropical and sub-tropical rivers, as the Soosoo of the Ganges and the *Inia* of the Amazon. The true Dolphins have the snout prolonged into a rather slender beak, which is not only abruptly separated from the convex forehead, but even by a marked furrow. Both jaws are furnished with numerous equal teeth. The species are numerous, most of them recently discovered, and none of them appar-

ently having the very wide geographical range formerly ascribed to the common D. (*D. delphis*), with which they were confounded. They are very voracious animals, and are said to prey not only on fishes, medusæ, cephalopods, &c., but even on the wounded and feeble of their own species. They live, however, in herds which often delight the voyager in the ocean solitude by the gambols which they perform around his ship. They may be discerned at a great distance; as they are continually leaping from the surface of the sea, an action, which, as it seems to have no obvious object, is probably the mere exuberance of animal mirth. When a shoal is seen thus frolicking at the distance of a mile or two, in a few moments, having caught sight of the ship, down they come trooping with the velocity of the wind. When arrived, they display their agility in a thousand graceful motions, now leaping with curved bodies many feet into the air, then darting through a wave with incredible velocity, leaving a slender wake of whitening foam under the water; now the thin back-fin only is exposed cutting the surface like a knife, then the broad and muscular tail is elevated as the animal plunges perpendicularly down into the depth, or dives beneath the keel to explore the opposite side.

The Common D. is found in the Mediterranean and in the Northern Atlantic Ocean. It is usually not more than 6 or 8 feet long, but individuals have been seen of 10 feet. The body tapers towards the tail. The tail is crescent-shaped, and about a foot in breadth. The beak is about 6 inches long.

The blow-hole is crescent-shaped, with the horns directed backwards. The color is blackish on the back, grayish on the sides, and a satiny glistening white beneath. The female D. brings forth a single young one at a time, which she suckles and nurses with great care. Although an inhabitant of the ocean, the D. emits a peculiar murmuring or suppressed howling cry. The flesh of the D. was formerly considered a delicacy, and sailors still regard the capture of one as a happy event.

From the form of its beak, the D. receives from the French the names of *Bec d'Oie* (Goose-beak) and *Oie de Mer* (Goose of the Sea). It was very differently regarded and designated by the ancient Greek: it was their *Hieros Ichthys* (sacred fish), was invested with many fabulous attributes, and was the subject of many mythological legends. It was supposed to be peculiarly friendly

to men. It was sacred to Apollo, who was worshiped at Delphi with dolphins for his symbols. The figure of the D. (see accompanying illustration) appears on many ancient coins and medals; it is said to have been borne on the shield of Ulysses; it early appeared on the shield of some of the princes of France, and gave its name to one of the fairest of the



Dolphin.

French provinces, from which the heir-apparent of the French throne came to be styled the Dauphin. It is not easy to account for the high regard in which the D. was anciently held; nor is it altogether easy to explain the very general transference of its name in modern times to the coryphæe, a very different creature, remarkable for those changes of color in its dying moments which poets have delighted to celebrate.

Of the other species of D. one only occurs, and that but rarely, in the British seas, the Bottle-nosed D. (*D. Tursio*), which is said sometimes to attain a length of 24 feet. It appears to belong to the northern parts of the world.

Dolphins not unfrequently enter the mouths of rivers. A dolphin of the Arctic Ocean (*D. Leucas*) ascends into the fresh water of the Obi, to prey upon the ascending fishes of various kinds.

DOLPHIN, BLACK (*Aphis Fabæ*), a species of *Aphis* (q. v.), or



Black Dolphin :
a, a colony; b, a winged insect, magnified; c, a wingless female, magnified.

plant-louse, which infests the bean, and often does considerable injury to crops, sucking the juices of the plants and preventing the development of flower-buds. It is of a dull, black, and dark-green color, the young spotted with silvery white. The first that

appear are all wingless, but by and by winged individuals are produced, and the pest spreads with great rapidity. It is in the succulent tops of the plants that the aphides first appear, and a common practice of gardeners is to remove the tops in which they are observed.

DOM, or DON (from Lat. *dominus*, lord). This title was originally assumed by the popes, from whom it descended, in France at least, to bishops and other dignitaries, and finally to monks. In Portugal, the title *dom* is confined to the sovereign and his family. The Spanish *don* was originally confined to the nobility, but is now bestowed by courtesy as indiscriminately as the English *Mr.* or *gentleman*. The feminine *doña* is, in like manner, given to ladies.

DOO'M-BOC, or DOO'M-BOOK (book of dooms or sentences, *liber judicialis*), the code of laws compiled by King Alfred, chiefly from the West-Saxon collection of his own ancestor Ina, but comprising also many portions of the Kentish collection of Ethelbert, with the supplements of his successors, and of the Mercian laws of Offa. 'Ina's collection,' says Dr. Pauli, 'was the only one received entire into the Codex, which was chiefly applicable to the condition of the West Saxons. A few articles were admitted here and there from the Kentish and Mercian laws, but research into this matter is not possible, as Offa's book is lost.' Alfred made few if any original laws, but contented himself with restoring renovating, and improving those which he found already in existence. The West-Saxon dialect had become a written language earlier than any of the Teutonic dialects of the continent; and as the power of the clergy in Saxon England was of a more limited kind than elsewhere, the laws of England, up to the period of the Norman Conquest, were administered in the vernacular speech of the people. Alfred's peculiarly Christian character is strongly impressed on his code, which begins with extracts from the Bible, 'The Lord spake all these words, saying, I am the Lord thy God.' Then follow the ten commandments, the part of the Mosaic law relating to criminal offences, and passages from the New Testament, including the golden rule. Yet it should be observed, that these extracts prove not the *ecclesiastical*, but only the *scriptural* character of the *Dom-boc*. The code was ratified by the Witan, as Alfred expressly informs us. In addition to Dr. Pauli's life of Alfred, now published in two English translations, the reader is referred, for information on this subject, to Thorpe's Introduction to Alfred's Laws, in the *Ancient Laws and Institutes of England*, i. p. 58.

DOMBROW'SKI (properly **DABROWSKI**), JAN HENRYK, a distinguished Polish general, was born 29th August 1755, at Pierszowice, in the district of Craeow. He entered the service of the Elector of Saxony in 1780; but in 1792, on the first symptoms of the insurrection in Poland, proceeded to Warsaw. He took part in the Polish campaigns against Russia and Prussia, and exhibited such remarkable military talent, that on the termination of hostilities, Suwarow offered him employment in the Russian service, and Prussia made him a similar offer. Both were refused, and D. went to France, where, in 1796, he was commissioned by the Directory to form a Polish Legion among his exiled countrymen, of which he was appointed commander. The legion brilliantly distinguished itself in the Italian campaign. While in Rome, the admirable discipline which D. preserved among his troops, raised him so high in the estimation of the Senate, that it presented him with the standards which his great countryman Sobieski had taken from the Turks, when he compelled them to raise the siege of Vienna, and which he had sent to the church of San Loretto.

In the campaign of 1799—1800, D. gave splendid proofs of his courage. After the peace of Amiens, D. became a general of division in the service of the Cisalpine Republic; and after the battle of Jena, along with Wybicki, he was ordered by Napoleon (1806) to summon his countrymen to arms. His entrance into Warsaw, at the head of twelve Polish divisions, resembled a classical 'triumph.' At Dirschau and Friedland, he won fresh laurels. In the fatal Russian campaign of 1812, he commanded one of the three divisions of the fifth *corps d'armée*, and at the passage of the Beresina, saved from destruction the relics of the Poniatowski's corps. In 1813, at the head of his Poles, he took an honorable part in the battles of Teltow, Grossbeeren, Jüterbogk, and Leipsic. After the fall of Napoleon, D. returned to Poland, and in 1815 was appointed by the Emperor Alexander a general of cavalry and Polish senator; but in the following year he withdrew from public employment to his estate in the duchy of Posen. He died June 6th 1818.

DOME (Ital. *duomo*). Though often used synonymously with Cupola (q. v.), a dome, in the stricter sense which it has obtained in the languages of Northern Europe, signifies the external part of the spherical or polygonal roof, of which the cupola (*cupo*, or *eup*) is the internal part. In Italian usage, however, it has a wider signification than even the first, being used to denote the cathedral or chief church of the town, *the house (domus) par excellence*, or

house of God. The cause of the name of the building being thus applied to the form of the roof which covered it, arose from the fact, that the chief churches of Italy were at one period almost universally so roofed. In tracing the historical origin of the dome, we are usually in the habit of regarding it as originating with the architecture of the Eastern Empire, because it was at Constantinople and in the Byzantine provinces that it was first employed in ecclesiastical structures. But it was the Romans who, in reality, were the inventors of the dome, as of all the other applications of the semicircular arch. Of their success in applying it to large buildings, we have abundant proof in the ancient domes still to be seen in Rome and its neighborhood. The dome of the Pantheon is still probably the most magnificent dome in existence, and others of smaller size are to be seen in the temples of Bacchus, Vesta, Romulus, Hercules, &c. 'From Rome it went to Constantinople, and from the same source also, came the few insignificant attempts at domes in the Western Empire.'—Ferguson's *Handbook of Architecture*, ii. 943. The external form of the dome of the church of St. Sophia at Constantinople, which became the typical Christian structure of the kind, will be seen in the illustration appended to **BYZANTINE ARCHITECTURE**. See **PANTHEON**. The dome of San Vitale, at Ravenna (q. v.), is said to be still more ancient than that of San Sophia, and is a very remarkable structure of the same class. On the church of St. Marco, at Venice, there are no less than five domes, the center one, as is usual, being much larger than the others. The interior of these domes is covered with Mosaic (q. v.). So far from being peculiar to the few churches we have mentioned, domes occur in the churches of almost every town along the western shore of the Adriatic, and form, in fact, the chief architectural feature of this side of Italy.

The construction of domes in modern times was revived in Rome, by the building of that of Our Lady of Loretto in 1507. But the three most celebrated modern domes are those of St. Peter's (q. v.) at Rome, of St. Paul's (q. v.) in London, and of the Pantheon (q. v.) in Paris. A very complete article on domes, which has been condensed in the *Penny Cyclopædia* will be found in the *Encyclopédie Méthodique*, under 'Architecture.'

DOMENICHINO, or **DOMENICO**, **ZAMPIERI**, a celebrated painter of the Bolognese school, was born in Bologna, 1581. He began his studies under D. Calvaert, and completed them under the Caracci. During the whole of his career, D. had much to suffer from the jealousy of rivals, who are not free from the suspicion of having caused his death by poison, 1641. His frescoes are distinguished by correctness of design, soft delicacy, and freshness of color; the heads of his figures, in particular, are remarkable for expressive force. The master-piece of D., the 'Communion of St. Jerome' (in the Vatican), though suggested by Ag. Caracci's, is a sublime production. The 'Life of the Blessed Virgin,' and the 'Cure of the Demonic Boy,' are of exquisite beauty. Out of Italy, the Museum of the Louvre possesses the largest number of D.'s works.

DOMESDAY BOOK, or **DOOMSDAY BOOK**, the name of one of the oldest and most valuable records of England, containing the results of a statistical survey of that country made by William the Conqueror, and completed in the year 1086. The origin of the name—which seems to have been given to other records of the same kind—is somewhat uncertain; but it has obvious reference to the supreme authority of the book in doom or judgment on the matters contained in it. It was anciently known by several other names, such as the *Liber de Wintonia*, or Book of Winchester; and the *Rotulus Wintonia*, or Roll of Winchester, because it was at one time preserved in the royal treasury in that city; the *Liber Regis*, or the King's Book; the *Scriptura Thesauri Regis*, or Record of the King's Treasury (where it was long kept, together with the king's seal, under three locks and keys); the *Liber Censualis Anglie*, or Rate-book of England.

The way in which the survey was made will be best described in the words of the contemporary writer in the Anglo-Saxon Chronicle. After relating how, in the year 1085, England was threatened with invasion from Denmark and Flanders, and how King William prepared for its defence by laying waste the seashores, and by raising the largest army that had ever been seen in the island, 'billeting the soldiers upon his subjects, every man according to the land which he possessed,' the annalist goes on to say that at midwinter, when the king was at Gloucester, 'he had a great consultation, and spoke very deeply with his witan [i. e., great council or parliament] concerning this land, how it was held, and what were its tenantry. He then sent his men all over England, into every shire, and caused them to ascertain how many hundred hydes of land it contained, and what lands the king had in it, what cattle were in the several counties, and how much revenue he ought to get yearly from each. He also caused them to write down how much land belonged to his arch-bishops, to his bishops, his abbots, and his earls, and—that I may be brief

—what property every inhabitant of all England possessed in land or in cattle, and how much money this was worth.

'So very straitly did he cause the survey to be made, that there was not a single hyde, nor a yardland of ground, nor—it is shameful to say what he thought no shame to do—was there an ox, or a cow, or a pig passed by, and that was not set down in the accounts, and then all these writings were brought to him.'

The survey was made by commissioners called the King's Justiciaries, who seem to have had the help of the chief men of every shire. By a sworn assize or jury of the sheriffs, lords of manors, presbyters of churches, reeves [i. e., grievers or overseers] of hundreds, bailiffs, and six villeins [i. e., tenants at will] of every village, they made inquest as to the name of the place; who held it in the time of King Edward (1041—1066); who was its present possessor; how many hydes there were in the manor; how many ploughgates in demesne [i. e., reserved in the lord's own hand]; how many homagers or vassals; how many villeins; how many cottars; how many serfs; what freemen; how many tenants in socage [i. e., tenants by hereditary right]; how much wood; how much meadow and pasture; what mills and fish-ponds; how much had been added or taken away; what was the gross value in King Edward's time; what was the present value; and how much each free-man or soc-man has or had. Of all this there was to be a threefold return or valuation: 1. As the land was held in King Edward's days; 2. As it had been given by King William; 3. As it stood at the time when the survey was made; and the jurors were to say further whether the value could now be raised.

The returns thus gathered in the several shires, and their hundreds and other subdivisions, were arranged and digested in the record which is now called the Great or Exchequer Domesday. The enumeration of the cattle and swine, which so moved the indignation of the Anglo-Saxon chronicler, was omitted from the record, doubtless because the live-stock was altering every

Rex tenet in domino Stocche. De firma regis. E. fuit. Le se defendit
p. xon hit. Nichil geldaverunt. Terra est 16 Carucate. In Dominio sunt
ii. cap. 7. xxi. villi. 7. x. bordi cu. ac. car. Ibi gecta. g. Will
ceul de regis cu. dimat hita melemofina. Ibi. V. seru. 7. u. mo
lun de xos lot 7. xxi. st. pa. Silva. xl. porc. & ipsa e
n. parca regis.
T. R. E. 7. post. uall. xxi. lib. Modo. xxi. lib. Tamen qui tenet red-
dit xxi. lib. ad pensu. Vicecomes h. xxi. s. solid

Specimen of Domesday Book:

The reading is as follows:

Rex tenet in Domino Stocche. De firma Regis Edwardi fuit. Tunc se defendebat pro 17 Hidis. Nichil geldaverunt. Terra est 16 Carucate. In Dominio sunt 2æ Carucate & 24 Villani et 10 Bordarij cum 20 Carnicis. Ibi Ecclesia quam Willelmus tenet de Rege cum dimidia Hida in Elemosina. Ibi 5 Servi & 2 Molini de 25 sol. & 16 Acra Prati. Silva 40 Porcorum & ipsa est in darco Regis. Tempore Regis Edwardi & post valebat 12 lib. Modo 15 lib. Tamen qui tenet reddit 15 lib. ad pensum. Vicecomes habet 25 solid.

month and year, so that an account of its numbers in any one year could not be of permanent importance; but that the enumeration was made, is proved by the records called Little Domesday and the Exon Domesday.

These are believed to be transcripts of the original rolls or returns made by the Conqueror's commissioners for the counties of Essex, Norfolk, Suffolk, Wilts, Dorset, Somerset, Devon, and Cornwall; and they set forth the number of horses, oxen, sheep, goats, and pigs, together with some other details left out in the compilation of the great Domesday. The taxes were levied according to the divisions of the country given in the D. B., until 1522, when a new survey, popularly called the *New D. B.*, was made.

The mere statement which has been made of its contents, is enough to show the immense value of Domesday Book for all purposes of inquiry into the ancient condition of England. 'It will ever,' says Dr. Lappenberg, 'be found an inexhaustible source of information respecting the Anglo-Saxon and Norman constitutions, particularly the rights and revenues of the kings and their vassals, the relations of cities and towns, statistic accounts of various kings, families and their landed members, together with innumerable matters highly interesting to inquiring posterity, but unnoticed by the chroniclers of those times, either as too well known or as worthless. An intimate acquaintance with Domesday should supply the basis of every historical account of England, particularly of its special history during the middle age.' No other country of Europe can show such a work. It was fit, therefore, that it should have been the first great English record

published at the national cost: It appeared in 1783 in two folios, being printed with types cast for the purpose, so as to represent the contractions of the original manuscript, and having been ten years in passing through the press. In 1816 two supplementary volumes were published, the one containing an excellent general introduction, by Sir Henry Ellis of the British Museum, with indices of the names of places and of the tenants in chief mentioned in the work; the other containing four other records of the same nature; 1. The Exon Domesday, already mentioned; 2. The Inquisitio Eliensis, a record closely resembling the Exeter Domesday, containing the survey of the lands of the monastery of Ely, in the counties of Cambridge, Hertford, Essex, Norfolk, Suffolk, and Huntingdon; 3. The Winton Domesday, containing two surveys of the city of Winchester, one made between 1107 and 1128, the other in 1148; and, 4. The Boldon Book, a survey of the possessions of the see of Durham, made in 1183. This last work is especially valuable, as partially supplying a deficiency in the survey for Domesday Book, which did not extend to the counties of Durham, Northumberland, Westmoreland, and Cumberland, either, it would seem, because they had been lately laid waste by the Conqueror, or because his dominion was not fully established in them. A new and better edition of the Boldon Book was issued in 1852 by the Surtees Society, which, in 1857, printed *Bishop Hatfield's Survey*, another record of the possessions of the see of Durham, compiled between 1345 and 1381. A new and enlarged edition of Sir Henry Ellis's *General Introduction to Domesday Book*, was published in 1833, in 2 vols. 8vo. See also Stubb's *Select Charters*, and Freeman's *Norman Conquest* (vol. v., 1876).

In 1861, a fac-simile copy of that part of Domesday Book which relates to Cornwall, was published by the Ordnance Survey, as an example of what can be done by the new process of engraving called photozincography. This experiment proving successful, government has gone on publishing the rest of the Domesday Book, county by county, in the same way. In 1872 government ordered a general return of owners of lands, to be prepared by the Local Government Board. This new 'Domesday Book' was published in 1874—1876.

DOMESTIC ANIMALS are those which, in order to turn them to his use, man has tamed or reduced in a greater or less measure from their natural wildness, and which he makes the objects of his care, and in a living state his property. Many animals are useful to man, which he has never thus appropriated. Such are the deer and other game which the hunter pursues, and fishes generally, whether of the sea, lake, or river. Man has not yet found it possible to domesticate them, or has not found it necessary or desirable to do so. Individuals, indeed, of some species may have been domesticated, and become very tame, but these are exceptional instances. In general, those only are called domestic animals which have existed from one generation to another in a state of domestication. Of almost all of them, domesticated races exist, considerably different from any that are now found in a state of nature; the peculiar circumstances in which they are placed by domestication exercising a modifying influence, like that of cultivation in plants. Domestic animals mostly belong to the classes of Mammals and Birds. Of mammals, those which have been domesticated are exclusively of the common quadruped form, and mostly herbivorous. The greatest number, and these among the most important, belong to the order of Ruminants; some of them being valuable for their flesh, their milk, their hair or wool, their hide, &c., or as beasts of burden and of draught, some even on all these accounts. To this order belong the ox, buffalo, and yak, the sheep, the goat, the reindeer, the camel, and the llama and alpaca. Of other herbivorous quadrupeds, the most important are the horse and ass, the elephant and the hog. Of the elephant, however, although for many ages it has been much employed for various purposes in India, no domesticated race exists; the individuals which man reduces to his services, being still taken as at first from among the wild denizens of the forest. Domesticated races exist of two comparatively unimportant quadrupeds of the order of Rodents, the rabbit and the cavy or Guinea-pig.—Of carnivorous quadrupeds, there are only two which have been generally and thoroughly domesticated, the dog and the cat. The uses to which these animals are destined are very different from those in order to which herbivorous quadrupeds are kept in a domestic state. Analogous to one of the uses of the dog is that to which the cheetah or hunting-leopard is applied by some of the princes of India, but like the elephant, it is only individually domesticated. The same remark may be made concerning some other animals—the otter, the civet, &c.—which in different countries are tamed or kept in confinement to meet certain purposes for which man finds it convenient to employ them.

The domestication of the ferret is rather more complete.—Of birds, the most important domestic species belong to the gallinaceous order, and to the family *Anatula* among web-footed birds.

To the former belong the common domestic fowl, the turkey, the peacock, the Guinea-fowl, &c.; to the latter, the goose, duck, &c. Of other birds, none can be said to be truly domesticated, except, perhaps, one or two species of song-birds, particularly the canary. The birds used in falconry are domesticated only in the same sense as the cheetah; but it is not uninteresting to observe that man has been able to make both birds and beasts of prey his servants.—Reptiles are quite capable of being tamed, and in some countries some of them are occasionally kept in houses for killing flies, or even for killing mice and rats; but none of them can be enumerated among domestic animals. Nor, perhaps, can any species of fish be so regarded, although artificial ponds have long been in use, and some species of fresh-water fish are to a certain extent the objects of care and of a kind of culture on the part of man.—In the lower divisions of the animal kingdom, only a few species ever receive such culture, or in their living state are claimed by man as his property. All these belong to the class of insects—viz., two or three species of bee, two or three species of silk-worm moth, and two or three species of cochineal insect. These may perhaps more fitly be described as *cultivated* than as *domesticated*.

Many animals not yet domesticated, might probably be added with advantage to the number of domestic animals. Adaptation to particular climates and situations might probably be found to recommend species allied to those in which great part of the wealth of mankind has long consisted, and from which still more of it has been derived. It is not impossible, also, that as the waste places of the world become peopled, animals already becoming scarce, may be advantageously domesticated on account of their fur or other products for which they are now pursued by the hunter.—The principal domestic animals of the present day, have been domestic animals, and highly valued as such, from time immemorial. We have no record of the domestication of the ox, the horse, the camel, the dog, &c. Even the llama and alpaca, although known only to the inhabitants of the Andes and adjacent regions, were found in a state of domestication there when South America was first visited by Europeans, and their subjection to man is probably to be referred to the earliest periods of Peruvian civilization. The limitation of some domestic animals to particular countries and climates—of which we have notable instances in the camel of the Asiatic deserts, the reindeer of the arctic regions, the yak of the steep and snow-clad Himalaya, the buffalo of tropical marshes, and the South American quadrupeds just mentioned—forbid us to suppose that all the important domestic animals were domesticated by the same people and at the same period, or that they have all spread in a state of domestication from a common center or source. Yet there are many circumstances which point to the same Asiatic region as that in which the greater number of them were first domesticated, which is commonly regarded as the cradle of the arts and sciences, and even of the human race.

DOMESTIC ARCHITECTURE. The external forms and internal arrangements of the domestic abodes of a people are far more influenced by their manners, habits, and occupations, and by the climate in which they live, than their ecclesiastical edifices and public buildings; and there is, consequently, no department of architecture which is so varied and national as domestic architecture. But not only are the circumstances of each country different in this respect—the same is the case with every department of each country, with every town in each department, with every street in each town; and a domestic architecture which fulfils its object, will not only adapt itself to the necessities, but will make the best, in point of artistic effect, of the specialties of every case with which it is called upon to deal. The circumstances of families, and even the tastes and fancies of individuals, are legitimate subjects of consideration in domestic architecture. To attempt to give to domestic architecture the beauty of uniformity, is consequently to mistake both its object and the source from which its charm is derived. When attained at all, uniformity is attained not in accordance with, but in defiance of, the utilitarian objects of domestic architecture. The result of this artistic falsehood may be seen in the monotonous and meaningless streets and squares that have been built in all our principal towns during the last eighty years. The legitimate charm of domestic architecture, because the only one which can arise from the complete fulfilment of its object, is the charm of variety. It is the charm which our ancestors sought during the whole of the great architectural period of the middle ages, and which our architects, who in this, as in so many other respects, are returning to their principles, are now beginning to cultivate. But here, as in all similar cases, it must be borne in mind that, in general, it is the principle alone that can be revived, and that the details by which it was carried out can be legitimately copied only in the exceptional cases in which circumstances and the objects to be attained remain unchanged. The position of an Englishman in the 19th differs in many respects from that of an Englishman in the 14th c.; and to construct for the former a house in all respects resembling that which was constructed for the latter, would be to commit an error

the same in kind as if we had sought for either of them a model dwelling in Pompeii or Canton.

An account of the forms of English houses from the 12th c. downwards, will be found in Parker's *Glossary of Architecture*. Apart from our own earlier examples, the forms of domestic architecture most suggestive for present use in this country, are those which are to be found in such wonderful beauty and variety in almost all of the older continental towns of the north of Europe. It was from the domestic architecture of France and the Netherlands that that of Scotland, at its best period, was mainly borrowed; and if we wish to improve it now, we can scarcely do better than revert to its original source.

DOMESTIC MANAGEMENT, financially considered, may be defined as the art of making a given income go the furthest possible in procuring for a family the means of living—the word living being understood in its wider and higher sense. It being assumed, as a fundamental maxim, that the outlay shall be within the income, the leading object of the act is, rightly to apportion the outlay among the different requisites. How this is best to be done, can be discovered only by large experience; and if a young housekeeper were to begin her career without some indications of the path she should follow, she must fall into serious mistakes, occasioning loss and discomfort. Not that any amount of previous instruction, whether written or oral, can give the skill of experience; but attention to some of the more important maxims may help to avert very serious errors while the lessons of experience are being learned. By way of outline charts for this rather intricate navigation, we give here four schemes of household expenditure, based upon experience, and adapted to some of the more extensive classes of the British community, prefacing the schemes with a few general and miscellaneous observations.

It is a very safe rule, that the best quality of food is the cheapest in the end; 'it goes further'—i. e., it gives more nourishment; but those who require to practise economy may, by going to market themselves, purchase good meat at a cheaper rate than they would if they sent for it, from reasons known to experienced buyers, such as the pieces they select not being called prime cuts, not being so well shaped, &c., which in no way takes from the wholesomeness of the article. Again, good cooking renders things more digestible and nourishing; bad cooking is absolute waste, to say nothing of the injury it does to the stomach. How meat is rendered tender by boiling or broiling, without having its nutritive qualities extracted, is described in the articles *BOLLING* and *BROILING*. For the time necessary for roasting, baking, stewing, and frying, good instructions are given in the very useful works, *The Dictionary of Daily Wants*, and Mrs. Beeton's *Book of Household Management*, where not only the mode of cooking, but the actual cost of each dish, is given.

Some books on housekeeping recommend that Coal should be bought when cheap, and that groceries should be purchased in large quantities; but this is open to the objections, that coal occupies a larger space than can be spared in small houses; that many articles of grocery waste in quantity or deteriorate in quality by keeping, as sugar, which loses weight, and tea, which loses aroma; and that both coal and grocery in masses, are apt to be wasted by servants, children, and thoughtless persons, from the circumstance of having large quantities to go to. Groceries may be bought cheaper in this way, and it is only personal experience that can decide in every case as to their being *really* cheaper. Candles and soap are the chief things that certainly improve by keeping. Candles should be hung up, if dips; but moulds should be stored in boxes, and covered and kept in a dry place. Soap bought in bars, in as dry a state as possible, should be cut in lumps, six to the bar, and laid on shelves, to harden slowly.

A thorough knowledge of the art of choosing material for Clothing, and making and cleaning articles of apparel, is also highly necessary, and, like good marketing for food, can only be acquired by practice. Many things must be considered in this kind of purchase; the evenness of the threads in cotton and linen fabrics, softness of texture, freedom from what is called 'dress.' In printed goods, the same rule is to be observed as to evenness of weaving, in addition to which, those kinds should be selected that have the pattern printed through, so as to show on the wrong side, and of a lilac or dark-blue color, as being the best for washing. Flannel goods should be chosen for their regular make, good width, and softness; and flannel articles should be made larger and longer than necessary, to allow for shrinking when washed. Good patterns for making from should be obtained, well-fitting and appropriate dress lasting longer, and looking better than what is put together in an inconsiderate, slovenly manner; a clever needlewoman, like a clever cook, is the most truly economical one. The same remarks apply to furniture-chintzes and linens for sheetings, &c. Articles chosen for glare and show, without regard to their being in keeping with the general style of the room or house, of a flimsy, irregular, or ill-printed make, must certainly turn out unsatisfactory and wasteful.

The accompanying scales relate to prices in London and other large English towns, and reckoned on the allowance of a loaf and a half of bread (weighing four pounds to the loaf) for each individual. Young children consume less bread than full-grown persons, but they require more milk and sugar; therefore the scale can be equalized according to circumstances. Puddings and vegetable food for the children must also influence the amount for butcher's meat. It is supposed in these scales that the husband dines at home; if he dines in the city, or elsewhere, a reduction must be made in the butcher's, baker's, grocer's, and publican's bills. Half a pound of butter, and half a pound of sugar, are the usual weekly allowances for each person. If the children are too young to be educated, the money allowed in the following scales should be saved till they are older.

SCALE FOR AN INCOME OF £300 PER ANNUM, FOR A FAMILY CONSISTING OF HUSBAND, WIFE, THREE CHILDREN, A GENERAL SERVANT, AND OCCASIONAL ASSISTANT.

	£	s.	d.
Rent, taxes, water, and gas.....	45	0	0
Wages for servant and charwoman.....	14	0	0
Butcher meat, at 16s. weekly.....	41	12	0
Baker, 9 loaves at 8½d.; flour, 1s.....	19	3	6
Grocer (tea, 1s. 6d.; parlor sugar, 7d.; children's and servant's, 1s. 8d.; parlor butter, 1s. 6d.; children's, 9d.; servant's, 8d.; spices, 4d.; cheese, 1s. 4d.; bacon, 1s. 2d.; rice, eggs, and pudding materials, 1s. 6d.), 11s. weekly.....	28	12	0
Vegetables and fruit.....	8	0	0
Milk, 3s. 6d. weekly.....	9	2	0
Beer for parlor and servant, 4s. weekly.....	10	8	0
Fuel.....	15	0	0
Washing (all done at home), soap, soda, mangle.....	4	10	0
Clothing for five persons.....	38	0	0
Church and charities.....	3	0	0
Library and books.....	2	0	0
Fire insurance on £300.....	0	6	0
Insurance on life.....	8	0	0
Education.....	20	0	0
Replenishing furniture, crockery, glass, &c....	5	14	0
Traveling (change of air).....	10	0	0
Doctor.....	5	5	0
Income-tax, at 4d. per pound.....	5	0	0
Omnibus, postage, and sundries.....	7	7	6
	£300	0	0

SCALE FOR AN INCOME OF £200 PER ANNUM, FOR A FAMILY CONSISTING OF HUSBAND, WIFE, THREE CHILDREN, AND A SERVANT.

	£	s.	d.
Rent and taxes, &c.....	32	0	0
Wages.....	5	0	0
Butcher, at 12s. weekly.....	31	4	0
Baker (9 loaves at 8½d.; flour, 9d.), 7s. 1½d. weekly.....	18	10	6
Grocer, 8s. weekly.....	20	16	0
Milk, 2s. 4d. weekly.....	6	1	4
Beer, 1s. 6d. weekly.....	3	18	0
Vegetables and fruit.....	6	10	0
Fuel.....	10	0	0
Washing (soap, starch, soda, &c.).....	3	10	0
Clothing.....	17	10	0
Church and charities.....	1	10	0
Library and newspaper.....	1	10	0
Fire insurance.....	0	4	0
Insurance on life.....	6	0	0
Income-tax at 4d. per pound.....	2	0	0
Education.....	12	10	0
Doctor.....	3	3	0
Replenishing.....	4	10	0
Traveling to sea-side.....	5	0	0
Omnibus, postage, sundries.....	8	13	2
	£200	0	0

SCALE FOR AN INCOME OF £100 PER ANNUM, FOR A FAMILY CONSISTING OF HUSBAND, WIFE, AND THREE CHILDREN.

[Rooms only should be rented, unless a lodger could be found, who would help to pay the rent of a cottage.]

	£	s.	d.
Rent, 5s. weekly.....	13	0	0
Butcher, 6s. weekly.....	15	12	0

Baker (7½ loaves at 7d.; flour, 8d.), weekly.	£	s.	d.
5s. 0½d.	13	2	0
Grocer, 4s. weekly	10	8	0
Milk, 1s. weekly	2	12	0
Vegetables, 1s. 8d. weekly	4	6	8
Beer (occasional)	1	6	6
Fuel	7	0	0
Washing (soap, starch, &c.)	2	0	0
Clothing	12	12	0
Doctor, or sick fund	3	0	0
Education	6	0	0
Life insurance	2	0	0
Fire insurance	0	2	0
Charities	0	5	6
Holiday excursions	1	10	0
Replenishing household goods	1	15	4
Books, papers, and periodicals	1	0	0
Postage and sundries	2	7	10
	£100	0	0

SCALE FOR AN INCOME OF £52 PER ANNUM, FOR A FAMILY CONSISTING OF HUSBAND, WIFE, AND THREE CHILDREN.

Rent of rooms, 3s. 6d. weekly	£	s.	d.
9 2 5			
Baker (7½ loaves at 7d.; flour, 8d.), 5s. 0½d. weekly	13	2	2
Butcher, 1s. 6d. weekly	3	18	0
Milk, 7d. weekly	1	10	4
Tea (quarter lb. at 3s.), 9d. weekly	1	19	0
Sugar (1½ lb. at 4d.), 6d. weekly	1	6	0
Rice, treacle, and pearl-barley	1	6	0
Butter (½ lb. at 1s. 6d.; dripping, 1 lb. at 3d.), 1s. weekly	2	12	0
Candles, average 6d. weekly	1	6	0
Mustard, salt, and spice	0	4	0
Vegetables, 1s. 6d. weekly	3	18	0
Coal and wood, 1s. 3d. weekly	3	5	0
Soap and soda	1	10	0
Schooling, 3d. weekly	0	13	0
Clothing fund	3	16	6
Sick fund	0	10	0
Holiday excursions	1	0	0
Postage, books, and sundries	1	2	0
	£52	0	0

[This income could be improved by having lodgers, who would help to pay the rent, and also if a plot of kitchen garden ground could be obtained. Since the above scales were prepared, the price of butcher meat, butter, and sundry other articles has risen considerably. This must therefore be considered.]

DOMICILE, a man's legal place of abode, or the place which the law will hold to be his residence. In determining questions of domicile, so often surrounded by difficulties, the law endeavors to follow the facts of each case, and, consequently, the legal as well as the natural view of the matter is expressed in that definition of a domicile in the code which says, 'every man has his domicile where he has placed his hearth and centred his fortunes, whence he goes not forth without an occasion, from which, when he is absent, he is said to be abroad, and to which, when he returns, he is said to cease to be abroad.'—Cod. 10, tit. 40, s. 7. Even in Rome, questions of domicile were not without importance, for the empire was divided for purposes of domestic government, and the inhabitants of one province was not subject to the magistrates of another. But it was in modern times, when Europe was divided into many independent kingdoms, and America was formed out of states having different local customs and laws, that the law of domicile assumed its full importance. It now constitutes one of the most difficult branches of private International Law (q. v.). The following are its most general rules: 1. The place of birth is the original domicile of every one, provided that, at the time of his birth, it was the domicile of his parents; but if his parents were then on a visit or on a journey, the home of the parents will be the domicile of birth, nativity, or origin (*domicilium originis*). 2. If the child is illegitimate, it follows the domicile of its mother. 3. The domicile originally obtained continues till a new one is acquired; unless it be lost by non-residence, under the provisions of a statute, as is the case with paupers, for the purposes of parish relief in Scotland. 4. Minors are generally deemed incapable of changing their domicile of their own accord, but it may be changed in the domicile of the parents, which it follows. 5. If the father dies, his last domicile is that of his widow and children. 6. A wife follows the domicile of her husband. 7. The place where a man lives, if there be no ground for entertaining an opposite presumption, is his domicile. 8. If a person of full age, having a right to change his domicile, takes up his abode in a new place,

with the acknowledged intention of remaining permanently fixed there (*animo manendi*), that place immediately becomes, and that which he has quitted ceases to be, his domicile. Questions as to what amounts to intention, or what circumstances constitute sufficient proof of intention of remaining, or quitting a place of residence, are amongst the most difficult in the law of domicile. Most persons who are resident abroad have a sort of floating notion that, in certain conceivable circumstances, they would return to their native country, and to these vague feelings they give expression in a manner more or less vague.

One of the most important effects of the law of domicile was as to the validity of the will which a deceased person leaves—the English rule being, that it must be according to the law of the domicile, wherever the will was made, though the law of Scotland allowed a will also to be good if it was executed according to the law of the country where it was made. A statute, however, was passed in 1861, to make the law uniform, so that the will of a British subject, as regards personal estate, made out of the United Kingdom, is deemed valid, wherever his domicile may be, if the will is conformable to the law of the country where made, or to the law of the domicile of origin. And by a later statute in 1868, even as regards real or heritable estate, an English will is to have effect given to it as regards property situated in Scotland. It is impossible, in our limits, to enumerate other effects of the law of domicile. Generally, it may be stated that it regulates the succession to personal or movable property, which is said to follow the person, and must be distributed after death according to the law of the country of which the deceased died a domiciled citizen. Heritable or real property, again, descends in accordance with the law of the land in which it is situated (*lex rei sitæ*). As to the effect of a domicile of citation in Scotland in actions of divorce, see DIVORCE, MARRIAGE.

DOMINANT, in Music, the fifth above the tonic: the ruling or governing tone of the key. Ancient writers called the dominant the *quinta toni*, from its being the next in importance to the tonic. The dominant chord is always a major chord, the third being the *subsemitonium modi*, or leading note, which always rises a semitone to the tonic. The dominant seventh is the major chord with the flat seventh above the dominant, and is the same in major and minor keys. The rules for the treatment of the dominant seventh, and for the chord of the ninth on the dominant, apply to all other chords of the seventh or ninth, which arise from the other degrees of the scale. The dominant seventh is a most important chord in modulation. The resolution of the dominant seventh is always into the chord of the tonic, when not interrupted. The dominant as a key is the nearest in relation to the tonic. Modulation into the key of the dominant is so frequent in composition, that its form may be said to be stereotyped. The subdominant, or under-dominant, stands next in importance to the dominant, and has its place on the fourth above the tonic, or, which is the same, on the fifth below. The chord of the subdominant is major or minor, according to the mode of the key. The chords on all other degrees of the scale, being either minor or diminished, give greater importance to the major chords of the tonic, dominant, and subdominant, in which chords all the notes of the scale are found, while the combination of these chords, giving the most perfect impression of a key, may account for their being of such importance in harmony.

DOMINANT TENEMENT. See **SERVITUDE**.

DOMINGO, SAN or SANTO, a maritime city of Hayti, capital of a province of the same name, and of the republic of San Domingo or the Dominican Republic, stands on the S.E. coast, at the mouth of the Ozama, in lat. 18° 29' N., and long. 69° 57' W. It is the oldest settlement of European origin in America having been founded in 1494 by Bartolommeo Columbus. The population numbers about 10,000; and the principal buildings are churches, including a cathedral, convents, hospitals, colleges, barracks, an arsenal, and a light-house. The town is surrounded by a wall 8 feet thick and 10 feet high, built of *mamposteria*, a composition of earth, powdered stone, and lime. The streets are broad and intersecting at right angles. The chief trade is in timber and dye-woods. The name S. D. is sometimes applied to the whole island of Hayti. See **HAYTI**, and **DOMINICAN REPUBLIC**.

DOMINIC, St. See **DOMINICANS**.

DOMINICA or **DOMINIQUE**, a British West India Island, lies in lat. 15° 18' N., and long. 61° 24' W., containing about 290 square miles, and (1881) 28,211 inhabitants. It is of volcanic origin, hot and sulphureous springs still attesting the fact. It is the loftiest of the Lesser Antilles, attaining, at one point, an elevation of 5314 feet, and nearly one-half of the surface consists of precipitous mountains and deep ravines. Where capable of cultivation, the soil is fertile; and, even on apparently inaccessible sites, the emancipated negroes have successfully established provision grounds. The principal productions are sugar, coffee, cocoa, cotton, lime-juice, molasses, rum, tamarinds, sulphur,

indigo, rose-wood, and other cabinet woods. The annual value of imports ranges from £56,000 to £65,000; that of exports, from £65,000 to above £100,000. The public debt is about £8000. The capital of the island is Roseau, or Charlotteville, on the west coast; it is the chief port, having a population of 3000. It is reported that 1000 Caribs are still living secluded in the mountains of the interior. In 1880 there was a great (and rare) eruption of volcanic ash from the dormant crater of the Grand Soufrière mountain. Since 1872, D. is a member of the Leeward Islands colony, and sends representatives to the general legislative council; but it has its own lieutenant-governor, its treasury, and its local legislature. Though the majority of the inhabitants are Roman Catholics, the clergymen of the Church of England were till lately paid from the public funds. There is now religious equality. The abolition of slavery is admitted by all parties to have worked well in Dominica.

In 1839, the planters at a public meeting acknowledged, 'with feelings of unmixed gratification, the peaceable and quiet disposition evinced by the laborers, as a body, since their entire emancipation; and, in 1852, the lieutenant-governor officially adverted to the prosperity and contentment of the same class. It is even said that most of the 20 members of assembly are men of color. The temperature, according to season and altitude, ranges from 88° F. down to chilliness; and even in the dry months, from February to August, rain frequently falls. D. was discovered by Columbus, on his second voyage, in 1493, on a Sunday (whence its name Dominica, i. e., the Lord's Day), being then thinly inhabited by Caribs. In the 17th c. and part of the 18th, it may be described as a neutral island; but in 1759, it was captured by England, and in 1763 ceded by France; French again from 1802 till 1814, it has since been English. In 1880 there was an eruption of volcanic ash from the Grande Soufrière, a dormant volcanic vent.

DOMINICAL LETTER, or SUNDAY LETTER, is one of the seven letters A, B, C, D, E, F, G, used in almanacs, &c., to mark the Sundays throughout the year. The first seven days of the year being marked in their order by the above letters in their order, then the following seven, and all consecutive sets of seven days to the end of the year, are similarly marked; so that the 1st, 8th, 15th, 22d, &c. days of the year are all marked by A; and the 2d, 9th, 16th, 23d, &c., by B; and so on. The days being thus marked, it is evident that on whatever day the first Sunday of the year falls, the letter which marks it will mark all the other Sundays in the year, as the number of the letters and of the days in the week is the same.

As the common year consists of 52 weeks and one day over, the dominical letters go backwards one day every common year. If the dominical letter of a common year be G, F will be the dominical letter for the next year. As a leap-year consists of 52 weeks and two days, the letters go backwards two days every leap-year. If in the beginning of a leap-year the dominical letter be G, E will be the dominical letter for the next year. This extraordinary retrocession, however, is made to take place at the intercalary day (the 29th February) by the artifice of marking it by the same letter as the day preceding it, and thus the next Sunday is marked by the letter preceding that which marked the Sundays before the intercalary day. Suppose the 28th February in a leap-year to be a Sunday, and marked by F, it is evident that the dominical letter for the rest of the year will be E. As every fourth year is a leap-year, and the letters are seven in number, it is clear that the same order of letters must return in four times seven, or 28 years, which would, but for the leap-years, recur in seven years, and hence the Solar Cycle (see **PERIOD**). The dominical letters were first introduced into the calendar by the early Christians, to displace the nundinal letters in the Roman calendar. They are of use as a means of discovering on what day of the week any day of the month falls in a given year. See **EASTER**. Rules and tables for finding them are given in prayer-books, breviaries, &c., as well as in works on dates. See **DATE**.

DOMINICAN REPUBLIC, a state formed of the Spanish or east section of Hayti (q. v.). Spain, in 1697, surrendered to France, by the treaty of Ryswick, the west part of the island, retaining the remainder down to 1795. In the year last mentioned, however, the Spanish portion became nominally French. In 1814—the west having vindicated its independence—France, formally relinquished, in favor of Spain, all claim to the east. In 1822, the colony, in imitation of the continental possessions, threw off the yoke of the mother-country, to link itself, more or less closely with its African neighbors. But, in or about 1843, it assumed a separate standing as the Dominican Republic, the anarchy of which it exchanged in 1861 for the despotism of its former masters. But in 1863 it again revolted, and Spain gave up the possession; and the republic has since maintained a troubled existence. The D. R. has an area of 18,000 sq. m., nearly $\frac{2}{3}$ ds of the area of the whole island. Its principal productions are sugar, tobacco, and coffee. Its population, chiefly negroes and mulattoes, is estimated

at 300,000. The capital, San Domingo, contains 12,000 inhabitants.

DOMINICANS, an order of preaching friars in the Roman Catholic Church (*Frates prædicatores*), founded at Toulouse in 1215 by Dominic (Domingo) de Guzman. Dominic was born at Calahorra, in Old Castile, in 1170. He studied theology at Palencia, and in 1199 became canon and archdeacon of Osma in Castile. In 1205, along with his superior, Diego de Azebes, Bishop of Osma, he began to itinerate through the south of France, for the purpose of converting the 'heretical' Albigenses; and convinced that the ignorance of the people and the worldliness of the clergy were great helps to the progress of heresy, he instituted the order which bears his name for the express purpose of preaching and the cure of souls. Dominic, however, found it impossible to convert the Albigenses by this method, and therefore had recourse to another. In 1208, at the instigation of Dominic, the pope proclaimed a crusade against these 'heretics'; the barons of France were summoned to take part in it, and headed by De Montfort, committed horrible slaughter on these unfortunate people. The order of the D. was confirmed by Innocent III. and Honorius III. in 1216. The members followed the rule of St. Augustine, somewhat modified; their dress was a white garment, resembling that of the Carthusians, with a black coat and pointed cap of the same color. In 1220 they took the vow of poverty. Dominic died at Bologna in 1221, and was canonized by Gregory IX. in 1233. He is said to have been ordinarily not a cruel or unfeeling man, but his religious passions were so vehement that they entirely dried up the milk of human kindness in his heart, and his conduct towards heretics was merciless in the extreme.

As early as 1206, he founded an order of Dominican nuns, which, after 1218, when the first convent was established at Rome, spread far and wide. These nuns followed the same rule as the friars, and were solemnly pledged to habits of industry. A third Dominican order (the Knights of Christ) was established in 1224, and confirmed in 1279. It was originally a company of knights and nobles who had leagued themselves together for the suppression of 'heresy' by force of arms, but after the death of its founder, the order was changed into that of the *Penitents of St. Dominic*. The members of this branch of the D. were also called the Tertiary Dominicans. They were not bound by any vows, but their special duties were to observe particular fasts and devotions, and to execute great ecclesiastical judgments. They retained all their civic and domestic privileges. There were also *female Penitents of St. Dominic*, a few of whom, however, betook themselves to a conventual life, and became nuns. These few were chiefly in Italy; the most famous was St. Catharine of Siena. The glory of apostolic poverty, which encircled the D., the privileges which they possessed—especially of preaching and hearing confession—and the circumstance that as early as 1230, only fifteen years after the foundation of their order, they secured a chair of theology in the great university of Paris, all helped to rapidly increase their numbers and influence. Within six years after their establishment, they had spread to England through one Gilbert du Fresney, and founded a monastery at Oxford. 'The monks,' writes the contemporary annalist, Matthew Paris, himself a Benedictine, 'did not, in three or four hundred years, ascend to such a height of greatness as the friars, minors and preachers, within twenty-four years after they began to build their first house in England.' Their progress was scarcely less rapid in Scotland, where they found a munificent patron in King Alexander II., who is said to have met St. Dominic at Paris about the year 1217. In Britain, the Dominicans were called the *Black Friars*. In France, they received the name of Jacobins, from the Rue St. Jacques (Lat. *Jacobus*) in Paris, where they first established themselves. Their monasteries arose throughout all Christendom, and were even to be seen on the shores of Asia, Africa, and subsequently America. Their monarchical constitution, which bound all the branches and congregations of the order under one grand head (*magister ordinis*), insured their progress and the co-operation of their efforts to secure influence in church and state. Through their preaching and proselytizing, it is undeniable that they exercised, at the time of the foundation of their order, and for a considerable time after, an influence alike extensive and beneficial. They have produced several great scholars and men of genius, such as Albertus Magnus; Thomas Aquinas, the normal theologian of the Roman Catholic Church; and Raymond de Pennafort. They have, however, acquired a black reputation in history in connection with the Inquisition (q. v.), in which they were the chief agents.

After 1423, when they obtained permission to accept endowments, they in some measure refrained from begging, and engaged themselves more with politics and theology. Their great rivals were the *Franciscans* (q. v.), and the mutual animosity of the two orders was strongly exhibited in the disputes of the Thomists and Scotists. These two orders divided between them the honor of controlling the church, and often the Catholic states of Christen-

dom, until the rise of the Jesuits in the 16th c., who gradually drove both from the schools and the court, when the D. were compelled to return to their original vocation. Their power was, however, again revived to a certain extent in 1620, when the censorship of books was conferred on the Master of the Vatican at Rome, who must always be a Dominican. In the 18th c., the



Dominican, or Black Friar.

order of D. possessed 1000 monasteries and convents, divided into 45 provinces, besides 12 separate congregations or sects. At present, the order flourishes only in Italy, France, Hungary, Switzerland, and America. The Dominican nuns, who are not numerous, have convents in Italy, France, Belgium, Hungary, Bavaria, and America.

DO'MINIS, MARCUS ANTONIUS DE, an ecclesiastic whose career was both singular and chequered. He was born in 1566 at Arba, on the coast of Dalmatia, and educated, first at Loretto, and subsequently at Padua, where he greatly distinguished himself both by his ability and the varied character of his studies. While at Padua, he taught mathematics, physics, and eloquence. Having completed his theological curriculum, he was, after some time, appointed Bishop of Segni, and two years later, Archbishop of Spalatro, in which capacity, however, he quarrelled with the pope, and having, moreover, exhibited certain Protestant leanings, he found it expedient to resign his post. In 1616, he came to England, where he was hospitably received. King James appointed him Dean of Windsor; and while holding this office, he wrote his *De Republica Ecclesiastica*, a work in which he endeavored to show that the pope had no supremacy over other bishops, but was only *primus inter pares*. D. published one or two other productions between 1617 and 1618; but finding Anglicanism far from satisfactory, a revulsion of feeling occurred, and D. once more looked and longed for the unity of the Catholic Church. The motives that induced him to return to the Roman Catholic Church are not known.

Most writers consider that he was actuated by avarice and ambition, but a critical appreciation of his character would lead us to doubt this harsh judgment. He was, it has been supposed, desirous of discovering a church broad enough to form the basis of a universal Christianity. Men holding such opinions are always misunderstood, and so D., even after his return to Rome, was still suspected of heresy. In consequence, he was imprisoned in the castle of St. Angelo, where he died, September 1624. Being subsequently condemned as a heretic, his body was raised from its grave, and burned.

While at Padua, D. wrote his *De Radiis Visus et Lucis in Vitris Perspectivis et Irile* (Venice, 1611). He was the first to point out that in the phenomenon of the rainbow, the light undergoes, in each rain-drop, two refractions and an intermediate reflection.

DOMINIUM, a Roman law-term, which has been received into the technical language of most of the legal systems of Europe. It may be described as a full legal right in and to an object—as the right from which alone legal possession could flow, but which actual possession alone could never confer, unless such possession had endured for the period of legal prescription. The right to possess is thus distinguished from the right arising from possession, which is the usufruct. Ownership or dominium may be either absolute—that is to say, it may include the beneficial interest in the subject—or it may be bare ownership, consisting in

some limited power over it at the time, or some ultimate right to it at a future time. Dominium must not be confounded with Imperium (q. v.), which has a totally different signification.

DO'MINO, the name formerly given to the garb worn in winter by priests while officiating in cold edifices. It is now used to signify a masquerade costume, consisting of an ample cloak or mantle with wide sleeves. See MASQUERADE.

DOMINOS, the name of a game, usually played with 28 oblong, flat pieces of ivory or bone, &c., each of which bears two numbers marked by points from nought to six. The party wins who has first played out his tablets, or, if this has been found impossible, who has the fewest points on the tablets still remaining. The game of dominos has been attempted to be traced back to the Greeks and Hebrews, and also to the Chinese. So much is certain, that it was introduced about the beginning of the 18th c. from Italy into France, where it immediately became popular in the larger towns. From Paris it spread to Germany, where, as in France, it is now played in every coffee-house. The Café de l'Opera in Paris, long boasted of assembling the most expert players; an honor, however, which was warmly contested by the establishments of Rouen and Poitiers.

DO'MINUS, the Latin word by which we commonly render lord, but which more properly signifies master, as opposed to slave (*servus*). Aurelianus is said to have been the first emperor who adopted dominus as a title of honor on his medals, though it had long been made use of in conversation and in correspondence in that sense, as by Pliny in addressing Trajan. In legal phraseology, the *dominus litis* is the person really interested in the issue of an action, though not necessarily the pursuer.

DOMITIA'NUS, T. FLAVIUS, emperor of Rome from 81 to 96 A.D., was the son of Vespasian, and younger brother of Titus, whom he succeeded on the throne. The earlier years of his reign were on the whole advantageously occupied for the public benefit. Many good laws were passed, the provinces carefully governed, and justice rigidly administered. As he grew older, however, his ambition, his jealousy, and his pride, wounded by the failure of his campaigns against the Dacians and the Marcomanni, in 87 A.D., began to instigate him to the most atrocious cruelties. By murder or banishment, he deprived Rome of nearly every citizen conspicuous for talent, learning, or wealth. To win the army, he greatly increased the pay of the soldiers, and secured the favor of the people by prodigal largesses and gladiatorial shows and games, in which he sometimes took part in person. His cruelties became at length so intolerable, that a conspiracy—encouraged, if not organized—by his wife Domitia, whom he had doomed to death, was formed against him, and the tyrant fell under the dagger of the assassin, 18th September 96 A.D.

DO'MO D'O'SSOLA, a charming little town in the extreme north of Piedmont, at the foot of the Simplon, near the right bank of the Tosa, which flows into Lago Maggiore. Its general aspect is peculiarly Italian. It has some trade and several handsome buildings, but is chiefly noteworthy as being a starting-point for tourists who wish to make excursions up the southern valleys of the Alps. The chief places of interest in the vicinity are the Val Anzasca, the Val Vigizzo, and the Falls of the Tosa. From D. the Simplon can be ascended in seven hours. Pop. 2480.

DON (anc. *Ta'nais*), a river of Russia, has its source in a small lake in the government of Tula, in lat. about 53° 45' N., and long. 38° 10' E. It flows at first in a south-eastern direction through the governments of Tula, Riazan, Tambov, and Woronetz, and after winding south-west through the country of the Don Cossacks, it advances to its embouchure in the Sea of Azov, which it enters by three mouths, only one of which is navigable. The Don receives 80 affluents, of which the principal are the Sosna and the Donetz on the right, and on the left the Kheper, the Medveditz, the Sal, and the Manitch. Its total length is about 1150 miles. Its course is obstructed by frequent sand-banks, which, when the water is low, render navigation impossible to any but flat-bottomed boats. From April to June, however, during which months it overflows its banks, and forms unwholesome swamps on either side, it is navigable as high as Zadonsk, 600 miles from its mouth. The Don is connected by a canal with the Volga, and by this means the produce and manufactures of the interior are conveyed to the southern provinces of Russia. The waters of the Don abound in fish, the traffic in which commodity is considerable, especially in its lower course.

DON, a river of Aberdeenshire, rising on the west border of the county in a peat-moss, 1640 feet above the sea. It runs north-east, then east, and lastly south-east, entering the sea a mile north-east of Old Aberdeen. It has a total course of 78 miles, but only 42 in a straight line, and it drains a tract of 495 square miles, chiefly composed of granite and gneiss, with a little syenite and clay-slate. In the upper part of its course, it receives some large mountain streams, but its chief tributary is the Ury, which comes 24 miles from the north-west. Near the junction of the Ury and

Don is a curious conical gravel hillock, called the Bass, the subject of a prophecy by Thomas the Rhymers. The Don, at less than a mile from the sea, is crossed by the old 'Brig o' Balgownie,' of one Gothic arch. Lord Byron, while a youth, had a superstitious dread in crossing this bridge, from an old prophecy connected with it. To keep this bridge in repair, Sir Alexander Hay, in 1605, left an annuity of £2, 5s. 8½d., which sum has now accumulated to about £25,000, in addition to about £17,000, spent in 1825, in the erection of a new bridge over the Don, a quarter of a mile lower down.

DON, or DUN, a river of the West Riding of Yorkshire, rising in the moors on the borders of Derbyshire and Cheshire. It runs 55 miles, first south-east to Sheffield, and then north-east by Rotherham, Doncaster, and Thorne, into the Aire, which soon afterwards unites with the Ouse. Its basin consists of Carboniferous and Permian strata. Its chief tributaries are the Rother, Dearne, and Wente. It is navigable for the last 39 miles of its course below Sheffield, by the aid of artificial canals and cuts.

DO'NA, SAN, a town of North Italy, in the province of Venice, 18 miles north-east from Venice, on the left bank of the Piave. Pop. 5550.

DON BENITO, a town of Spain, in the province of Badajoz, 55 miles east of the city of that name. It is situated near the left bank of the Guadiana, and is in general well built, with wide and tolerably clean streets. It has several squares, the chief of which is lined with the principal structures in the town, including the town-hall, prison, and a convent; and in the center is a public promenade. D. B. has manufactures of woollens, wine, and oil, and its proximity to the Guadiana affords it great trading facilities. Pop. about 15,000.

DON CA'RLOS. See CARLOS.

DON JU'AN is a legendary and mythical personage like Dr. Faustus. The two have been made the representatives of two different tendencies, both proceeding from the same principle—from the principle, namely, of unbelief and godlessness, which necessarily turns self into either a god or a beast—the principle of subjectivism, or selfishness become dominant. In Faust, expression has been given to the subjective idealism of the Germanic nations, their tendency to subtle speculation and a rationalism antagonistic to faith. In D. J. appear the practical materialism and refined sensualism of the Romanic peoples, and the tendency of blind belief in a corrupt catholicism to pass into unbelief.

Although Faust and D. J. have thus the same source, and the same termination, yet, as they proceed from opposite poles, they stand in contrast to each other, and, as was natural, have found different vehicles of expression—Faust in poetry, D. J. in music.

The ideal of the D. J. legend is presented in the life of a profligate who gives himself up so entirely to the gratification of sense, especially to the most powerful of all the impulses, that of love, that he acknowledges no higher consideration, and proceeds to murder the man that stands between him and his wish, fancying that in so doing he had annihilated his very existence. Partly in wanton daring, partly to allay all uneasy misgiving, he then challenges that Spirit in which he disbelieves to demonstrate to him its existence in the only way he holds valid—namely, through the senses. When this actually happens, when the Spirit proves its existence and power by animating the marble statue which he had, with daring mockery, invited as his guest, and summoning him to the final tribunal, compels him to acknowledge the supremacy of spirit, and the worthlessness of a merely sensuous, godless, and immoral existence, it is all over with him, he is crushed, and sinks into hell.

This ideal career is aptly enough localized in one of the most luxurious cities of the once world-monarchy of the Saracens—viz., Seville—and the characters wear the names of the ancient noble families of the place. The hero of the story, D. J., is described as a member of the celebrated family Tenorio, and is represented as living sometimes contemporary with Peter the Cruel, sometimes with Charles V. The chief aim of his sinful career is the seduction of the daughter of a governor of Seville, or of a nobleman of the family of the Ulloas. Being opposed by the father, he stabs him in a duel. He then forces his way into the family tomb of the murdered man, within the convent of San Francisco, causes a feast to be prepared there, and invites the statue which had been erected to his victim to be his guest. The stone guest appears at table as invited, compels D. J. to follow him, and, the measure of his sins being full, delivers him over to hell. At a later period, the legend came to be mixed up with the story of a similar profligate, Juan de Maraña, who had in like manner sold himself to the devil, but was at last converted, and died as a penitent monk in the odor of sanctity.

The genuine legend of D. J. was first put into form by Gabriel Tellez (Tirso de Molina), in *El Burlador de Sevilla y Convidado de*

Piedra. This drama was transplanted to the Italian stage about 1620, and soon found its way to Paris, where numerous versions of it, among others Molière's *Festin de Pierre* (1669), made their appearance. It was brought on the English stage by Shadwell under the title of *The Libertine* (1676). In the end of the 17th c., a new Spanish version of Tellez's play was prepared by Antonio de Zamora, and brought on the stage. It is this version that forms the groundwork of the later Italian versions and of Mozart's opera. It was first put into an operative form by Vincenzo Righini in *Il Convitato di Pietra* (1777); the text of Mozart's *Don Giovanni* was written by Lorenzo da Ponte (1787). Through this famous opera the story became popular all over Europe, and has since furnished a theme for numbers of poets, playwrights, and writers of romance. A. Dumas has a drama, *Don Juan de Maraña*; Byron's *Don Juan* follows the name, and in so far the character, of the original; and Prosper Mérimée's novel, *Les Ames du Purgatoire, ou les Deux Don Juan*, is founded upon it.

DON QUIXOTE. See CERVANTES.

DONABUE, a town of Pegu, stands on one of the main branches by which the Irawaddy enters the Bay of Bengal, lat. 17° 10' N., and long. 95° 27' E. It is within the delta of this grand artery of the country, and is situated 65 miles to the north-west of Rangoon, and 54 to the north-east of Bassein, the principal seaports of the newly acquired British province. It is only on historical grounds, however, that the place is worthy of notice. Here the English were repulsed with considerable loss in both the Burmese wars; first in 1825, and again in 1853.

DONAGHADEE, a seaport in the north of the county of Down, on the Irish Channel, 18 miles English (14 Irish) east-north-east of Belfast, and 22 miles south-west of Portpatrick, Wigtonshire, with which it is connected by a submarine telegraph cable. It forms a crescent round the harbor, with two chief streets, one facing the sea. Its exports are cattle, grain, potatoes, &c. The embroidery of muslin was established in D. about 50 years ago, and it still maintains its pre-eminence in this branch of manufactures, which gives employment to the greater part of the female population. Pop. (1881) 1861. On the north of D. is a conical mound, 140 feet high, 480 feet in circuit at the base, and surmounted by a modern miniature castle 50 feet high, whence there is a very extensive prospect, including the Scotch coast and the Isle of Man. The Danes, in 837, are said to have destroyed a university which stood on a level a little south of where D. now is.

DONALDSON, JOHN WILLIAM, was born in London, June 10, 1811. His father, Stuart Donaldson, a wealthy merchant, was descended from an old Scotch family; his mother was daughter of J. Cundall, Esq. of Snale Green, Lancashire. He was educated first at the university of London, and afterwards at Trinity College, Cambridge. He graduated as B. A. in the year 1834, and obtained the second place in the first class of the classical tripos. The year following, he was elected Fellow. His first work was a volume entitled *The Theatre of the Greeks*, partly original and partly compiled, which, having been carefully revised and improved in six successive editions, still holds its place as a school and college class-book. He was still resident at Cambridge, holding the position of assistant-tutor at Trinity, when he published the first edition of his *New Cratylus* (1839), a work remarkable for its research, erudition, and boldness, and as being the first attempt, on a large scale, to familiarize Englishmen with the principles of comparative philology, as established by the great scholars of Germany—Pott, Bopp, Grimm, and others. Availing himself largely, but not servilely, of the labors of these men, he developed their principles, and continued their researches, with a special application to the history, structure, and etymology of the Greek language. The *New Cratylus* in its latest, largest, and most improved form, is still the most important work which has been written in English upon the subject. Mr. D. soon after married the daughter of Sir John Mortlock of Stapleford, and accepted the post of head-master of the grammar-school of Bury St. Edmunds, having previously taken holy orders. Notwithstanding the engrossing nature of his duties as head-master, he found time to prosecute and extend his linguistic studies, embracing in their wide range Hebrew and Arabic, and most of the dialects of modern Europe.

In the *Varronianus*, of which the first edition appeared in 1844, he undertook to accomplish for Latin philology what in the *New Cratylus* he had done for Greek. He dedicated the work to the Bishop of St. Davids (Dr. Thirlwall), in grateful recognition of the benefits derived from his Cambridge teaching. Among his other works of this period may be mentioned an edition of Pindar, of the *Antigone* of Sophocles (with a verse translation), *Maskil le Sopher* (a treatise on Hebrew grammar), and finally *Jashar*, a book written in Latin, and published at Berlin, the object of which was, by critical tests, to distinguish the fragments of the lost book of *Jashar* imbedded in the Pentateuch. This book was violently as-

sailed by the so-called 'religious press,' which did not prevent its undaunted author from issuing a second edition.

Soon afterwards he resigned his place at Bury St. Edmunds, and returned to Cambridge, where he gave a course of lectures on Latin Synonyms, and occupied himself with tuition. Here he wrote a volume entitled *Christian Orthodoxy*. Some critics vehemently disputed its right to the title. A smaller volume on *Classical Scholarship* followed. He had previously issued a *Greek Grammar* and a *Latin Grammar* for the use of schools. These, during his residence at Cambridge, he recast and enlarged, so as to rival in profundity and copiousness any other works on the same subjects. In 1856, he was appointed one of the Classical Examiners in the university of London, an honor which he owed chiefly to the strenuous support of Mr. Grote, the historian of Greece.

He was engaged in superintending the compilation of a new *Greek Lexicon*, when his health, for the first time, began to show symptoms of failure. A tour in Germany during the summer of 1860 did not produce any change for the better. Incipient disease of the brain, the result of overwork, showed itself first by neuralgic pains, and afterwards by more alarming symptoms. He removed to London, and died in his mother's house, after some weeks of great suffering, borne with calm and patient courage, on the 10th of February 1861. In private life, he was distinguished by kindness of heart, ready wit, unflinching vivacity, and varied conversational powers. It ought, perhaps, to be mentioned that a little work, published anonymously under the title of *Philetherus Anglicanus*, which made no small sensation at the time of its appearance, has been very generally attributed to Dr. Donaldson.

DONALDSON'S HOSPITAL, an extensive establishment at Edinburgh, of the character of Christ's Hospital, London. Its founder was James Donaldson, a successful printer in Edinburgh, son of Alexander Donaldson, publisher, of whom some notice is taken in the articles **BOOK-TRADE** and **COPYRIGHT**. In 1763, Alexander started the *Edinburgh Advertiser* newspaper, which was afterwards conducted by his son James, and became a lucrative concern in his hands. Dying in 1830, James bequeathed the fortune of two generations, amounting to about £215,000, to trustees, for the endowment and erection of a hospital for the maintenance and education of poor boys and girls.

The building, which occupies a commanding situation to the west of Edinburgh, was begun in 1842, and finished in 1850, is a large and beautiful quadrangular structure, in the Elizabethan style, the late W. H. Playfair being the architect. The cost of the edifice and furnishings was nearly £124,000, but as this was defrayed by the accumulated interest, the original endowment remained untouched. The hospital can accommodate 300 children—150 boys and 150 girls: in 1877 it contained 214 children (120 boys and 94 girls), of whom 115 (70 boys and 45 girls) were deaf and dumb. Those eligible for admission are declared to be, '1st, Poor children of the name of Donaldson or Marshall, if appearing to the governors to be deserving; 2d, Such poor children as shall appear to be in the most destitute circumstances and the most deserving of admission.' None are received whose parents are able to maintain them. The children are clothed and maintained in the hospital, and taught such useful branches of a plain English education as will fit the boys for trades, and the girls for being servants. The age of admission is from seven till nine, and that of leaving the hospital fourteen years. The children wear a simple uniform of modern fashion.

DONATELLO (properly, **DONATO DI BETTO BARDI**), one of the restorers of the art of sculpture in Italy, was born at Florence in 1383. He belonged to the Donato family, which reckons several scholars among its members, and has given some doges to the republic of Venice. *Donatello* was a diminutive given to the artist in childhood. He received his earliest instructions from Lorenzo Biceci. His first great works in marble were the 'St. Peter' and 'St. Mark' in the church of St. Michael in his native city. His own favorite, however, was the statue of an old man in the garb of a senator, on the steeple of the same church. It is known under the name of *Zuccone* (the Gourd or Baldhead). He died at Florence, December 13, 1466. D.'s principal works, besides those already mentioned, are—a statue of 'St. George' (in marble), 'Judith bearing the Head of Holofernes' (in bronze), the 'Crucifixion' (in wood), several statues of the 'Baptist' (executed in various materials), and a grand equestrian statue (in bronze) of Erasmus Gattamelata, erected on one of the public places of Padua. He also executed a number of bas-reliefs. The whole tendency of D.'s genius was towards a reproduction of the antique; and his style, though not free from harshness and the rudeness of early art, sometimes reminds one of the glorious productions of ancient Greece.

DONATION. A donation in prospect of death, *donatio mortis causa*, differs from a gift *inter vivos*, inasmuch as it is incomplete, and revocable during the donor's life, or ambulatory, as lawyers

say. It differs from a legacy, on the other hand, in that it requires no probate, for it is not a testamentary act, the donee's title proceeding directly from the donor in his lifetime. In Scotland, following the law of Rome, it is common to distinguish between donations *pure*—or those which do not take place in anticipation of death, marriage, or any other specific event—and gifts. Such donations are in reality gifts, but gifts which are not intended to be immediately delivered. It was with reference to this species of donation that the equitable arrangement called the *beneficium competentie* was introduced, by which the donor was allowed to retain as much as was necessary for his own subsistence before fulfilling the obligation, if he was reduced to indigence.

Another implied condition of a donation by the Roman law was, that when any one who had no children made a donation of the whole or the greater part of his estate, the donation became void if he had children afterwards; the presumption being that he would not have given his property away if he had anticipated that he was to become the father of a family. It is a general principle of law, that a donation is never presumed; but this rule suffers an exception in the case of alimony given without an agreement to pay board, which is presumed to be gratuitous unless given by one who makes a livelihood of entertaining strangers. Minors, and persons incapable of contracting, are not presumed to have been alimoned gratuitously, unless their relationship to their entertainer be such as to warrant the presumption. Where the minor is possessed of an adequate separate estate, even the father may claim the expense of maintaining him, and the rule applies with greater force to all more distant relatives. Donations between man and wife (*inter virum et uxorem*) were by the Roman law, and are by the law of Scotland, revocable by the donor at any time during his or her life, *ne conjuges mutuo amore se spoliarent* (lest the spouses should despoil themselves from mutual love). But mutual grants for substantial considerations between the spouses are not revocable, if there be any reasonable proportion between the two. Thus, where there has been no ante-nuptial contract of marriage, the husband may provide for the wife in the event of her survivance, and the provision will be effectual in so far as it is rational. It will be revocable only *quoad excessum*. Donations in the prospect of marriage (*donationes propter nuptias*) in the Roman law were given by the husband in security of the dowry or *dos*, which he was bound to pay back to the wife or her relatives on the dissolution of the marriage. When the *dos* was returned to the wife, the donation was returned to the husband. In the law of Scotland, when donations *propter nuptias* are spoken of, we are to understand provisions made by the husband not with a view to the dissolution of the marriage, but as an equivalent for the dowry, or, as it is called in Scotland, the *tocher*.

DONATISTS were the followers of Donatus, a Numidian bishop who opposed the election of Cecilianus in 311 A.D. to the bishopric of Carthage, on the ground of the ordination having been performed by one who had been a Traditor, or traitor—that is, one who, during persecution, had given up the sacred books to the pagan authorities; and also because Cecilianus had exhibited great hostility towards the victims of the late persecution. After some time, the Council of Arles (August 1, 314 A.D.) decided against Donatus, who in a short time seceded from the Catholic Church, and formed a distinct sect, which, by 330, had 172 bishops in Northern Africa. The D., like the followers of Novatian (q. v.), went upon the principle, that the essence of the true church consisted in the purity and holiness of all its members individually, and not merely in its apostolical and Catholic foundation and doctrine. They therefore both excommunicated all lapsed and gross offenders, not receiving them again but on being re-baptized, and also held that the efficacy of the sacraments depended on the worthiness of the administrator. Driven to fanaticism by the oppression of the secular power, they not only denied to the state all right to meddle with ecclesiastical affairs, but bands of Donatist ascetics collected, attacked the imperial troops (348), and continued to devastate Mauritania and Numidia for a dozen years.

In the beginning of the 5th century, they seem to have almost equalled the Catholics in number, and the eloquence of Augustine and the severities of Honorius were exercised upon the sect in vain; they continued to exist as a separate body. But by adopting a more prudent plan of proceeding, the Catholic bishops had, by the end of the 6th c., induced most of those that had left to return to the bosom of the church; and in the 7th c. the D. were extinct. Donatism is regarded by Neander (see *Dogmengeschichte*, translated into English by J. E. Royland; Bohn, vol. ii. page 394) as a reaction against that form of Catholicism, 'which conceived the church to be an outward organism, continued by the succession of bishops, who formed the necessary medium of communication with Christ, and for partaking in the Holy Spirit and salvation.' 'Whoever is shown to be a Christian in a right and

lawful manner, is to me a Catholic,' was a saying of the D.; while the church in general, guided by Augustine, wished to let the worthy and unworthy remain mixed together, and to defer the separation to the final judgment.' Thus, while the D. had the merit of superior strictness of theory, it must be acknowledged that their views were less practical than those of their opponents.

DONA'TUS, ÆLIUS, a well-known grammarian and commentator, who taught grammar and rhetoric at Rome about 355 A.D., and was the instructor of St. Jerome. He wrote treatises, *De Literis*, *Syllabis*, *Pedibus et Tonis*, *De Octo Partibus Orationis*, and *De Barbarismo, Solecismo, &c.*, the best edition of which is in Lindemann's *Corpus Grammaticorum Latinorum* (vol. i.). These writings form together a pretty complete course of Latin grammar, and in the middle ages were the only text-book used in the schools, so that Donat came, in the west of Europe, to be synonymous with grammar, or with the elements of any science. *The Donat into Religion* is the title of a book by an English bishop, and there was an old French proverb, *Les diables estoient encore à leur Donat* ('The devils were yet in their grammar'). The Latin grammar of D. has formed the groundwork of the elementary treatises on that subject to the present day. Donatus was one of the first books on which the art of printing by means of letters cut on wooden blocks was tried, and copies of these Donatuses are reckoned among the greatest of bibliographical curiosities. The author also wrote a commentary on Terence, of which we possess only a part extending to five comedies, to be found in the edition of Terence by Klotz (2 vols., Leip. 1838).

From this D. we must distinguish a later grammarian, **TIBERIUS CLAUDIUS DONATUS**, from whom we have a very worthless life of Virgil, prefixed to many editions of that poet, and fragments of a commentary on the *Æneid*.

DO'NAUWORTH, a town of Bavaria, situated at the confluence of the Wernitz and the Danube, about 25 miles north-north-west of Augsburg. It is well built, in the form of an amphitheater, round the side of a hill, and is surrounded by walls. It was formerly a free imperial city of considerable importance, but it has now sunk into an insignificant place of 4000 inhabitants. It is historically interesting, however, as the main cause of the 'Thirty Years' War'; the severity of the punishment meted out to the inhabitants in 1607, in consequence of their adoption of the Reformed doctrines, and their assault on a Roman Catholic procession of the 'host,' having led to the formation of the Protestant League, and Catholic Union, the opponents in that long and severe struggle. It is likewise associated with the name of Marlborough, who stormed and carried the intrenched camp of the Bavarians here in 1704. Also, on the 6th October 1805, the French, under Soult, obtained a victory here over the Austrians, under Mack.

DO'NAX, a genus of lamellibranchiate molluscs, of the family *Tellinidæ*, with shell of two equal valves, which close perfectly, and are of a triangular form, prettily striated from the beak to the margin, the beak occupying the obtuse angle of the triangle. The species of D. are generally small. Several are found on the British coasts. The fossil species are not numerous, and belong to the eocene formation.

DO'NCASTER, a municipal borough in the West Riding of Yorkshire, on the right bank of the Don, on the Great North Road, 35 miles south of York. The country around is flat, but beautiful. Fine old elms line the broad and level road to the south. D. is very clean and well built. The High Street is a mile long. It has manufactures of iron, brass, sacking, linen, and agricultural machines. Its corn-market is large and important. Pop. (1871) 18,763; (1881) 21,130. D. was the ancient *Danum*, and lay on the Roman road from York to Lincoln. Roman coins, urns, and a votive altar have been found here. It was the *Dona Castre* of the Saxons. The Saxon Northumbrian kings had a palace here. D. was burned by lightning in 759, and frequently ravaged by the Danes. It has long been famous for its annual races, begun in 1703, and held a mile south-east of the town in the second week of September. Colonel St. Leger, in 1776, founded stakes which have been yearly run for by the best horses in England. On an eminence five miles west-south-west of D. are the ruins of Conisborough Castle, a Norman-Saxon round tower, 37 feet in diameter and 86 feet high, with walls 15 feet thick, strengthened by square buttresses reaching the whole height. The door is arrived at by an external flight of 37 steps, and within is a cylinder open to the heavens.

DO'NDRA HEAD, the most southerly extremity of Ceylon, is in lat. 5° 55' N., and long. 80° 38' E. As compared with Cape Comorin, the corresponding point in the peninsula of Hindustan, it more directly faces the Indian Ocean, and lies nearer the grand thoroughfares of eastern commerce. An adjacent village of the same name numbers 900 inhabitants.

DONEGA'L, a seaport in the south of Donegal county, at the mouth of the Eske, on a shallow creek of Donegal Bay, 11 miles

north-north-east of Ballyshannon. It lies in a rich alluvial tract, surrounded on three sides by hills, behind which rise lofty picturesque mountains. Pop. (1861) 1516; (1881) 1416. D. exports corn and butter. On the river is Donegal Castle, formerly belonging to the O'Donnells of Tyrconnel. On the shore are the ruins of a Franciscan monastery, founded in 1474 by Hugh O'Donnell. Near D. is a frequented sulphureo-chalybeate spa.

DONEGAL, a maritime county in Ulster province, and washed by the Atlantic on the north and west. Its greatest length is 85 miles; greatest breadth, 41; average, 27; area, 1865 square miles, one-third being arable, and $\frac{1}{16}$ in wood. The coast-line is 395 miles long, being indented by many deep bays and loughs, some 2 to 20 miles broad, and 15 to 25 long. Some of the coast cliffs rise from 500 to 800 feet. Of the many isles off the coast, 17 are inhabited. Except a small tract in the east and south-east, the surface is mountainous, moory, and boggy, with many small lakes and rivers, associated with endless fairy tales and traditions. The highest hill, Erigal, rises 2462 feet, and several other hills exceed 2000 feet. The mountain-ridges run north-east and south-west. The largest stream is the Foyle, running 16 miles north-east into Lough Foyle. Derg is the largest loch. The geological structure of D. consists of granite, metamorphic rocks, and graywacke, with Devonian and carboniferous limestone strata and trap. White marble occurs at Dunlewy. Except on the Foyle, the climate is moist, raw, and boisterous from violent west and north-west winds. There are many ruins of houses and churches overwhelmed with sand. Of the Irish counties, D., in ratio to its area, has least land in cultivation and occupied in towns and woods. The soil is generally cold and poor on the primitive rocks, and light clay on the slaty. In 1880, 229,597 acres were in crop, the largest proportion being oats, potatoes, turnips, and flax. There are manufactures of linen, worsted stockings, worked muslins, and kelp, and fisheries of cod, sole, plaice, herring, and mackerel. Trade is chiefly through Londonderry. Inaccessible retreats and abundance of turf-fuel made D. at one time the chief seat of illicit distillation in Ireland. It contains 6 baronies, 8 poor-law unions, and 51 parishes. Pop. (1841) 296, 448; (1851) 255,160; (1871) 218,334; (1881) 205,443, of whom 157,224 are Roman Catholics, 24,626 Episcopalians, 21,306 Presbyterians, and the rest of other denominations. D. sends two members to parliament. The towns are small, the chief being Lifford, the county town; Ballyshannon, Letterkenny, Rathmelton, Donegal, and Killybegs. Industrious farmers and artisans occupy the low fertile tracts. The population of the mountain districts has been much diminished by emigration.

Till 1612, when James I. planted Ulster with English and Scotch settlers, the south part of D. was called Tyrconnel, and belonged to the O'Donnells, who, from the 12th c., were inaugurated as Princes of Tyrconnel on Doune Rock, near Kilmacrenan. D. has many ruins and traces of forts, of 30 religious houses, castles, and of the palace of the North Irish kings on a hill near Lough Swilly. Near Derry is the coronation-stone of the ancient Irish kings. D. contains many memorials of St. Columba. Warren, in 1798, captured a French fleet off Tory Isle, which contains the remains of seven churches, two stone crosses, and a round tower. St. Patrick's Purgatory is on an isle in Loch Derg. Near Horn Head is a hole in the roof of a cave, called M'Swiney's Gun, from which issue, at times, jets of water with loud explosions.

DONGARPU'R, a fortified town of Rajputana, in Central India, is in lat. 23° 50' N., and long. 73° 45' E., and is 345 miles to the north of Bombay. It is the capital of a protected state of the same name, which contains 952 square miles, and 175,000 inhabitants.

DONG-NAI' is the name of a river and a town in Anam or Cochinchina, an oriental state which has recently derived an adventitious interest from the combined attacks of France and Spain.—1. The river enters the Chinese Sea, by various mouths, about lat. 10° 20' N., and long. 107° E. It is navigable for large vessels as far up as Sai-gon, which, with a population of 180,000, and a trade of great value, stands 40 miles from the coast. From this city, a canal of 23 miles in length connects the D. with the Menam-kong, or Cambodia, which, in a more westerly channel, divides Anam from Siam.—2. The town is on an affluent of the river, being 25 miles to the north-east of Sai-gon.

DO'NGOLA (New), or **MARA'KAH**, a town of Nubia, capital of a province of the same name, is situated on the left bank of the Nile, in lat. 19° 10' N., long. 30° 22' E. D., which is a military station, is also a place of considerable trade. Its exports are chiefly slaves, in return for which it receives goods of all kinds from Cairo. Its bazaar is well supplied, and it has an indigo-factory belonging to the khedive of Egypt. Population estimated at 20,000. In the vicinity, on the fertile river-island of Argo, are the ruins of old Ethiopian and Egyptian buildings, colossal statues, &c.—**OLD DONGOLA** is a ruined town on the right bank of the

Nile, 75 miles south-south-east of New Dongola. On the east side, the desert in some places stretches down to the water-edge.

DONIS CONDITIONA'LIBUS, STATUTE DE, called also the Statute of Westminster the Second, 13 Edw. I. c. 1, is the statute which first established in England the power of creating an Entail (q. v.). Before the passing of this act, it had been held by the judges that a conveyance to a man and the heirs of his body was a fee-simple conditional, i. e., a Fee-simple (q. v.) on condition that the donee should have heirs of his body; and this condition having been purified by the birth of an heir, the donee was at liberty to alienate or burden the land, and thus to defeat the original gift. In this respect, however, the gift differed from a fee-simple, that if the donee failed to exercise his power of alienation, and died without issue surviving, the land descended not to the heirs of the donee, but to those of the donor. To counteract the decision of the judges above noticed, the statute *de donis* was passed. It provided 'that the will of the giver, according to the form in the deed of gift manifestly expressed, shall be from henceforth observed.' From the date of this act, the courts recognized two estates in the land—viz., that of the donee, which is called a Fee-tail (q. v.), and that in the donor, which was a reversion or expectancy, by which, on the termination of the estate-tail, the lands would revert to the original owner. As to the manner in which even this intention was defeated, see **ENTAIL**. Not only lands, but rents, dignities, &c., might be entailed under this act. *Co. Litt.* 20 a.

DONIZETTI, GAETANO, a famous Italian composer, was born at Bergamo, in Lombardy, 1798. He learned the elements of music at the Lyceum of that town, and later, the art of composing under Simon Mayr. D.'s first compositions belonged exclusively to church-music, but the only success he obtained by them was an appointment as a chorister at the church of Basilica di San-Maggiore. D. gave up that position very soon, and after several vicissitudes, entered the military service of Austria. D. now devoted himself to the composition of operas, of which he has left more than sixty. *Enrico di Borgogna*, 1819, with nineteen others that followed, failed to produce any marked result; and it was not until 1831 that his renown began to spread beyond Italy. *Anna Bolena*, *L'Elisir d'Amore*, *Lucrezia Borgia*, *Marino Faliero*, *Lucia di Lammermoor*, *La Fille du Régiment*, followed each other in rapid succession, adding new lustre to his fame. D.'s last productions were *Don Sebastiano* and *Caterino Cornaro*. He died at Bergamo in 1848. Among modern Italian composers, D. is reckoned to be nearest to Rossini, whose style he imitated during the first stage of his career. D.'s music is praised not so much for melody as for dramatic truth and solidity of execution.

DONJON, or **DUNGEON**, the principal tower or keep (q. v.) of a castle (q. v.) or fortress. It was so called either from being placed on a *dun* or elevation, natural or artificial, or because, from its position, it dominated (Lat. *dominio*, corrupted into *domgio*, *dongeo*) or commanded the other parts of the fortress. From the circumstance that the lower or underground story of the donjon was used as a prison, has come the modern meaning of the word. See **CASTLE**.

DONNE, JOHN, D.D., the son of an eminent merchant, cadet of an ancient family in Wales, was born in London in 1573. His parents were Catholics, and he was educated in that faith. At the age of eleven he went to Oxford, where he remained three years; thereafter, he removed to Cambridge. Although he greatly distinguished himself at these seats of learning, the faith of his parents prevented him from taking a degree. At the age of 17, he entered Lincoln's Inn, to read for the bar; and while so engaged, he carefully studied the principal points in dispute between Catholics and Protestants, and finally joined the latter. About this time, he wrote several of his minor poems, the erotic heat of which contrasted strangely with the austerity of his later years. In 1594, he went abroad, and lived for three years in Spain and Italy. On his return, he was made secretary to Lord Ellesmere, then Lord Keeper of the Great Seal. Here he fell in love with that nobleman's niece, and they were privately married. When the union was discovered, D. was imprisoned by his enraged father-in-law. After his liberation, he recovered his wife by legal process, and, without settled employment, went to reside at the house of Sir Francis Wooley, a kinsman of his wife. After the death of Sir Francis, he removed to London, and lived with Sir Robert Drury, in Drury Lane. With Sir Robert he went to Paris; and on his return, at the instigation of James I., who was delighted with the *Pseudo-Martyr*, a book which D. had written against the Catholics, he entered holy orders. He was made D.D. by the university of Cambridge; and after accompanying an embassy to the queen of Bohemia, he was made on his return Dean of St. Paul's, and vicar of St. Dunstan's. A fever carried him off in 1631. His life has been written by Izaak Walton—forming one of the group of 'lives' so praised by Wordsworth in a celebrated sonnet.

D.'s works consist of satires, elegies, religious poems, compli-

mentary verses, and epigrams: they were collected and published by his son in 1650. An earlier but imperfect collection appeared in 1633. D. is usually considered as the first of a series of poets of the 17th c., who, under the infelicitous name of the Metaphysical Poets, filled a conspicuous place in English literary history. The directness of thought, the naturalness of description, the rich abundance of genuine poetical feeling and imagery, now began to give way to cold and forced conceits, and elaborate exercises of the intellect. Yet it is generally acknowledged that amid much rubbish, there is not a little real poetry, and that of a high order, in Donne. His fancy was rich and subtle, his wit singularly keen and poignant, and his word-painting such, that, if he had possessed, in addition, music and sensibility, he would probably have enjoyed a perpetual popularity.

DOO, GEORGE THOMAS, one of the best English historical engravers of the present day, was born in the parish of Christ Church, Surrey, January 6, 1800. He has made himself best known by his famous plate of 'Knox Preaching before the Lords of the Covenant,' after Wilkie; while his admirable rendering of Eastlake's 'Italian Pilgrims coming in Sight of Rome,' his exquisitely finished heads of women and children, after Lawrence, his engravings from Raffaele, Correggio, and others, have succeeded in winning for him a very high place in the estimation of the admirers of his laborious art. In 1851, he was elected a Fellow of the Royal Society, and, in 1856, a Royal Academician. He was appointed chairman of the Engravings Committee of the London International Exhibition of 1862. In 1864, he completed, after eight years' work, a large engraving of the 'Raising of Lazarus,' by Sebastian del Piombo.

DOOM, the old name given to the last judgment, and to those representations of it in churches which have a religious rather than an artistic object. Many of the dooms are executed in distemper. In the reign of Edward VI most of them were washed over, or otherwise obliterated, as superstitious. There is a fine one still remaining in the church of the Holy Trinity at Coventry.

DOOM or **DUM PALM** (*Hyphane Thebaica*), a species of palm remarkable for the repeated forkings of its stem. It is a native



Doom Palm (*Hyphane Thebaica*).

of Upper Egypt and of the central parts of Africa. In some districts, it is the most plentiful tree, sometimes even forming forests, sometimes growing amidst the very sands of the desert. Its leaves are fan-shaped. Ropes are made of the fibre of its leaf-stalks. Its fruit is about the size of an orange, but of a somewhat elongated irregular shape; the outer skin is red, and this being peeled off, a considerable thickness of a spongy dry substance is found within it—also part of the *pericarp*—which has an insipid sweetness, and a remarkable resemblance to gingerbread, so that the tree is sometimes called the **GINGERBREAD-TREE**. This substance is used as an article of food, and an infusion of it as a beverage. The infusion is cooling, gently aperient, and very salutary in fevers. The albumen of the seed is hard and semi-transparent, and is turned into beads and other little ornaments. Each fruit contains one seed. Egyptian bdellium (see **BDELLIUM**) is said to be an exudation of this palm.

DOO'MSDAY BOOK. See **DOMESDAY BOOK**.

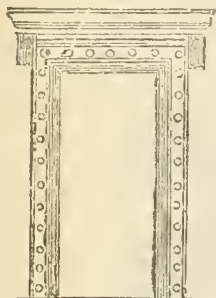
DOO'MSTER. See **DEEMSTER**.

DOON, a Scotch river, rising in the south-east of Ayrshire in Loch Enoch. It runs north-west through Loch Doon (5 miles by ½ mile, amid treeless mountains), past Dalmellington, Burns's Monument, and Alloway Kirk, to the Firth of Clyde two miles south of Ayr. It is 30 miles long. On leaving Loch Doon, the

river flows through Glen Ness, a huge rocky and wooded ravine, not surpassed in picturesque beauty by any similar scenery in Scotland. On an islet in the loch are the ruins of Doon Castle, where Edward, brother of Robert Bruce, is said to have lived. Burns has immortalized the D. in song.

DOOR AND DOORWAY, in Art. The form of the doorway is determined by the architectural style of the building in which it is placed. In classical buildings, it is generally rectangular in form, though both Greeks and Romans, following the Egyptians, amongst whom the practice was almost universal, occasionally diminished the opening towards the top; and the Romans, in later times, very frequently threw over it the circular arch, which was the characteristic feature of their style. Egyptian doorways are known to us, for the most part, only by the examples which remain in monumental structures; and these, like the other members of the style as thus exhibited, are of gigantic proportions. The doorway of the temple at Edfu measures 74 feet to its summit, but the lintel and cornice which cover it are so deep and massy as to occupy a space of no less than 23 feet, so that the height of the aperture is only 51. With the Egyptians, the doorway was an architectural object of very great importance. On either side of it, colossal statues or obelisks were placed, and the approach to it was often lined with rows of gigantic sphinxes.

The Greek doorway was surrounded by mouldings, and as the lintel or top-stone which covered it projected on both sides beyond the jambs, the mouldings which ran round both jutted out at the place of meeting, forming a sort of shoulders, as in the accompanying example. This arrangement, however, was by no means uniform, the mouldings of the jambs being frequently quite separated from those of the architrave, as in the beautiful doorway Erechtheum, of which an illustration is copied from Mr. Donaldson's work on Doors. The doors themselves, in antiquity, in private dwellings, were generally of wood; and in structures devoted to religious or public purposes, of metal, and occasionally

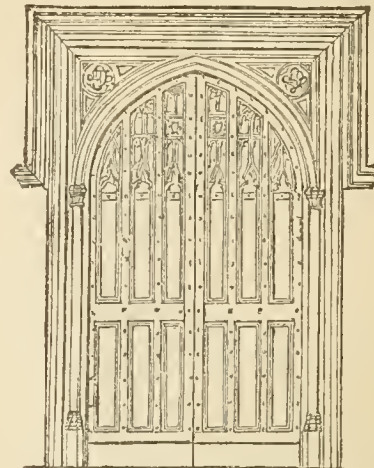


Doorway of Erechtheum.

of marble. They were generally panelled, and turned on pivots working in sockets. With the exception of the forms of the windows, and the tracery and foliage of the pillars, doorways are the most characteristic feature in all the styles of Gothic architecture. In the earliest, which we in this country are in the habit of calling Saxon, and which on the continent is commonly known as Romanic, they are of course very plain. There is seldom more than a few simple mouldings, surrounding a semicircular arch, and in some of the earliest examples, the head of the opening is covered by two flat stones, leaning upon each other in the center, and their other ends being placed

on the imposts, so as to form a triangle. In the Norman style, they become gradually more ornamental. The arch still continued in general to be semicircular, though there are a few instances of the segmental or horse-shoe arch. As the style advanced, the mouldings and enrichments became more various. Of these, that which is most characteristic of the style, is the zigzag moulding. Circular or octagonal shafts were now frequently placed in the jambs, and these, too, were often ornamented with zigzag or spiral mouldings, their capitals being enriched with foliage or grotesque heads or figures. The opening of the doorway often does not rise higher than the springing of the arch, and in this case it is generally flat, the semicircular space between it and the arch being frequently ornamented with a sculptured representation of some scriptural subject. The few Norman doors that exist are devoid of ornament, with the exception of projecting nails, and a simple iron scroll-work projecting from the hinge, and stretching to a greater or less extent over the door. As the doorway adheres strictly to the characteristics of the style, early English doorways of course generally terminate in pointed arches. In these the mouldings are more numerous, the jambs contain a greater number of small shafts, some of which occasionally stand quite free, and on the whole the work is richer in form, and more finished in execution. The opening of the doorway is now frequently divided into two, either by a single shaft or a clustered column. In the decorated style, the doorways are not in general so deeply recessed as in the early English; and this circumstance takes from them in richness more than they gain in elegance by their greater height, and by the more delicate character of their ornamentation. In these, the mouldings are commonly enriched with flowers or foliage, either in running patterns or placed separately at short intervals. Of these, the commonest are the Ball-flower (q. v.), and a flower of four leaves, which often projects boldly, and produces a fine effect. The iron scroll-work on the doors resembles that in the former style, except that the terminations are more frequently worked into leaves or flowers. In other cases, the doors are

panelled, and covered with characteristic tracery. In the perpendicular style, though the door continues to be arched, it is usually placed under a heavy square external moulding. The doorway in this style loses much of the depth and richness which belongs to it in the earlier styles which we have been considering. Shafts are still used in the jambs, though not always, and they are generally small and few in number; the capitals of the jambs rarely



Perpendicular Doorway:
From the Bishop's Palace, Lincoln.

possess the same richness of foliage, and frequently consist merely of plain mouldings. One or more large hollows are often left in the jambs, forming small niches, which frequently contain statues. This latter characteristic seems to be peculiar to the perpendicular style. In the doorways, as well as in the windows of this style, the four-centered arch came into general use, but two-centered arches, and, in small doorways, ogees, are frequently to be met with. The doors in the perpendicular style, when ornamented, are usually panelled, the upper parts being sometimes covered with tracery, but the fine iron scroll-work of the earlier styles had entirely disappeared.

DOOR, the movable panel by which the opening to an apartment, closet, or passage is closed. Doors are made of wood, iron, bronze, or stone. When moving horizontally on hinges, they are called *swing-doors*; when two such are used to close one opening, they are *folding-doors*. *Sliding-doors* are those which move on rollers, and may be pushed aside. A *jib-door* is one which is concealed as much as possible when shut. A *trap-door* is one which opens vertically over a horizontal opening, as a hole in a floor, &c. When a small door closes an opening cut in a larger one, it is usually called a *wicket*.

Doors are commonly made of wood, and these we shall first describe. The most simply made door is constructed of several boards joined together at their edges by a *rebate*, or a *ploughed and tongued groove* (see CARPENTRY, figs. 19 and 20); these are held together by a transverse piece simply nailed to each board; this is called a *ledge*, and the door thus made, a *ledge-door*. These are commonly used for workshops, stabling, &c.; but when durability and appearance are to be combined, a stout frame is first made, its parts joined together by mortise and tenon. See CARPENTRY, fig. 9. This frame has one or more openings—usually four—which are filled with thin pieces called *panels*, fitted into grooves ploughed in the edges of the frame. The horizontal pieces of the frame are, according to their position, called the top-rail, bottom-rail, lock-rail, and frieze-rail. The lock-rail is that to which the lock is fixed, the frieze-rail intermediate between the middle and top-rail in large doors. The extreme vertical parts of the frame to which the rails are fixed are called *stiles*, and the intermediate vertical part, a *mounting*. Doors are named one, two, four, six, &c., panelled doors, and are further described by the kind of moulding which surrounds the panel, and from the description of panel. The main object of framing, besides appearance, is to counteract the tendency of the wood to warp, by binding the different parts together with pieces having their fibres at right angles to each other.

In many old buildings, the outer, and even some inner doors are made of massive oaken planks, bound together with ornamental iron straps. Iron doors are chiefly used to intercept fire. For this purpose, they are best made of wrought iron, with double sides. Bronze doors are sometimes used for churches and other large buildings. They are usually ornamented with castings in high and low relief. Those of the Baptistery of the cathedral of Florence, by Ghiberti, and the Pantheon of Rome, are among the most celebrated examples. A few examples of

marble doors exist, chiefly in cemeteries and some Belgian churches.

DOORA. See DURRA.

DOORN, in English, *Thorn*, is a common name in South Africa. It indicates various communes in the Cape Colony. It also designates two rivers, distinguished as *Great* and *Little*, both of them joining the Olifant, or Elephant, on the right, but the smaller from the south-east, and the larger from the north-east.

DOORNBOOM (*Acacia horrida*), the most common tree in the wastes of South Africa. The name D. (*Thorn-tree*), given to it by the Dutch colonists, and the botanical specific name, are due to the number and sharpness of its spines. It seldom much exceeds thirty feet in height, but its timber is hard and tough, and is much used for house-carpentry, &c. See ACACIA.

DOQUET, or DOCKET (from the same root as *dock*, to cut off or clip), a small piece of paper or parchment, containing a brief or summary of a large writing. All attestations or declarations annexed to written instruments are called doquets, more particularly those that are done by a notary. The notarial doquet is said to be the most ancient example of fixed style in Europe; and though latterly appropriated to the instrument of *sasine*, it was formerly common to all solemn instruments. It consisted of a Latin attestation, holograph of the notary, annexed to the notarial instrument prepared by him. The name of the notary was set forth, and the authority mentioned, by which he had been appointed to be a notary. In the case of an instrument of *sasine*, it stated that he was personally present with the witnesses; that he saw, knew, heard, and noted the circumstances mentioned in the *sasine*; that he prepared the instrument, and the number of pages it contained. In addition to his subscription, the notary was formerly in use in Scotland to add his *signum*, which was a flourish of the pen, called a paraph or ruck. Latterly, he only subscribed the document on each page; and on the last page, opposite to the doquet, he added to his subscription the motto which he had assumed on his admission as a notary. The notarial doquet of instruments of *sasine* was superseded by 8 and 9 Vict. c. 35, s. 5.

DOR. See DUNG BEETLE.

DOR, or MONT DOR (often written less properly Mont d'Or), a chain of mountains in France comprised in the great group of the Auvergne (q. v.) mountains in the department of Puy-de-Dôme. They are clearly of volcanic formation, and rise in the Puy-de-Sancy, which is the highest peak of Central France, to the height of 6190 feet.

DORA'K, a town of Persia, in the province of Khuzistan, situated on a marshy plain at the junction of the Dorak with the Jerahi. It is surrounded by a mud-wall, and defended by a fort. By a canal which unites the Dorak with the river Karun, a considerable trade is carried on. D. is also reported to have thriving manufactures. Pop. 6000.

DORAN, JOHN, Ph.D., a copious contributor to miscellaneous literature, descended from an old Irish family of Drogheda, was born in London in 1807. In early life he resided in France and Germany, and was chiefly educated by his father. So early as 1822 he produced the melodrama of *The Wandering Jew*, and at the age of twenty became the editor of the *Literary Chronicle*. In 1835 he wrote a history of Reading, but from that time till 1854 he confined his labors to the periodical press. In the latter year he published *Habits and Men*, followed by *Table Traits and Something on Them*. *Lives of the Queens of England of the House of Hanover* appeared in 1855; *Knights and their Days*, in 1856; *Monarchs retired from Business*, in 1857; *History of Court Fools*, in 1858; *New Pictures and Old Panels*, in 1859; *The Princes of Wales*, in 1860; and a *Memoir of Queen Adelaide*, in 1861. In 1864 he produced *Their Majesties' Servants*, a history of the stage from Betterton to Kean; in 1868, *Saints and Sinners*; and in 1873, his most interesting work, an account of Mrs. Montague and the 'blue-stockings' of her day, under the title of *A Lady of Last Century*. In 1876 he published *Mann and Manners*, the letters of Sir Horace Mann to Horace Walpole. His last work, *London in Jacobite Times*, appeared in 1877. Besides being a large contributor to miscellaneous literature, Dr. D. several times edited the *Athenæum*, and at his death, 25th January 1878, he was editor of *Notes and Queries*.

DO'RCAS SOCI'ETY, the name given to an association of ladies who supply clothes to necessitous families. The name is taken from Acts ix. 39: 'And all the widows stood by him weeping, and showing the coats and garments which Dorcas made, while she was with them.'

DO'RCHESTER, a parliamentary and municipal borough, the county town of Dorsetshire. It has a considerable trade in ale and beer, and sends much butter to London. Pop. (1881) 7568. It sends one member to parliament. D. was the Roman *Durnovaria* or *Durinum*, a walled town with a fosse, and a chief Roman British station. Parts of the wall, six feet thick, remained till 1802.

Near D. are the remains of the most perfect Roman amphitheater in England, 218 by 163 feet, and 30 feet deep, the seats rising from the arena, cut in the chalk, and capable of holding 13,000 spectators. There is also a Roman camp with a ditch and high vallum. Near D. is a large British station with three earthen ramparts, a mile and a half in circuit, and pierced by intricate passages, and enclosing barrows. The inner rampart is 60 feet high. Here, in 1685, Judge Jeffreys, in his 'bloody assize,' sentenced to death, in two days, 109 persons implicated in Monmouth's rebellion.

DO'RCHESTER, formerly accounted a separate city of Massachusetts, U.S., was in 1870 annexed to the city of Boston. The fortification of Dorchester Heights, in 1776, compelled the evacuation of Boston.

DOROGNE, a department in the south-west of France, formed of the ancient province of Périgord, with small portions of Limousin, Angoumois, and Saintonge. Area, 3531 square miles. Pop. (1881) 492,608. The surface is for the most part hilly, and covered with broom and underwood, with here and there a valley of extraordinary beauty and fertility, enclosed with hills, the sides of which are generally clothed with vineyards. There is a great deficiency of corn, but the want, as an article of food for the inhabitants, is supplied to some extent by the immense produce of the chestnuts, which, with the walnut and the oak, are the prevailing trees in the forests. The climate is generally mild. Mines of coal, iron, and manganese are worked; marble, alabaster and millstones are quarried. The manufactures are coarse woollens, hosiery, brandy, oil, paper, &c. D. carries on considerable trade in iron, wine, hams, and truffled turkeys. It has five arrondissements—viz., Bergerac, Nontron, Périgueux, Ribérac, and Sarlat, with Périgueux as capital.

DO'RDRECHT. See DORT.

DORÉ, PAUL GUSTAVE, a French artist of great and versatile power, was born at Strasburg in 1832. He was educated at Paris, and very early gave indication of superior ability. His first attempts were sketches, contributed to the *Journal pour Rire* and others of the Paris periodicals. In 1855, he exhibited his picture of the 'Battle of the Alma,' which was followed by the 'Battle of Inkermann' in 1857. In this year he first became heard of in England by the reissue of his illustrations of the legend of the 'Wandering Jew,' the power of weird and grotesque imagination displayed in which could not fail to arrest attention. The success of this work might seem to have determined the future career of the artist, who has since chiefly worked as an illustrator. His productiveness in this field is amazing. He has illustrated editions of *Rabelais*, of the *Contes Drolatiques* of De Balzac, of Dante's *Divina Commedia*, of *Don Quixote*, of Lafontaine's *Fables*, of Milton, and of the Bible—all of which bear the impress of D.'s original genius. He has also illustrated Tennyson's works, Coleridge's *Ancient Mariner*, the *Legend of the Wandering Jew*, besides executing a vast mass of miscellaneous work. 'Christ leaving the Praetorium' is his most important painting. There was a Doré Gallery in London for many years, where his designs were exhibited. In 1861 D. received the decoration of the Legion of Honor. He died 23d January, 1883. He was the most fertile and vivid designer the world has seen, and the work he has left behind him is enormous. As a painter, he was a failure in France, as with most educated persons, his pictures being scenic representations. He had real gifts as a sculptor.

DOUGLASS, FREDERICK, American orator and journalist, was born at Tuckahoe, near Easton, Maryland, about 1817. His father was a white man, his mother a negro slave, and he was reared as a slave on the plantation of Col. Edward Lloyd until ten years old, when he was transferred to a relative of his owner at Baltimore. There he worked in a ship-yard, and taught himself to read and write.

At the age of 21, he escaped to New York, and thence to New Bedford, in Massachusetts, where he married a woman of color, and worked until 1841, when he attended an Anti-slavery Convention at Nantucket, and spoke so eloquently on the subject of slavery, that he was employed as an agent of the Massachusetts Anti-slavery Society, and lectured for four years with great success. In 1845, he published his Autobiography, and accepted an invitation to make a lecturing tour in Great Britain, where, in 1846, a contribution of £150 was made to buy his freedom. Returning to America, he established, in 1847, *Frederick Douglass's Paper*, a weekly abolition newspaper, at Rochester, New York. In 1855, he re-wrote his Autobiography, and in 1882 it appeared as *Life and Times of F. D.*, from 1817 to 1882. In 1871, he was Secretary to the Santo Domingo Commission; in 1872, he was a presidential elector; and in 1877, President Hayes appointed him Marshal of the district of Columbia. Mr. D. is a bold, vigorous, earnest, and fluent speaker.

DO'RIA, ANDREA, a noble Genoese, and one of the greatest admirals of his age, was born at Oneglia in 1468. At an early age,

he took service in the guard of the pope, Innocent VIII., and afterwards distinguished himself in the battles which the Milanese and the French fought against Genoa and the kings of Aragon. It was D. who, in 1503, after a short campaign, crushed the rebellion in Corsica. When Genoa, in 1513, got rid of the French domination, D. was appointed captain-general of the galleys, in which capacity he carried on a war of extermination against the dangerous swarms of African pirates who infested the Mediterranean. During the war between Francis I., king of France, and Charles V., emperor of Germany, and king of Spain, D. commanded the French fleet, reinforced by his own galleys, and inflicted everywhere severe losses upon the enemy. After the defeat of Francis I. near Pavia, D. accepted the command of the papal fleet; but upon the return of the king from his captivity, entered once more the French service, with the title of High Admiral of the Levant. He blockaded Genoa, for having espoused the cause of the emperor, and putting to flight the party of the Adorni, took the town. On finding the independence of his country threatened by the French, D. with his whole force went over to the emperor, and by so doing hastened the deliverance of Italy from French domination. In 1529, D. entered Genoa without resistance, and refusing the title of sovereign, which was offered by the emperor, established there a popular form of government, which remained in vigor up to the end of the republic. The grateful country decreed him the title of 'Father of Peace,' and the emperor, in whose service D. continued, conferred upon him the order of the Golden Fleece, together with the principality of Melfi. In 1532, D. won a decisive victory over the Turks near Patras, and the conquest of Tunis (1535) was chiefly his work. He took part in the joint expedition against the Turks under Barbarossa in 1539, and in another against Algiers in 1541, where he lost eleven of his own galleys. The tranquillity of his last years was disturbed by the conspiracy of Fieschi. D. took fierce revenge upon the conspirators for the death of his nephew Gianettino. D. died without offspring, in 1560, at Genoa, in his 93d year.

DORIANS, one of the four principal peoples of Greece, who took their name, according to the legend, from Dorus, the son of Hellen, who settled in Doris; but Herodotus says that in the time of King Deucalion they inhabited the district Phthiotis; and in the time of Dorus, the son of Hellen, the country called Histiaeotis, at the foot of the Ossa and Olympus. But the statement of Apollodorus is more probable, according to which they would appear to have occupied the whole country along the northern shore of the Corinthian Gulf. Indeed, Doris Proper was far too small and insignificant a district to furnish a sufficient number of men for a victorious invasion of the Peloponnesus. In this remarkable achievement they were conjoined with the Heracleidae, and ruled in Sparta. Doric colonies were then founded in Italy, Sicily, and Asia Minor. Strikingly as all the four nations of Greece differed from each other in language, manners, and form of government, the D. in particular differed from the Ionians. The former preserved a certain primitive solidity and earnestness, but with it something coarse and hard. See O. Müller's *Die Doriæ* (2 vols. Breslau, 1824; 2d ed. 3 vols., 1844). The *Doric dialect* bore the same character; it was harsh and rough, while the Ionian was soft and polished, yet the former had something venerable from its antiquity, and was therefore employed in hymns and choruses. In philosophy, the influence of the Doric character was particularly visible in the Pythagorean school and its attachment to the aristocracy. It is no less traceable in architecture in the strong unadorned Doric pillars, which form so marked a contrast to the slender and decorated Ionian columns.

DORIC ORDER. The oldest, strongest, and simplest of the three orders of Greek architecture. See COLUMN, ENTABLATURE, GREEK ARCHITECTURE.

DORIS, a genus of gasteropodous molluscs of the order *Nudi-branchiata*, the type of a family called *Dorida*, and sometimes popularly **SEA-LEMONS**. The body is oval, the abdomen flat, the back flat in some and elevated in others, the mouth a small proboscis with two small tentacula, the vent situated in the back, and surrounded by a circle of branched or plumed gills. The species are found in all seas, many in those of Britain; but they are more numerous in the southern hemisphere.

Some of them attain a considerable size. Few of them inhabit deep water. They crawl on rocks, sea-weeds, &c., where they are often left by the tide, or swim in a reversed position; the foot made concave by muscular action, serving to buoy them up. Some of them are pretty and interesting inmates of the aquarium. Gosse mentions, that specimens of *D. bilamellata* were 'very social in confinement, continually finding out one another, and crowding close up together.'—*A Naturalist's Rambles on the Devonshire Coast*.

DORIS, a small mountainous district of ancient Hellas, between Phocis, Ætolia, Locris, and Thessalia, was the earliest home of

the Dorians. With its four towns, Boium, Cythinum, Erineus, and Pindus, it formed the Doric Tetrapolis, which was afterwards completely destroyed by the Macedonians, Ætolians, and other nations, so that at the time of the Romans, only a few remains of these towns were visible.—D. was also the name of a district in Asia Minor on the coasts of Caria, inhabited by colonists from the Peloponnesus; it formed a *Hetropolis*.—In modern Greece, D. forms an eparchy of the government of Phocis.

DORKING, or **DA'RKING**, a town in England, in the middle of Surrey, stands in a picturesque valley on the left bank of the mole, 23 miles south-west of London by road. It lies on the Roman road which ran between London and Chichester. Pop. (1881) 6328. Its chief trade is in flour, lime, and chalk from the adjacent pits. Dorking gives its name to a peculiar breed of domestic fowl. See **POULTRY**.

DORMANT (Fr. sleeping). In heraldic representation, an animal dormant has its head resting on its forepaws, whereas an animal couchant has its head erect.

DORMANT VITALITY is a term used to designate a peculiar condition which is manifested by many organized beings, and which is characterized by an apparent suspension of all the vital actions. Beings in this state can scarcely be said to be *alive*, since they exhibit no vital activity, nor can they be designated as *dead*, since that implies their incapability of resuming their former state; hence, since they retain their peculiar attributes without manifesting them, the term dormant vitality seems the most appropriate for them. This condition may result either from the withdrawal of the stimuli necessary for the maintenance of vital actions (as water, heat, &c.), or it may proceed from some change in the organism itself, whereby its power of responding to these stimuli is for a time diminished or lost. We shall illustrate our meaning by a few striking examples of each kind of dormant vitality.

1. Dormant vitality from the withdrawal of the necessary stimuli.

Seeds deprived of access to air and moisture may retain their vitality for an enormous time. 'I have now before me,' says Dr. Lindley, 'three plants of raspberries which have been raised in the gardens of the Horticultural Society, from seeds taken from the stomach of a man whose skeleton was found thirty feet below the surface of the earth, at the bottom of a barrow that was opened near Dorchester. He had been buried with some coins of the Emperor Hadrian, and it is probable, therefore, that the seeds were 1600 or 1700 years old.' A more remarkable illustration of the vitality of seeds is afforded by a case communicated to Dr. Carpenter, and published in his *General and Comparative Physiology*, the facts of which may be shortly stated as follows: In a town in the state of Maine, about 40 miles from the sea, a well was being dug, and at a depth of about 20 feet a stratum of sand was found, which excited interest, from the circumstance that no similar sand was known to exist nearer than the sea-beach. It was, in the first instance, collected in a heap, but was subsequently scattered about the spot on which the heap had stood. In a year or two, when the very existence of the sand was almost forgotten, it was observed that a large number of small trees were growing up on the ground where it had been strewed. They turned out to be beach plum-trees, and they actually bore the beach-plum, which had never before been seen except immediately upon the sea-shore. These trees had therefore sprung up from seeds which were in the stratum of sea-sand that had been pierced by the well-diggers, and had probably retained their vitality through a period of time beyond the estimation of human calculation—the period, namely, in which the sea had gradually receded forty miles from its present limits.

Among the lower animals, we find several of comparatively complex structure, in which dormant vitality can be induced for a considerable period, as, for instance, several years by the abstraction of their *moisture*. The well-known rotifer, the wheel-animalcule, may be reduced to a state of perfect dryness, and kept in this condition for a great length of time (certainly three or four years, and some writers say far longer) without evincing a sign of life, and yet it will immediately revive on being moistened. The *Tardigrades*, an allied tribe, have been desiccated by the most powerful means which chemistry affords, and have then been heated to a temperature of 250°, and have still been revived by water, although in their active state a temperature of 120° destroys them. In Woodward's *Manual of the Mollusca*, cases are recorded of living snails crawling out of shells which were supposed to be empty, and in which they must have been dormant for several years, and the eggs of snails and others of the lower animals have a still greater power of revivification after drying. Sir James Emerson Tennent describes various fishes in Ceylon which bury themselves in the mud when the pools or tanks dry up, and remain torpid until the periodic rains of that country ensue, and previous observers had noted similar facts in other tropical countries. Humboldt relates that crocodiles and boas are some-



Doris: a, gills.

times found alive, though torpid, in hardened mud, and revive on the application of water.

A diminution of temperature will induce this phenomenon in many animals. In one of Captain Sir James Ross's voyages, several caterpillars having been exposed to a temperature of 40° below zero, froze so completely, that when thrown in a tumbler they chinked like lumps of ice. When thawed, they resumed their movements, took food, and became transformed into the chrysalis state. One of them, which had been frozen and thawed four times, subsequently became a moth. In the North American lakes, frozen fishes are often found in the ice, which revive when gently thawed. Spallanzani kept frogs and snakes in a torpid state for three years in an ice-house, and then revived them by warmth. The same capability does not exist, at all events to the same extent, in the warm-blooded animals. A total suspension of vital activity in a bird or a mammal for any length of time, from the prolonged application of severe cold, or from any other cause, is never followed by recovery. The stories of certain birds burying themselves in the mud during winter, are regarded by the best authorities as more than questionable; and in hibernating mammals (see HIBERNATION), the suspension is not total. How we are to explain, or whether we ought to believe, the remarkable cases of certain Indian fakirs, who are stated to have the power of suspending all their vital activity for days, or even weeks, we do not know.

The late Mr. Braid of Manchester published a collection of these cases, directly obtained from British officers who had been eye-witnesses of them in India, in his *Observations on Trance or Human Hybernation*, 1850. We quote one of these, vouched for by Sir Claude Wade. The fakir was buried in an underground cell, under strict guardianship, for six weeks; the body had been twice dug up by Runjeet Singh (at whose court the exhibition came off) during the period of interment, and had been found in the same position as when first buried. In this and in all the other recorded cases, the appearance of the body when first disinterred is described as quite corpse-like, and no pulsation could be detected at the heart or in the arteries. The means of restoration employed were chiefly warmth to the vertex, and friction to the body and limbs.

2. Dormant vitality from changes within the organism.

The insect world affords us the chief illustrations of this variety of dormant vitality. The pupa or chrysalis stage of insect life is in itself one of dormant vitality, unconnected with any of the external influences which we have been describing. That this stage may be much shortened by artificial heat, and prolonged by artificial cold, has been known since the time of Reaumur; but, as the following case shows, there are other causes inherent in the animal itself, which tend at a certain time to prolong the pupa condition. In the *Papilio Machaon* there are two generations every year; for the butterfly that comes forth in the early summer lays eggs which rapidly pass through all the phases of insect life, and produce another set of eggs later in the season, whose larvae or caterpillars turn into pupae before the winter. The pupa stage of the first brood (in July) lasts only thirteen days, while that of the second brood (which commences in September) lasts nine or ten months, the butterfly not appearing until the following June. The difference of temperature is obviously quite insufficient to account for the great diversity between the two periods. Several other similar cases may be found in Kirby and Spence's *Entomology*.

DO'RMER, or DORMER WINDOW, is a window placed in a small gable rising out of a sloping roof, often made use of for the purpose of enlarging and lighting the attic or garret-rooms of modern houses. It is also popularly known as a storm-window. *Dormers* do not appear to have been invented before the middle of the 14th century.

DO'RMITORY (Fr. *dormitoire*, from Lat. *dormire*, to sleep), a sleeping apartment in a monastery, or other religious establishment. Dormitories are usually of considerable size, sometimes having a range of cells parted off on each side.

DO'RMOUSE (*Myoxis*), a genus of rodent quadrupeds, ranked by some naturalists in the family *Muridae* (Rats, Mice, &c.), and by others in the family *Sciuridae* (Squirrels, &c.); being, in fact, a connecting link between the one family and the other. Their habits resemble those of squirrels; the dentition, however, more nearly agrees with that of mice. There are four molar teeth on each side in each jaw: the upper jaw has not the anterior rudimentary fifth molar, characteristic of squirrels. The molars have their summits marked by transverse ridges. There are no cheek-pouches. The ears resemble those of mice. The fore-paws have each four toes and a rudimentary thumb; the hind feet have five toes. The fur is very fine and soft. The tail is long, and in the different species exhibits characters variously intermediate between those of mice and squirrels. This genus and the closely allied genus *Graphyurus* are remarkable as the only genera of rodents in which there is no cecum. The species of *D.* are beau-

tiful little animals, natives chiefly of the south of Europe. Some species are also found in Africa, and the genus *Graphyurus* is entirely African. The only British species of *D.* is the COMMON *D.*, RED *D.*, or MUSCARDINE (*M. avellanarius*), an inhabitant of woods in some parts of England. It is about the size of a common mouse, with head proportionally large; has a rather pointed muzzle, large prominent eyes, and a flattened tail, thickly clothed with rather long hair; and is of a tawny red color on the upper parts, and white beneath. It is extremely gentle and easily



Dormouse (*Myoxis avellanarius*),

tamed, feeds on beechmast, acorns, hazel-nuts, grain, &c., and spends the colder parts of winter in a state of torpidity, although in mild weather it awakens up to consume a little of the store of food which, like squirrels, it lays up for that season. Before its hybernation begins, it is generally very fat, nor does it become emaciated by hybernating. It makes a nest of tangled or interlaced herbage opening from above, usually in copse or underwood; and produces about four young ones at a birth. It often assumes a remarkable posture in feeding, suspending itself by its hind feet; more generally it sits upon its haunches, and holds its food in its fore-paws. This species is found in all parts of continental Europe, from the Mediterranean to Sweden. The FAT *D.* (*M. glis*) is a larger species, grayish brown, about the size of a rat, with tail very like that of a squirrel, a native of the south of Europe, where it inhabits forests, leaping from branch to branch with great agility. It is eaten by the Italians, as it was by the ancient Romans, who highly esteemed it, and fattened it for the table in receptacles called *gliraria*.—The GARDEN *D.* (*M. nitela*), common in Europe as far north as Poland, is frequently found in gardens, and even in outhouses. It is often very destructive of the fruit of wall and espalier trees. It is rather smaller than the Fat *D.*, grayish brown, black round the eyes, and has the tail tufted only at the extremity. All the species of *D.* hibernate; and from this circumstance the name seems to be derived (Lat. *dormio*, to sleep).

DO'RNBIRN, a town of Austria, in the north-west of Tyrol, about 8 miles south of the eastern extremity of the Lake of Constance, is situated on the Lossen, a small mountain stream. The houses are widely scattered. The women of *D.* are chiefly employed in muslin-embroidery; the men are for the most part carpenters, and are principally engaged in the construction of wooden houses, which are carried in detached pieces to the market-town (Bregenz), and are thence exported. Pop. (1880) 8263.

DO'RNICK, DORNIC, DORNOCK, a species of figured linen, for a full description of which see Ure's *Dict. of Arts and Manufactures*. Dornicks were formerly made in considerable quantity at Dornich, or Tournay, in the Netherlands, and hence their name. From this place, the manufacture was probably carried to Norfolk by the Dutch, who emigrated thither during the persecution of the Duke of Alva. By a statute, 5 and 6 Ed. VI. c. 24, this manufacture, or 'mystery,' carried on at Norwich, is carefully protected. All persons, except those residing in Norwich or Pulham, are forbidden to carry on the 'mystery,' under pain of forfeiture of the article, and of the sum of 6s. 8d. for every six yards so made. By 4 Will. and Mary, c. 5, s. 2 (68), a duty of 10 per cent., in addition to duties previously levied, is laid on all tapestry or dornicks imported, except from France. It is scarcely necessary to add, that these stringent provisions are no longer in observance.

DO'RNOCH, a royal burgh and county town of Sutherland-shire, situated near the entrance to the DORNOCH FIRTH—an inlet of the North Sea, running 25 miles inland, and separating Sutherland from Ross-shire. The cathedral stands in the center of the town, and is an object of considerable attraction. It is said to have been begun in the 11th c. by St. Bar, and was enlarged in 1270 by Bishop Gilbert Murray. It was burned in 1570, and thereafter partially repaired. In the year 1837, it was to a certain extent restored by the late Duchess of Sutherland. It is in the shape of a cross, and is surmounted with a tower and clock

spire. The interior is fitted up and used as the parish church. D. was, in olden times, the residence of the Bishops of Sutherland and Caithness. The west tower of the Bishop's palace stands immediately opposite to the cathedral. Next to it is a handsome building, in the old English style of architecture, for the courts of law and public offices. The town has a neat, clean appearance, and is lighted with gas. It is considered one of the best bathing-places in the north, and has extensive 'links,' fit for archery, golfing, and other exercises. D. is one of the six northern burghs which send a member to the House of Commons. It was constituted a royal burgh by Charles I. in 1628. The last victim in Scotland to the laws against witchcraft was burned here in 1722. Pop. (1871) 625; (1881) 497.

DOROGH, a town of Hungary, 20 miles north-north-west from Debreczin, situated in the midst of a very fertile district. The population, 8026 in number, are chiefly engaged in agricultural pursuits.

DOROGOBU'SH, or **DOROGOBOUGE**, a town of Russia, in the government of Smolensk, is situated on the left bank of the Dnieper, about 50 miles E.N.E. of Smolensk. It is a small town, but pretty, and well built, and has some manufactures. Pop. (1880) 10,000. At D., the French under Eugene, in their retreat from Moscow, encountered many disasters.

DOROSMA, a town of Central Hungary, Little Cumania, 6 miles W.N.W. of Szeged. It contains a Roman Catholic high school. Pop. (1880) 10,652.

DO'RPAT, or **DERPT** (Russian, *Gurieo*, Esthonian, *Tartolin*), a town of Russia, in the government of Livonia, is situated on the Embach, here crossed by a fine granite bridge, 150 miles north-east of Riga, and is built in the form of a semicircle. It consists of a town proper, with two suburbs. Its streets are straight and clean; its houses, which are mostly of one story, are built of brick or wood, have handsome fronts, and are often showily painted. It is the winter residence of the Livonian nobles and gentry. The Domberg Hill, at the north-west extremity of the town, is tastefully laid out in avenues and promenades; its summit, formerly the site of a cathedral, destroyed by fire in 1775, is now occupied by an observatory, the university library, schools of anatomy and natural history, museums, &c. The observatory—one of the most renowned in Europe, and long presided over by the celebrated Struve—possesses a great refracting telescope, presented by the Emperor Alexander I. The university, founded in 1632 by Gustavus Adolphus, suppressed in 1656 by the Muscovites, and re-established by Alexander I. in 1802, is also famous. It supports a staff of about 70 professors and lecturers, and is attended by between 800 and 900 students, of every religious denomination, who are taught theology, ethics, law, medicine, natural philosophy, and natural history. German is employed, except for law. It is also the chief school of the Protestant clergy in Russia, and the Reformed Synod of Wilna send their students hither. D. has a botanical garden, containing 18,000 plants, some of which cannot be obtained in any other botanical garden in Europe. D. was formerly a walled town, and the ramparts still exist, but have been converted into public walks. The chief employment of the people consist in supplying the wants of those connected with the University. Pop. (1880) 29,727.

DORRE ISLAND, lying to the north of Dirk-Hartog Island (q. v.), in lat. 25° 10' S., forms, like its southern neighbor, part of the breast-work of Shark Bay, in Western Australia. It is 20 miles long.

DORSE (*Gadus callarias*, or *Morrhua callarias*), a fish of the same genus with the cod, haddock, &c.; plentiful in the Baltic and in other northern seas, but scarcely known on the coasts of Britain. It never attains so great a size as the cod, being seldom more than two feet in length, but much resembles it in form and color, although its color is more variable, from which it has received the name of **VARIABLE COD**. It is also called the **BALTIC COD**. It differs from the cod in the greater length of the upper jaw. It enters the mouths of large rivers. It is in great request on the coasts of the Baltic, being esteemed the best fish of all this family.

DO'RSET, **EARL OF**. See **SACKVILLE**.

DO'RSETSHIRE, or **DO'RSET**, a maritime county in the south of England, on the English Channel, between Devonshire and Hampshire. Its greatest length is 58 miles; greatest breadth 40; average, 21; area, 627,265 acres; a third being arable, a ninth waste, and the rest in pasture. The coast-line is 75 miles long, with some cliffs and head-lands. St. Alban's head is 344 feet high. Portland Isle (q. v.) is connected with the mainland by a remarkable formation known as Chesil Bank. The surface is uneven and bleak. Chalk downs run along the south coast, and through the middle of the county nearly from east to west. The highest point is Pilsden Pen, 934 feet. The chief rivers are the Stour and the Frome. Geologically, D. consists of strata of plastic clay, chalk, oolite, lias, with some weald and greensand. Re-

main of colossal reptiles have been found at Lyme Regis. The chief mineral productions are the celebrated Purbeck and Portland building-stones, coarse marble, and white china and pipe clays. The climate is mild. The chalk hills or downs are covered with short fine pasture, on which countless numbers of South-down sheep are fed. The soil is chiefly sand, gravel, clay, and chalk. D. is mainly a pastoral county, producing sheep, cattle, cheese, and butter; but some wheat, barley, hemp, linseed, hops, &c., are raised. Sanfoin is grown on the chalk hills. There are small manufactures of linen, silk, woollens, flax, hemp, buttons, stockings, and ale and cider. D. is divided into 12 poor-law unions, and about 290 parishes. The chief towns are Dorchester, Bridport, Poole, Weymouth and Melcombe Regis, Shaftesbury, and Wareham. D. sends 10 members to parliament, 3 for the county, and 7 for the above towns. Pop. (1871) 195,537; (1881) 190,979. The London and South-Western, and Somerset and Dorset Railways run through D. D. has ancient British and Roman remains, as stone circles, cromlechs, barrows, camps and amphitheater, and three Roman stations. There are some remains of 40 abbeys, priories, hospitals, &c. The ruins of Corfe Castle, a seat of the Saxon kings of Wessex, are among the grandest in England.

DORSTENIA. See **CONTRAYERVA**.

DORT, or **DO'RDRECHT**, a town of the Netherlands, in the province of South Holland, situated on an island formed by the Maas, about twelve miles south-east of Rotterdam. An inundation in 1421, in which upwards of 70 villages were destroyed and 100,000 people drowned, separated the site upon which D. stands from the mainland. D. is fortified on the south side and its position is naturally so strong, that though frequently besieged, it has never been taken. It is one of the oldest towns in Holland, and some interesting historical particulars attach to it. Here, in 1572, the states of Holland, after their revolt from Spain, held their first assembly and declared the Prince of Orange to be the only lawful governor of the country. In 1618—1619, the conclave of Protestant divines known as the Synod of Dort met here, and condemned the doctrines of Arminius as heretical, and affirmed those of Calvin. (For an account of the questions at issue, see **ARMINIUS**.) The Gothic building in which the synod sat, whose miraculous labors, according to the president's closing address, 'made hell tremble,' was long used as a public-house, and the room in which they met as a dancing-saloon; the house has been destroyed.

Among the principal buildings of D. are a Gothic church with a tall square tower, and containing a beautiful marble pulpit, and the town-hall. The town is traversed by canals, and the Rhine and the Maas afford it great facilities for trade. Large ships can go quite up to the quays. Gigantic wood-rafts, valuing sometimes as much as £30,000 each, obtained from the Black Forest and Switzerland, come down the Rhine to D., which has numerous saw-mills, ship-building docks, salt and sugar refineries, bleacheries, and manufactures of tobacco, white-lead, &c. It has also a considerable trade in corn, flax, oil, timber, and salt-fish. Pop. (1880) 27,292.

DO'RTMUND, the most important town of Westphalia, on the Cologne and Minden Railway, is situated on the Emscher, 47 miles north-north-east of Cologne. It is the center of a mining district, with numerous foundries, and the headquarters of the mining authorities of Westphalia. D. was formerly surrounded by massive walls, but the greater part of these have been removed, and the town is now quite modern in its aspect. Its history goes back into the earliest middle-age traditions, figuring in the time of Charlemagne under the name of Throtmanni, Tremonia, Trotmunde, and Dortmunde. Subsequently it became a free Hanse town, but was ceded to Prussia in 1815, at the Congress of Vienna. The town-hall of D. is one of the oldest in Germany. D. is an important railway center, and manufactures railway material on a large scale. Coal and iron are wrought in the neighborhood; and in D. are nearly 50 beer-breweries. Pop. (1880) 66,544.

DORY (*Zeus*), a genus of fishes, the type of a family, *Zeidae*, which is sometimes regarded as merely a group of the great family of *Scomberidae*, but is at least a very distinct group, characterized not only by an oval and much compressed form of body, but also by a protractile mouth. The teeth are feeble. The species of *Zeidae* are distributed in the seas of all parts of the world, although only three occur on the British coasts, and two of these are very rare (see **BOAR-FISH** and **OPAH**). In the D. genus, the general surface of the body is smooth and destitute of scales, but spiny scales or bony shields guard the dorsal and ventral edges. The anterior portions of the dorsal and anal fins are spiny, and are very distinctly separated from the spineless portions; the spines of the dorsal fin are prolonged into long filaments, and the tail-fin is rounded.

The British species (*Zeus faber*), popularly known as the **JOHN DORY**, sometimes attains a considerable size: Pennant mentions one which weighed 12 lbs.; but it is seldom seen of much more than 18 inches in length. It is principally found on the southern, and particularly the south-western coasts of England, visiting

them, apparently, in pursuit of pilchards; but becomes more rare towards the north. It is highly esteemed for the table, having among modern epicures pretty much the same reputation which it had among those of ancient Rome. It is common in the Mediterranean. The name D. is generally supposed to be properly *dorée* (gilt), and to refer to the prevailing yellowish color and golden lustre of the fish, whilst the familiar appellation, *John*, is in like manner derived from *jaune* (yellow), although it has been suggested that it may rather be from the Gascon *jau*, a cock—names

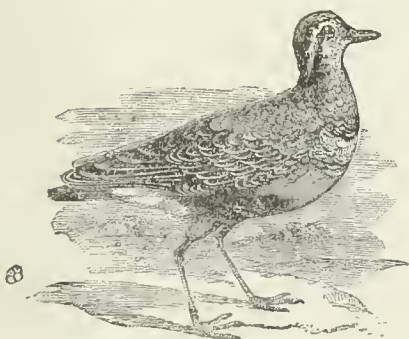


John Dory (*Zeus faber*)

signifying Cock. Sea-chicken, St. Peter's Cock, &c., being given to this fish in different languages. The D. has a remarkable dark spot on each side. An idle legend refers these spots to the finger and thumb of St. Peter, and the D. thus disputes with the had-hock the honor of being reputed the fish from whose mouth he took the tribute-money. Other species of D., very similar to the European, are found in the seas of other parts of the world—one of them Australian, exhibiting similar dark spots.

DO'TIS, or TOTIS, a town in the N.W. of Hungary, district of Komorn, and 37 miles W.N.W. of Pesth. Between the town proper and its suburb, called *Lake Town*, from its situation on a small lake, are the remains of an old castle, said to have been a favorite residence of Mathias Corvinus, the Hungarian king. D. contains a splendid château, the property of the Esterházy family, the gardens adjoining which are laid out in the English fashion. Pertaining to this castle are some very extensive wine-vaults, one of them containing a tun capable of holding 34,700 English gallons. Pop. (1880) 6507.

DO'TTEREL (*Charadrius morinellus*), a species of Plover (q. v.), which in summer inhabits the northern parts of Europe and Asia, breeding chiefly in the highest latitudes, and migrates on the approach of winter to the countries around the Mediterranean and those of similar climate. It appears in Britain as a bird of passage, both on its northward migration in spring, and on its southward



Dotterel (*Charadrius morinellus*).

migration in autumn. Some breed in the mountains both of Scotland and of England, always at very considerable elevations. The D. is about nine inches and a half in its whole length. In summer plumage, the upper parts are of a brownish ash color, the feathers edged with deep red; the cheeks, throat, and a band above the eyes white; the breast bright rust-color, with a white gorget on the upper part of it, bounded above by a blackish line; a conspicuous black patch on the middle of the belly; some of the tail-feathers tipped with white. The D. has become proverbial for stupidity; but the readiness with which it allows itself to be approached seems to be entirely owing to its coming from regions little frequented by man, and it becomes shy and watchful after a little experience. It is much esteemed for the table, and well known in the London market.

DOUAI, or DOUAY, a town of France, in the department of Nord, situated on the river Scarpe, about 20 miles south of Lille. It is a dull, lifeless place, but is surrounded with walls, and is

strongly fortified. The principal buildings are the churches, the Hotel de Ville, the public library, the museum, a hospital, and the old buildings of the English College. There are several good schools in D., and a great cannon-foundry. The manufactures include lace, tulle, cotton, oil, soap, brushes, iron machinery; and there is an active trade in corn, seed, and linen. Pop (1876) 23,348. D. has existed since Roman times. It was long a bone of contention between the Flemish counts and the French rulers. It passed with the rest of Flanders under the dominion of Spain, but was taken by Louis XIV. in 1667. Marlborough captured it in 1710, but the French re-occupied it after his withdrawal, and were finally confirmed in the possession of it by the peace of Utrecht.—The *English Catholic College* at D., long the sole or chief theological seminary for English-speaking Catholics, was founded by Dr. William (afterwards Cardinal) Allen in 1568. By reason of political difficulties with the Spanish authorities, then in possession of the town, the college was transferred to Rheims in 1578; but in 1593 it was again established at D., and there it flourished till the French Revolution, when it was broken up. Subsequently it was re-established on a smaller scale by the Benedictine Fathers, and is still conducted by them.

DOUAY BIBLE. See BIBLE.

DOUBLE CONSCIOUSNESS. Double or divided consciousness has likewise been designated double personality. The term comprehends a group of morbid mental conditions involving some modification in the clearness of the idea of personal identity. Individuals are often encountered with confused notions of the 'me' and 'not me'; others conceive that parts or properties of their frame belong to another person, or that they are inhabited and ruled by a spirit or entity acting in opposition to their will and interests; and there are others who, at different times and under different circumstances, such as when influenced by, or free from moral or physical stimulation, conceive that they are different persons, and endowed with different qualities and powers. These manifestations, however, do not fully illustrate the state under consideration, which has been described as exhibiting, in some measure, two separate and independent trains of thought, and two independent mental capabilities in the same individual, each train of thought and each capability being wholly dis severed from the other, and the two states in which they respectively predominate, subject to frequent interchanges and alternations. In the most marked or perfect form of this phenomenon, the individual is conscious of the two independent trains of thought, and conceives, in consequence of the apparent independence of these, that he is two distinct persons at the same time. There are few instances of this mental affection on record (see Wigan *On Duality of Mind*, Abercrombie's *Inquiry into Intellectual Powers*, Elliot in Combe's *System of Phrenology*, 3d edition).

A servant-girl, at the period of puberty, gave evidence of double personality for three months. In an advanced stage of the affection, the circumstances which occurred during the paroxysm were completely forgotten by her when it was over, but were perfectly remembered during subsequent paroxysms. She was, for example, taken to church while in her abnormal state. She shed tears during the sermon, particularly during an account given of the execution of three young men, who had described, in their dying declarations, the dangerous steps with which their career of vice and infamy commenced. When she returned home, she recovered in a quarter of an hour, was quite amazed at the questions put to her about the sermon, and denied that she had been in church; but next night, when taken ill, she mentioned that she had been there, repeated the words of the text, and gave an accurate account of the tragical narrative of the three criminals by which her feelings had been so powerfully affected (*Philosophical Transactions*, Edin. 1822). This description assimilates the patient to the class of somnambulists. But such perversions of the faculties generally involve a more palpable and complete duality of mind. The personal identity seems to be lost or impaired. A. B. conceived that he was himself and another person at the same time; he acted as if this belief were sincere, and could not divest himself of the conviction that in his body were two minds or persons suggesting courses of conduct widely opposed. He was certain that his original self, A. B., was a base, abandoned scoundrel, tempting his other, or new, or better self—to whom, it should be noted, was attached the emphatic *Ego*—to commit crimes or acts of which he altogether disapproved. The second person in this duality repelled, struggled with these abominable solicitations, such as that he should commit suicide; and loathed the tempter or first person. This struggle sometimes became real and visible, when the hands, acting under the will of No. 2, or the virtuous and opposing principle, beat and bruised the legs, body, or head, which, it may be presumed, were supposed to belong to No. 1, the vicious, or tempting impulse. The object of the one was obviously to inflict pain upon the other. The blows were so severe as to leave marks for days; and when these were adverted to, the answer was, as if from No. 2: 'Don't justify him, he deserved it.' Such conflicts

generally occurred during the night, and the interference of the night-watch was required to part or pacify the combatants.* In this case the manifestations of disease might be attributed to the abstruse but vain philosophical inquiries of the mind during health.

While it is quite intelligible that habits of protracted self-analysis, or of that abstraction which loses all idea of distinct personality in the act of thinking, or in the subject occupying attention may induce such a condition, a more physical explanation has been sought in the alternate morbid activity of different parts of the brain, in the non-consentaneous or independent and alternate activity of the two hemispheres of the brain, which, when acting together, are held to be the organ of the mind in its unity and entireness. Latterly, the views of Sir William Hamilton have been brought to bear upon the point; and still more recently, the theory called 'unconscious cerebration,' which supposes certain impressions to exist unperceived, and to become objects of consciousness only under certain conditions, has been applied to the same purpose; but, in so far as the impairment of the conviction of personal identity is concerned, the problem still awaits solution.

DOUBLE FLAT, a musical character used to lower the note before which it is placed two half-tones.

DOUBLE FLOWERS. See **FLOWER**.

DOUBLE SHARP, a musical character the reverse of the double flat.

DOUBLE SHOTTING is, as its name implies, an augmentation of the destructive power of ordnance, by doubling the shot fired off at one time from a gun. Sometimes three shots are fired at once, in which case the piece is said to be 'treble-shotted.'

DOUBLET (so called from being originally lined or wadded for defence), was a close tight-fitting garment, the skirts reaching a little below the girdle, as in the accompanying cut, from Fairholt's *Costume in England*. It was almost identical with the jerkin. The sleeves were sometimes separate, and tied on at the arm.

DOUBLING THE CUBE was a celebrated geometrical problem among the ancients. The object was, to find the side of a cube whose content should be twice that of another given cube; and various accounts are given of how the problem was suggested. One legend brings the matter into connection with Delos (hence the name of 'the Delian problem'), and relates that the oracle of Apollo in that island, being consulted by the inhabitants during the prevalence of a pestilence, gave for answer, that they should make the altar of Apollo, which was in the form of a cube, as large again. This was done, and yet the pestilence continued; and the oracle being again consulted, replied, that the altar must retain its cubic form, which had not been attended to in the enlargement. This problem perplexed the Delians, as it did mathematicians of after-ages. Even Plato, whom they consulted on the difficulty, could give them no solution, and had recourse, according to the story, to evasion.

This problem, however, is older than Plato; before his time, it had occupied Hippocrates of Chios (not the physician Hippocrates), and was studied afterwards by Eratosthenes, Nicomedes, Hero, and others. Apollonius applied conic sections to the solution of the question, as did also Menæchmus; Nicomedes invented a curve, which he called the conchoid, for the express purpose, and Diocles the cissoid. The analytical method introduced into geometry by Descartes showed this problem in its true light. It was seen to be only a special case of the solution of a cubic equation—a solution which is impossible by geometry, i. e., by the use of the circle and straight line. It may, however, be represented by the intersection of two conic sections, of which one may be a circle. Descartes made use of the parabola with the circle, which is the simplest way. With numbers, the question is merely one of the extraction of the cube root. If the side of a cube be one foot, its solid contents is $1 \times 1 \times 1 = 1$ cubic foot. The side of a cube of double that content, or 2 cubic feet is, $\sqrt[3]{2} = 1.259921$.

DOUBLINGS, the heraldic term for the linings of robes or mantles, or of the mantlings of achievements. See **MANTLING**.

DOUBLOON (Sp. *dublone*, double) is the name of a gold piece coined in Spain and Spanish America. The Dublon de Isabella, coined since 1848, is of 100 reals, and equivalent to 25.84 French francs, or 20s. 8d. The older Spanish doubloons vary in value from 85 to 81 francs.

* Fifth Annual Report, Crichton Royal Institution, 1844, p. 13.



DOUBS, a department of France, on the eastern frontier, separated from Switzerland by the Jura Mountains, is situated in lat. $46^{\circ} 35' - 47^{\circ} 31' N.$, and long. $5^{\circ} 42' - 7^{\circ} 4' E.$ Area about 2000 square miles. Pop. (1881) 308,482. D. is traversed by the river Doubs, a tributary of the Saône, and is separated, on the N.W., from the department of Haute Saône by the Oignon, also a tributary of the Saône. The surface is hilly, being crossed by four parallel ranges of the Jura Mountains. The climate is more rigorous than in most similar latitudes. The pine and the walnut attain a huge size, and the common orchard trees thrive well. Maize, potatoes, hemp, and flax are raised. The pasturage is excellent, and rears good breeds of horned cattle and horses, which are exported. In the valleys, great quantities of butter and cheese are produced. The rivers are well stored with fish. Mines of iron and coal are worked, and gypsum and marble are abundant. The trade is principally in iron, cattle, horses, and dairy produce. D. is divided into the four arrondissements of Besançon, Baume-les-Dames, Montbéliard, and Pontarlier. The capital of D. is Besançon.

DOUCHE. See **BATH** and **HYDROPATHY**.

DOUGH is the name given to the moistened and kneaded flour in the first stage of making Bread (q. v.).

DOUGLAS, the modern capital and principal seaport of the Isle of Man, is so called from its being situated near the junction of two streams—the *Dhoo* (black) and *Glass* (gray). D. lies on the margin of a highly picturesque bay, on the east side of the island. From the excellence of the sea-bathing, and its central position, it has become highly popular as a watering place. The old town, standing on the south-western edge of the bay, consists of narrow, tortuous streets, and presents a vivid contrast to the handsome modern terraces and villas which occupy the rising ground beyond. It possesses an excellent landing pier; another pier and breakwater, constructed of concrete cement blocks, was opened in 1879; the new street and charming promenade following the line of the bay is one of its most agreeable features. Conspicuous in the center of the crescent of the bay stands Castle Mona, formerly the residence of John, Duke of Athol, but now converted into a first-class hotel. The Tower of Refuge, a picturesque object, occupies a dangerous rock, in the southern area of the bay, called Conister, and was erected in 1833 for the safety of shipwrecked mariners, by the late Sir William Hillary, Bart., who during his residence at D., founded the Royal National Life-boat Institution. D. is the principal packet station of the island, with a daily service of steamers during the summer months, and possesses telegraphic communication with England. Pop. (1871) 13,846.

DOUGLAS, THE FAMILY OF. Archeology has failed in its efforts to pierce the obscurity which veils the origin of the heroic race of which it has been said:

So many, so good as of Douglas blood have been,
Of one surname, in one kingrick, never yet were seen.

A legend of the 16th or 17th c. told how, about the year 770, a Scottish king, whose ranks had been broken by the fierce onset of a Lord of the Isles, saw the tide of battle suddenly turned by an unknown chief; how, when the victory was won, the monarch asked where was his deliverer; how the answer ran in Erse, *Sholto Du-glas* ('Behold that dark-gray man'); and how the warrior was rewarded with that Clydesdale valley which, taking from him its name of Douglas, gave surname to his descendants. This fable has long ceased to be believed. Equal discredit has fallen on the theory which, sixty years ago, the laborious Chalmers advanced in his *Caledonia*, that the Douglasses sprang from a Fleming of the name of Theobald, who, between the years 1147 and 1164, had a grant of lands on the Douglas Water from the Abbot of Kelso. There is no trace of any connection between the Flemish Theobald and the Douglasses; nor were the lands which he acquired on one side of the stream any part of their old domain on the other. What was boasted of the Douglasses by their historian, two centuries ago, therefore still holds true. 'We do not know them in the fountain, but in the stream; not in the root, but in the stem; for we know not who was the first mean man that did by his virtue raise himself above the vulgar.' It was thought likely, in the beginning of the 15th century, that the Douglasses and the Murrays had come of the same stock, and in this old conjecture all that is known on the subject must still be summed up.

1. *William of Douglas*, the first of the family who appears in record, was so called, doubtless, from the wild pastoral dale which he possessed. He is found witnessing charters by the king and the Bishop of Glasgow between 1175 and 1213. He was either the brother or brother-in-law of Sir Freskin of Murray, and had six sons, of whom Archibald, or Erkenbald, was his heir; and Brice, a monk of Kelso, rose to be Prior of Lesmahagoe (a dependency of Kelso, on the outskirts of Douglassdale), and in 1203 was preferred to the great bishopric of Murray. He owed this promotion, no doubt, to the influence of his kinsmen the Murrays,

and it contributed not a little to the rising fortunes of his own house. He was followed beyond the Spey by four brothers, of whom one became sheriff of Elgin; another became a canon of Murray; a third, who had been a monk of Kelso, seems to have become Archdeacon of Murray; and a fourth, who had been parson of Douglas, appears to have become Dean of Murray.

2. *Sir Archibald, or Erkenbald, of Douglas* is a witness to charters between 1190 and 1232. He attained the rank of knighthood, and beside his inheritance of Douglas, held the lands of Hailes, on the Water of Leith, from the monks of Dunfermline, and had a grant of the lands of Livingston and Hirdmarston from the Earl of Fife. He is said to have acquired other lands in Clydesdale by his marriage with one of the two daughters and heiresses of Sir John of Crawford.

3. *Sir William of Douglas*, apparently the son of Sir Archibald, figures in record from 1240 to 1273. He appears in 1255 as one of the Scottish partisans of King Henry III. of England; and in 1267 is found in possession of the manor of Fawdon, in Northumberland, by gift of the king's son (afterwards Edward I.). He seems to have had a brother, Sir Andrew, the progenitor of the Douglasses of Dalkeith and Morton, and certainly had two sons.

4. *Hugh of Douglas*, the elder, acquired land in Glencorse, in Lothian, by marriage with the sister of Sir Hugh of Abernethy; and dying without issue about 1287, was succeeded by his younger brother.

5. *Sir William of Douglas*, distinguished in the family traditions as *William the Hardy*, had all the daring and restless spirit which was characteristic of his descendants. His first appearance is in 1267, when his head was nearly severed from his shoulders in defending his father's English manor from a foray of the men of Redesdale. Twenty years later, he is found at the head of an armed band, carrying off his future wife, a wealthy widow, Alionora of Lovaine, from the manor of her kinsfolks, the La Zouches, at Tranent, in Lothian. We hear of him immediately afterwards as spoiling the monks of Melrose, deforcing the king's officers in the execution of a judgment in favor of his mother, unlawfully imprisoning three men in his castle of Douglas, and beheading one of them. He was the first man of mark who joined Wallace in the rising against the English in 1297; and for this his lands of Douglas were wasted with fire and sword, and his wife and children carried off, by Robert Bruce, the young Earl of Carrick, then a partisan of England. But the Knight of Douglas soon left the insurgent banners, and submitting to his old patron, King Edward I., to whom he had again and again sworn fealty, was sent prisoner to the castle of York, where he died about 1302. It appears that he possessed lands in one English, and in seven Scottish counties—Northumberland, Berwick, Edinburgh, Fife, Lanark, Ayr, Dumfries, and Wigton.

6. The history of his son, *the Good Sir James of Douglas*, is familiar to every one, as Bruce's greatest captain in the long War of the Succession. The hero of seventy fights, he is said to have won them all but thirteen, leaving the name of 'the Black Douglas'—so he was called from his swarthy complexion—as a word of fear by which English mothers stilled their children. He was slain in Andalusia, in 1330, on his way to the Holy Land with the heart of his royal master, and dying unmarried, was succeeded by his brother.

7. *Hugh of Douglas*, of whom nothing is known except that he made over the now great domains of his family, in 1342, to his nephew, *Sir William of Douglas* (son of a younger brother of the Good Sir James—Sir Archibald of Douglas, Regent of Scotland, slain at Halidon Hill in 1333).

EARLS OF DOUGLAS.—Hitherto, the Douglasses had no higher title than that of knight; but in 1357, Sir William of Douglas, who had fought at Poitiers, and distinguished himself in other fields, was made Earl of Douglas, and afterwards by marriage became Earl of Mar. His ambition aimed at still greater things, and in 1371 he disputed the succession to the Scottish crown with Robert II. (the first of the Stewarts). He claimed as a descendant of the Baliols and Cummings; and his pretensions were abandoned only on condition that his son should marry the king's daughter. He died in 1384. His son James, second Earl of Douglas and Mar, the conqueror of Hotspur, fell at Otterburn in 1388; and as he left no legitimate issue, the direct male line of William the Hardy and the Good Sir James now came to an end. His aunt had married for her second husband one of her brother's esquires, James of Sandilands, and through her Lord Torphichen is now the heir general and representative at common law of the House of Douglas.

The earldom of Douglas, meanwhile, was bestowed on an illegitimate son of the Good Sir James—Archibald, Lord of Galloway, surnamed the Grim. By his marriage with the heiress of Bothwell, he added that fair barony to the Douglas domains; and having married his only daughter to the heir-apparent of the Scottish crown, and his eldest son to the eldest daughter of the Scottish king, he died in 1401. His son and successor, Archibald, fourth Earl of Douglas, was, from his many misfortunes in battle,

surnamed 'The Tyneman,' i. e., the loser. At Homildon, in 1402, he was wounded in five places, lost an eye, and was taken prisoner by Hotspur. Next year, at Shrewsbury, he felled the English king to the earth, but was again wounded and taken prisoner. Repairing to France, he was there made Duke of Touraine, and fell at Verneuil in 1424. He was succeeded by his son Archibald, who distinguished himself in the French wars, and dying in 1439, was buried in the church of Douglas, where his tomb yet remains, inscribed with his high titles of 'Duke of Touraine, Earl of Douglas and of Longueville, Lord of Galloway, Wigton, and Annandale, Lieutenant of the King of Scots.' His son and successor, William, a boy of sixteen, is said to have kept a thousand horsemen in his train, to have created knights, and to have affected the pomp of parliaments in his baronial courts. His power and foreign possessions made him an object of fear to the Scottish crown; and, having been decoyed into the castle of Edinburgh by the crafty and unscrupulous Crichton, he was, after a hasty trial, beheaded, along with his brother, within the walls of the castle, in 1440. His French duchy and county died with him; his Scottish earldom was bestowed on his grand-uncle (the second son of Archibald the Grim), James, surnamed the Gross, who in 1437 had been made Earl of Avondale.

He died in 1443, being succeeded by his son William, who, by marriage with his kinswoman (the only daughter of Archibald, fifth Earl of Douglas, and second Duke of Touraine), again added the lordship of Galloway to the Douglas possessions. He was, for a time, all-powerful with King James II., who made him lieutenant-general of the realm; but afterwards losing the royal favor, he seems to have entered into a confederacy against the king, by whom he was killed in Stirling Castle, in 1452. Leaving no child, he was succeeded by his brother James, who, in 1454, made open war against King James II., as the murderer of his brother and kinsman (the sixth and eighth Earls of Douglas). The issue seemed doubtful for a time, but the Hamiltons and others being gained over to the king's side, Douglas fled to England. The struggle was still maintained by his brothers, Archibald, who by marriage had become Earl of Murray, and Hugh, who in 1445 had been made Earl of Ormond. They were defeated at Arkinholm in May 1455, Murray being slain on the field, and Ormond taken prisoner, and afterwards beheaded. Abercorn, Douglas, Strathaven, Thrieve, and other castles of the Douglasses, were dismantled; and the earldom of Douglas came to an end by forfeiture, after an existence of 98 years, during which it had been held by no fewer than nine lords. The last earl lived many years in England, where he had a pension from the crown, and was made a Knight of the Garter. In 1484, he leagued himself with the exiled Duke of Albany to invade Scotland. He was defeated and taken prisoner at Lochmaben, and, on being brought to the royal presence, is said to have turned his back upon the king. The compassionate James III. spared his life, on condition of his taking the cowl. 'He who may no better be, must be a monk,' muttered the old man, as he bowed to his fate. He died in the abbey of Lindores, in April 1488; and so ended the elder illegitimate line of the Douglasses.

EARLS OF ANGUS.—Meanwhile a younger illegitimate branch had been rising to great power. William, first Earl of Douglas, was the faithless husband of a faithless wife. She was believed to have had a paramour in Sir William Douglas of Liddesdale. Her jealous husband, who slew that 'flower of chivalry,' had himself shared the affections of the wife of his wife's brother, Margaret Stewart, Countess of Angus and Mar. The issue of this amour, which in that age was accounted incestuous, was a son George, who in 1389 had a grant of his mother's earldom of Angus; married in 1397, the youngest daughter of King Robert III.; was taken prisoner at Homildon in 1402, and died of the plague in England in the following year. He was succeeded by his son William, who, dying in 1437, was succeeded by his son James, who died without issue, when the title reverted to his uncle, George, fourth Earl of Angus, took part with the king against the Douglasses in 1454; his loyalty was rewarded by a grant of their old inheritance of Douglasdale; and so, in the phrase of the time, 'the Red Douglas'—such was the complexion of Angus—'put down the Black.' He died in 1462, being succeeded by his son Archibald, surnamed Bell-the-Cat, and sometimes also called the Great Earl.

After filling the highest offices in the state, and adding largely to the family possessions, he retired to the priory of Canons Regular at Whithorn, in Galloway, where he died in 1514. Having outlived his eldest son, he was succeeded by his grandson, Archibald, who, in 1514, married the Queen-dowager of Scotland, Margaret, sister of Henry VIII. of England, and widow of James IV. of Scotland. The fruit of this marriage was a daughter, Margaret, who, marrying the Earl of Lennox, became the mother of Henry, Lord Darnley, the husband of Queen Mary, and father of King James VI. The Earl of Angus had for a time supreme power in Scotland, but in 1528, the young king, James V., escaped from his hands, and sentence of forfeiture was passed against Angus

and his kinsmen. The king swore that while he lived the Douglasses should have no place in his kingdom; and he kept his vow. On his death in 1542, Angus returned to Scotland, and was restored to his honors and possessions. He died at Tantallon in 1556. His nephew, who succeeded him, died two years afterwards, leaving an only son, Archibald, eighth Earl of Angus. This 'Good Earl,' as he was called, died in 1588, when his title devolved on his kinsman William, the grandson of Sir William Douglas of Glenberrie, second son of Archibald Bell-the-Cat. Dying in 1591, he was succeeded by his son William, who next year obtained from the crown a special recognition of his high privileges as Earl of Angus, of taking the first place and giving the first vote in parliament, of leading the vanguard in battle, and of bearing the crown in parliament. He seems to have been a man of scholarly tastes, and is said to have written a history of the Douglasses. Having turned Roman Catholic, he was forced to leave Scotland, and spent his latter years in exercises of devotion at Paris, where he died in 1611, being succeeded by his son.

MARQUISES AND DUKE OF DOUGLAS, AND LORDS DOUGLAS.—William, eleventh Earl of Angus, was created Marquis of Douglas in 1633, and dying in 1660, was succeeded by his grandson James, who died in 1700, leaving issue one son and one daughter. The son Archibald, third Marquis of Douglas, was created Duke of Douglas in 1703, and died childless in 1761, when his dukedom became extinct, and his marquise devolved on the Duke of Hamilton, as descended in the male line from William Earl of Selkirk, third son of the first Marquis of Douglas. His grace's sister, Lady Jane Douglas, born in 1698, and married in 1746 to Sir John Stewart of Grandtully, was said to have given birth at Paris to twin sons in 1748. One of them died in 1753; the other, in 1761, was served heir of entail and provision general to the Duke of Douglas. An attempt was made to reduce his service, on the ground that he was not the child of Lady Jane Douglas; but the House of Lords, in 1771, gave final judgment in his favor. He was made a British peer in 1790, by the title of Baron Douglas of Douglas Castle, which became extinct on the death of his son James, fourth Lord Douglas, in 1857, when the Douglas estates devolved on his niece, the Countess of Home.

The title of Earl of Angus was claimed in 1763, as well by the Duke of Hamilton as by Archibald Stewart, afterwards Lord Douglas; but neither urged his claim to a decision, and the title is still in abeyance. The right attached to it of bearing the crown of Scotland, was debated before the Privy Council in 1823, when it was ruled that Lord Douglas's claim to that honor, being a claim of heritable right, fell to be decided in a court of law. It has been supposed that the motto of the Douglas arms, *Jamais arriere*, 'Never behind,' alludes to the peculiar precedence inherent in their earldom of Angus. The bloody heart commemorates Bruce's dying bequest to the Good Sir James; the three stars which the Douglasses bear in common with the Murrays, seem to denote the descent of both from one ancestor.

EARLS OF MORTON.—Sir Andrew of Douglas, who appears in record in 1248, was apparently a younger son of Sir Archibald, or Erkenbald, of Douglas, the second chief of the house. He was the father of William of Douglas, who, in 1296, swore fealty to King Edward I. for his lands in West Lothian, and who was probably the father of Sir James of Douglas—surnamed of Lothian, to distinguish him from his kinsman of Clydesdale—who, in 1315, had a grant from Bruce of the lands of Kincauld and Calder-clere. He died about 1320, being succeeded by his son, Sir William of Douglas of Liddesdale, who acquired the lordship of Dalkeith (by resignation of the Grahames), the barony of Aberdour in Fife, lands in Tweeddale, and great territories in Liddesdale, Eskdale, and Ewesdale which had been forfeited by the Soulises and Lovels. In 1335, he had a grant of the earldom of Athol, but resigned it in 1342. The Knight of Liddesdale—as he was called by his contemporaries, who regarded him as 'the flower of chivalry'—was assassinated in 1353 by his kinsman, William first Earl of Douglas, partly to revenge his wife's dishonor, partly to revenge the death of Sir David of Barclay, who had been assassinated at the instance of the Knight of Liddesdale, in revenge for the slaughter of his brother John. Dying childless, he was succeeded by his nephew, Sir James of Douglas of Dalkeith. This great chief, who died in 1420, saw Froissart sit as a guest at his board; himself possessed books of law, grammar, logic, and romance; and enjoined in his will that all the volumes which he had borrowed from his friends should be returned to them. His alliances were as princely as his life. His first wife was a daughter of 'Black Agnes,' the heroic Countess of Dunbar; his second was a sister of King Robert II.; and he matched his eldest son, Sir James of Douglas of Dalkeith, with a daughter of King Robert III. Their grandson married a daughter of King James I., and in 1458 was created Earl of Morton.

His grandson, the third earl, dying without male issue in 1553, the earldom devolved on his daughter's husband, the Regent Morton—James Douglas, great-grandson of Archibald Bell-the-Cat. After his fall, the title went to Archibald eighth Earl of

Angus; and when he died childless in 1588, it passed to the lineal male descendant of Sir Henry of Douglas (the son of Sir John of Douglas, the brother of the Knight of Liddesdale), Sir William Douglas of Lochleven, who thus became seventh Earl of Morton. His losses in the great civil war compelled him, in 1642, to sell Dalkeith to the Earl of Buccleuch, and his Tweeddale and Eskdale lands to others; but Aberdour and other old domains of the family still remain with his successor, the Earl of Morton, who, there is every reason to believe, descends legitimately in the male line from William of Douglas, the great progenitor of the race in the 12th century.

EARLS, MARQUISES, AND DUKES OF QUEENSBERRY; EARLS OF MARCH, AND EARLS OF SOLWAY.—James, second Earl of Douglas and Mar—the hero of Otterburn—had an illegitimate son, Sir William of Douglas of Drumlaurig, whose descendants were created Viscounts of Drumlaurig in 1628, Earls of Queensberry in 1633, Marquises of Queensberry in 1682, Dukes of Queensberry in 1684, Earls of March in 1697, and Earls of Solway in 1706. On the death of the fourth Duke of Queensberry in 1810, that title, with the barony of Drumlaurig and other lands, went to the Duke of Buccleuch; the title of Marquis of Queensberry, with the baronies of Tinwald, Torthorwald, &c., went to the heir-male of the family, Sir Charles Douglas of Kelhead; and the title of Earl of March, with the barony of Neidpath, went to the Earl of Wemyss. The title of Earl of Solway had become extinct in 1778.

EARLS OF SELKIRK, FORFAR, AND DUMBARTON; VISCOUNT BELHAVEN, AND LORDS MORDINGTON.—In 1646, the third son of the first Marquis of Douglas was created Earl of Selkirk. In 1651, the eldest son of the same marquis was created Earl of Ormond, and in 1661, Earl of Forfar. In 1675, the fourth son of the same marquis was created Earl of Dumbarton. In 1641, the second son of the tenth Earl of Angus was created Lord Mordington. In 1633, Sir Robert Douglas of Spot, a descendant of the Morton family, was created Viscount of Belhaven. Of all these titles, that of the Earl of Selkirk is the only one not now dormant or extinct.

A *History of the Houses of Douglas and Angus*, by David Hume of Godscroft, was published at Edinburgh in 1644 in 1 vol. fol., and reprinted in 1748 in 2 vols. 8vo. It preserves the traditions of the family, and has some literary merit, but its accuracy is not to be trusted. The earlier history of the Douglasses has been critically examined by the late George Chalmers in his *Caledonia*, vol. i. pp. 579—584 (Lond. 1807); by Mr. Riddell in his *Remarks upon Scotch Peerage Law*, pp. 174—178 (Edin. 1833); by Mr. Cosmo Innes, in the *Registrum Episcopatus Moraviensis*, pp. xlv.—xlvii. (Edin. 1837); and the *Liber S. Marie de Calchou*, vol. i. pp. xxvii., xxviii. (Edin. 1846); and by Mr. Joseph Robertson in the *Origines Parochiales Scoticæ*, vol. i., pp. 152—160 (Edin. 1851). The descent of the Houses of Angus and Dalkeith was first ascertained by Mr. Riddell in his *Remarks upon Scotch Peerage Law*, pp. 154—164 (Edin. 1833); and in his *Stewartiana*, pp. 82—84, 137—142. The charters and correspondence of the Morton family have been edited for the Bannatyne Club by Mr. Cosmo Innes in the *Registrum Honoris de Morton* (Edin. 1853, 2 vols. 4to).

DOUGLAS, GAWYN or GAVIN, a Scottish poet, was the third son of Archibald, fifth Earl of Angus, and was born in the year 1474 or 1475. He was educated at St. Andrews for the church, and was early appointed to the rectory of Hawthorpe or Prestonkirk. In 1501 he was made dean or provost of the Collegiate Church of St. Giles. From the marriage of his nephew, the sixth Earl of Angus, to the widowed queen of James IV., Douglas expected rapid preferment; but the jealousy of the nobility and the Regent Albany was such that D., who had through the influence of the queen obtained the bishopric of Dunkeld directly from the Pope, was tried before the Scottish peers, found guilty of conspiring against the privileges of the crown, and condemned to imprisonment. After reconciliation with the regent, he was set at liberty in about a year, and inducted into his bishopric. Owing to his nephew's ill-treatment of the queen, who thereupon joined with the regent against the Douglasses, Gavin D. was deprived of his bishopric, on which he went to England to obtain the aid of Henry VIII. He was, however, suddenly cut off at London by the plague in 1522, and was buried in the Savoy Church. One of D.'s earliest poetic efforts was a translation of Ovid's *Remedy of Love*, but it has not been preserved. In 1501, he wrote his *Palace of Honor*, addressed to King James IV. The leading idea of the poem, and some of the details, resemble Chaucer's *Temple of Fame*. *King Hart*, the other long poem of D., presents a metaphorical view of human life. But the most remarkable production of this author was a translation of Virgil's *Æneid* into Scottish verse, which he executed in the years 1512 and 1513, being the first version of a Latin classic published in Britain. It is generally allowed to be a masterly performance, though in too obsolete a language ever to be popular. D.'s verse is far from rhythmical to modern ears; yet the felicitous character of his allegories, and the rich beauty of his descriptions, might well tempt the lovers of genuine poetry to give him a trial.

A collected edition of his works in four volumes was issued under the superintendence of John Small, M.A., in 1874.

DOUGLAS, JOHN, D.D., was the son of a respectable shop-keeper of Pittenweem, Fifeshire, and was born there in 1721. In 1736, he entered St. Mary's College, Oxford, where he took his bachelor's degree after five years' study. D.'s life is little more than a chronicle of his very numerous preferments, which ended in his being translated to the see of Salisbury in 1791. He died 18th May 1807. D. only occasionally resided on his livings. He generally spent the winter months in London, and the summer months at the fashionable watering-places, in the Society of the Earl of Bath, who was his great patron. He was devoted to literature; but most of his productions were only interesting to his own time. Among other works chiefly of a pamphlet kind, he wrote a *Vindication of Milton from the Charge of Plagiarism*, adduced by Lauder (1750); *A Letter on the Criterion of Miracles* (1751); an ironical pamphlet against the Hutchinsonians and Methodists, entitled *The Destruction of the French foretold by Ezekiel* (1759); and the *Introduction and Notes to Captain Cook's Third Voyage* (1781).

DOUGLAS, GENERAL SIR HOWARD, Bart., G.C.B., son of Admiral Sir C. Douglas, was born at Gosport in 1776. Entering the army when young, he served in Spain and Portugal in 1808 and 1809, and again in Spain in 1811 and 1812. He was governor of New Brunswick from 1823 to 1829, Lord High Commissioner of the Ionian Islands from 1835 to 1840, and from 1842 to 1847 was M.P. for Liverpool. In 1851 he became a general in the army, and colonel of the 15th Regiment of foot. He has written several treatises, among which are *An Essay on the Principles and Construction of Military Bridges*, and *The Passage of Rivers in Military Operations* (Lond. 1816); a treatise on *Naval Gunnery* (1819; 4th edit., 1855); *Observations on Carnot's Fortification*, &c. His treatise on *Naval Gunnery* is regarded as a standard authority in foreign countries, although his recommendations were not acted upon by the British Admiralty until thirteen years after the publication of his work. He censured the conduct of the war in the Crimea in 1855, and declared that Sebastopol could not be reduced unless by a change in the plan of operations, such as he traced. His prophecy was verified by the event. He also published *Considerations on the Value and Importance of the British and North American Provinces*, and a treatise entitled *Naval Evolutions*. He died November 1861.

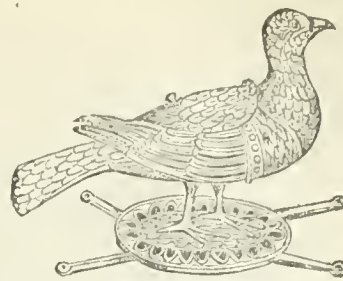
DOUR, a town of Belgium, in the province of Hainault, nine miles west-south-west of Mons. It is well built and prosperous, and has several schools and a literary society. Coal and iron mines are worked in the vicinity; there are also many quarries, and to some extent, weaving, bleaching, and leather-dressing are carried on. Pop. 8500.

DOURO (Span. *Duero*, Port. *Douro*), the name of one of the largest rivers of Spain and Portugal, rises in the province of Old Castile, about 30 miles west-north-west of the town of Soria. From its source it flows south-east to Soria, then winds towards the west, and pursues a general westward direction till it reaches the Portuguese border; it then flows south-west, forming for about 60 miles the boundary between Spain and Portugal; then crossing Portugal and flowing west, it falls into the Atlantic below Oporto. Its Portuguese tributaries are comparatively small. The total length of the river is about 500 miles. The D. is a noble river, and flows through some of the most imposing rock-scenery in the world, as at Barca d'Alva; but is rapid, and of difficult navigation, on account of rocks, sand-banks, &c. It passes through a large portion of the wine-country of Portugal, and conveys the produce to Oporto for exportation in flat-bottomed boats, containing from 30 to 70 pipes each.

DOVE (probably from the same root as *dive*, owing to its habit of ducking the head; compare Lat. *columba* with Gr. *kolumban*, to dive), a name sometimes extended, as the name Pigeon also is, to the whole family of *Columbida*, sometimes like it restricted—at least when used without prefix—to the genus *Columba* of the more recent ornithological systems. No distinction between the terms dove and pigeon is sanctioned either by constant scientific or general popular use. Audubon attempts to make a distinction, giving the name pigeon to those species of which many nests are built close together on the same trees, and dove to those which are solitary in their nidification; but this distinction is quite unsuitable to the European species, and contrary to British usage. See PIGEON.

DOVE. In Christian art, the dove is employed as an emblem of the Holy Ghost, no doubt from the fact of this being the form in which the Spirit descended on our Lord at his baptism. From the dove being also used to symbolize purity, it is generally represented white, with its beak and claws red, as they occur in nature. In the older pictures, a golden nimbus surrounds its head; the nimbus being frequently divided by a cross, either red or black. In stained glass windows we see the dove with seven rays proceeding from it, terminating in seven stars, significative of the

seven gifts of the Holy Spirit. Holding an olive branch, the dove is an emblem of peace. When seen issuing from the lips of dying saints and martyrs, it represents the human soul purified by suffer-



Pyx in the form of a Dove.

ing. A dove with six wings is a type of the church of Christ; and when so employed, it has the breast and belly of silver, and the back of gold, two wings being attached to the head, two to the shoulders, and two to the feet. The pyx or box for containing the Host (q. v.) in Catholic churches, is sometimes made in the form of a dove, and suspended over the altar; and the dove is often placed on the covers of fonts. In this position it may still be seen in parish churches in England.

DOVE, HEINRICH W., one of the ablest recent physicists of the continent, was born in 1803, at Liegnitz, in Silesia, where his father was a merchant. He studied at Breslau and at Berlin, at the latter of which he took the degree of Doctor in 1826. He was successively 'privatdozent' and assistant professor of natural philosophy in Königsberg. Having been transferred to a similar post in Berlin, he subsequently became full professor, and was elected to a seat in the Royal Academy of Sciences. His writings, which are very numerous, are to be found in the *Memoirs of that Academy*, and in Poggendorff's *Annalen*, besides several published separately. The most celebrated of these refer to Meteorology, Climatology, Induced Electricity, and Circularly Polarized Light. We may mention among his works *Ueber Mass und Messen* (2d edition, Berlin, 1835), a treatise on the art of measuring, and the origin and comparison of the metrical standards of different nations; *Meteorologische Untersuchungen* (Berlin, 1837), a remarkable treatise; *Ueber die nicht periodischen Aenderungen der Temperaturvertheilung auf der Oberfläche der Erde* (4 vols., Berlin, 1840—1847); *Untersuchungen in Gebiete der Inductionselectricität* (Berlin, 1843).

In conjunction with other distinguished German philosophers, D. commenced, in 1837, the publication of an extensive series of treatises on different branches of natural philosophy. This work, called *Repertorium der Physik* remains unfinished. In his capacity of director of all the Prussian observatories, he published annually an account of their labors. To him is due, amongst a great variety of optical discoveries, the application of the stereoscope to the detection of forged bank-notes—an ingenious and useful idea. To English readers, D. is best known by his treatise on the *Distribution of Heat on the Surface of the Globe*, which was published in 1853 by the British Association. In this work he enters fully into the causes of periodic variations of temperature at different parts of the globe, and lays down in admirable charts the monthly and annual isothermal and isabnormal lines—thus tracing the variations in form and position of the different isothermals throughout the year. *Das Gesetz der Stürme* (4th ed. 1874) has also been translated (*The Law of Storms*). Other works are *Ueber Electricität* (1848); *Optische Studien* (1859); *Eiszeit Föhn, u. Sirocco* (1867); *Klimatologie von Norddeutschland* (1871). D. died 6th April 1879.

DOVECOT. It is enacted by the Scottish statute 1617, c. 19, that no person shall build a dovecot or pigeon-house either in town or country, unless he be possessed of lands or tenements of the yearly value of ten chalders of victual, lying within at least two miles of it. It is also declared that no person having such qualification shall build more than one dovecot within the bounds foresaid. It has been held that the statute imposes no restraint on proprietors possessed of a greater rent, beyond limiting them to one dovecot for each portion of ground that yields ten chalders yearly. The statute does not extend to dovecots already built, and if a dovecot be challenged, it must be proved to have been built subsequently to the date of the statute, otherwise the contrary will be presumed. If an estate be purchased, or otherwise acquired from a person who was legally entitled to build a dovecot, the dovecot may be legally retained, but cannot be rebuilt if it become ruinous. The statute 2 George III. c. 29, for the protection of pigeons, does not extend to Scotland. See PIGEON. Dovecot breakers are guilty of theft, and very severe punishments were assigned to them by the old statutes.

DOVER, a parliamentary and municipal borough in the east of Kent, 66 miles east-south-east of London, and the headquarters

of the south-eastern district of the British army, is not only a charmingly situated watering-place, but, being the nearest point of the English coast to France, is a seaport of rapidly growing importance.

Within the last few years £750,000 have been expended by the government in constructing a magnificent pier, which, running out a distance of 2100 feet seawards, terminates in a fort fitted to bear two guns of heavy calibre, so mounted that they will completely sweep the Channel. This granite isthmus affords a safe anchorage for vessels in the stormiest weather, and travelers for Calais, about 25 miles distant, or Ostend, for which places passenger and cargo steamers leave twice a day, are enabled to embark or land in any state of the tide, or even when a furious gale is raging. Works which will cost over a million sterling are contemplated by the government to carry out a scheme for the erection of Dover Bay into a naval rendezvous and coaling-station. The fortifications comprise Dover Castle, which occupies a commanding position on the chalk cliffs, 375 feet above the level of the sea, and in the construction of which the Saxons and Normans displayed no small amount of ingenuity; the Western Heights, Fort Burgoyne, the South Front, the Drop Redoubt, the Citadel, the Western Outworks, and the North Center Bastion. No special trade is attached to the town, which transacts a miscellaneous maritime business with the French and Belgian ports, and offers excellent harbor accommodation. Pop. of borough, which returns two members to parliament (1871), 28,506; (1881) 28,486. D. is well sheltered by the cliffs, and ends landward in a charming valley leading to what is known as 'The Garden of Kent.' In Roman days it was known as *Durris*; the Normans called it *Dovere*; the French, *Douvres*; whilst in legal documents of this day the town is *Dovar*, all four terms being variations of the word '*Dour*,' the name of the small river which runs through the town. Fortified and walled by William the Conqueror, during whose reign it was nearly burned down, noted as the place of King John's submission to the pope, besieged by the French, held during the civil war by the Parliamentarians, threatened by the first Napoleon, and celebrated as the headquarters of the Lord Wardens of the Cinque ports, D. holds a distinguished place in English history. Three submarine cables connect it with the continent, and, if the designs of eminent French and English civil engineers are practicable, a tunnel may soon be constructed under the Channel, which will bring France within an hour or an hour and a half's journey from Dover.

DOVER, a city of New Hampshire, United States, founded in 1623, is the oldest in the state. It has considerable cotton, woolen, iron, brass, and leather manufactures, and extensive print works, and is well supplied with churches and educational establishments. Its pop. in 1880 was 11,687.

DOVER, STRAIT OF (*Fretum Gallicum*, *Pas de Calais*), the seachannel between England and France, connecting the English Channel and North Sea, whose tides meet here. It is 18 to 25 miles broad, and 6 to 29 fathoms deep, but at Warne and Ridge Shoals only $1\frac{1}{2}$ to 4 fathoms. The English coast consists of chalk cliffs, 300 to 600 feet high, succeeded on the south by lower greensand, and the French, from Calais to Cape Grisnez, is of similar strata. Britain and the continent seem to have been once united here by an isthmus. In August, 1875, Captain Webb, an English naval officer, accomplished the wonderful feat of swimming the S. of D. in 21 $\frac{1}{4}$ hours.

DO'VERON, or DE'VERON, a river of the north-east of Scotland, rising in the west of Aberdeenshire, a little south of the Buck of the Cabrach (2377 feet high). It runs 55 miles north-east, or 36 in a straight line, through adjacent parts of the counties of Aberdeen and Banff, and partly dividing them, past Huntly to the North Sea at Banff. It drains a basin of 410 square miles, composed of syenitic greenstone, metamorphic rocks, graywacke and old red sandstone.

DOVER'S POWDER is a preparation of powder of ipecacuanha 1 drachm, opium in powder 1 drachm, and sulphate of potash 1 ounce. The whole is thoroughly mixed, and the ordinary dose is from 5 to 10 grains. Occasionally, saltpetre is added. It is a most valuable medicine, and acts as a sudorific, increasing the proportion of sweat or sensible perspiration. In feverish conditions, where there is the dry furred tongue, and the dry skin, and the brain out of order, Dover's powder is reckoned to prove injurious; but where the tongue is moist, the skin moist and soft, and the brain comparatively unaffected, Dover's powder is of great service.

DO'VRE FJELD. See SCANDINAVIA.

DOW, DOU, or DOUW, GERARD, one of the most exquisite of all the Dutch *genre*-painters was born at Leyden in 1613. He received his first instructions in drawing from one Dolendo, a draughtsman, and at the age of 15 entered the school of Rembrandt. That marvelous genius for color which the latter pos-

sessed, fascinated the young painter, who soon showed a similar mastery over *chiaroscuro*, but at the same time developed artistic qualities of a wholly different kind from those of his master. The most insignificant incidents of daily life were precious to D., and were delineated with a delicacy, neatness, and care, that could not be surpassed. In his workshop, the utmost cleanliness prevailed. D. was true to nature in a degree positively wonderful. The richness, transparency, vigor, and harmony of his coloring are beyond all praise. In consequence, his pictures, though generally small in size, are considered gems of art, and have brought astonishing prices. One of his best works, 'The Dropsical Woman,' is valued at 30,000 guilders. Among his other pieces may be mentioned 'The Village Grocer,' 'The Dutch Cook,' 'The Mountebank,' 'The Fiddler,' 'The Dentist,' and 'The Interior of a Household.' His works, which are pretty numerous, are in all the great European collections. D. died at Leyden in 1680.

DOW'AGER (Fr. *douairière*, from *douaire*, dowry, dower, derived from the Greek and Lat. *dos*, a thing given, verb *do*, to give), a widow with a Dower (q. v.); but commonly the title is applied only to the widows of persons of high rank. The queen-dowager, as the widow of the king, enjoys most of the privileges which belonged to her as queen-consort. But it is not high treason to conspire her death, because the succession to the crown is not thereby endangered. Still no man can marry a queen-dowager without special license from the king. Though an alien born, the queen-dowager is entitled, by the common law, to dower after the king's death, though it was not till recently that this privilege belonged to the alien widow of a subject. A queen-dowager, though she should marry a subject, does not lose her regal title, as peeresses-dowager, when commoners by birth, lose their peerages when they marry commoners.

DOWER (Lat. *dos*, in Domesday, *Maritagium*), 'in the common law, is taken for that portion of lands or tenements which the wife hath for terme of her life of the lands or tenements of her husband after his decease, for the sustenance of herself, and the nurture and education of her children.'—*Coke upon Litt.* 30 b. Formerly, a widow's right to dower was protected by the law, and could only be defeated by certain prescribed means; but by 3 and 4 Will. IV. c. 105, a husband, by simple conveyance of his land, or by burdening it with debt, may defeat the right of his widow to dower. He may effect the same purpose by introducing into the deed of conveyance to himself, or into his last will and testament, a simple declaration of his intention to bar his widow's right of dower. Though the right of dower has thus lost much of its importance, the history of this right forms an interesting chapter in the English common law. In feudal times, when personal property was small, a widow depended almost exclusively on her right to dower for maintenance after her husband's death. Three things, says Lord Coke, 31 a, were necessary for dower—marriage, seisin, and the death of the husband. The usual amount of dower was a third of the land in which the husband died seised; but, by custom, as Gavelkind (q. v.), it amounted sometimes to a half, and in certain cases to the whole.—*Litt.* s. 37. Besides dower at common law, and dower by custom, three other species of dower are noticed by Littleton—viz., *dower de la plus belle*, s. 47; *dower ad ostium ecclesie*, s. 39; and *dower ex assensu patris*, s. 40. The first of these was where a man died possessed of lands held partly by Knight's Service (q. v.), and partly by Socage (q. v.), leaving a child under 14, the widow could be compelled, as guardian in socage, to take her dower out of the socage lands. This species of dower fell with the military tenures by 12 Car. II. c. 24. The last two species of dower mentioned above were both made at the time of the celebration of the marriage. *Dower ad ostium ecclesie* was when the husband, being of full age, at the church door specially endowed his wife in the whole or a part of his lands. In *dower ex assensu patris*, the bridegroom's father being alive, the same form was observed, with the sanction and consent of the father. In both of these cases, the widow was entitled, on death of her husband, to enter at once upon the land without any assignment. These species of dower were abolished by 3 and 4 Will. IV. c. 105, s. 13. In dower at common law, and dower by custom, which are still suffered to exist, a widow cannot enforce her claim until certain lands have been assigned to her for her dower by the heir or by writ of the sheriff.—*Co. Litt.* 34 b. In early times, it was necessary to pay a duty to the lord for this assignment, but this exaction was abolished by Magna Charta. In its general principles, the right to dower in England resembled the right of *Terce* (q. v.) in Scotland. In both countries, the amount allowed by law was a third of the husband's lands, and in both a certain process was necessary before the widow could enforce her right. A woman forfeits her right to dower by eloping from her husband (13 Edw. I. c. 34), by the treason of her husband, by divorce *a vinculo*, but not by divorce *a mensa et thoro*. The right to dower was also barred by levying a Fine (q. v.) of lands, by conveyance to uses in bar

of dower, and by the settlement of a jointure upon the wife. See **FINE JOINTURE**.

DOW'LAS, a kind of coarse strong linen, used by working-people for shirts, and manufactured largely at Knaresborough in Yorkshire, at Dundee, and at Newburgh and other places in Fifeshire. Since the introduction of calico, the home demand for dowlas has very much diminished, the article being little used except in the iron districts. The principal exports of dowlas are to Spain, and the countries inhabited by peoples of Spanish origin, in North and South America.

DOWLATABAD, (in English, *Abode of Prosperity*), a strongly fortified town of Hindustan, within the Nizam's dominions, near their north-west frontier, in lat. 19° 57' N., and long. 75° 18' E. The town is commanded by a rock-fortress, which, with a height of about 500 feet, is scarped into a perpendicular for the lowest third of the altitude. This stronghold is all the more formidable from its being completely isolated, being fully 3000 yards distant from any other eminence. The town of D. has recently greatly decayed, and only a small portion of it is now inhabited.

DOWN, a maritime county in the south-east of Ulster Province, Ireland. It is 51 miles long, and 33 broad, with an area of 967 square miles, $\frac{5}{8}$ ths being arable, and $\frac{3}{8}$ ths in wood. It has a coastline of 67 miles, or 125 by the inlets, mostly low and rocky, and with many isles off it. The chief inlets are Belfast Lough, 3 miles broad, and 15 deep; Strangford Lough, $\frac{1}{2}$ to 3 miles by 10; Dundrum and Carlingford Bays. The Mourne Mountains cover 90 square miles in the south, and rise 2796 feet in Slieve Donard. The other parts of D. are mostly undulating and hilly, with plains and fine meadows along the rivers. The chief rocks are Lower Silurian—covering most of the county—and granite, composing the Mourne and Croob Mountains. The chief rivers are the Upper Bann and the Lagan. The Newry Canal admits vessels of 50 tons, and with the Ulster Canal opens communication through almost all Ulster. Thick marl beds occur in the alluvial tracts. The soils are chiefly stony and clayey loams. In 1881, 301,520 acres, out of the total 612,495, were in crop. The chief crops are oats, potatoes, turnips, wheat, flax, and barley. Many pigs are reared. The chief manufacture is linen, especially in finer fabrics, as muslin, woven in the houses of the small farmers. Flax and cotton mills have become common. Hosiery, leather, salt, thread, and woollens are also made. These, with corn, butter, pork, and hides, are the chief exports. D. is among the best cultivated of the Irish counties, and has more resident gentry (almost all Protestants, of English and Scotch descent) than any other Ulster county. It contains 10 baronies, 5 poor-law unions, and 70 parishes.

The chief towns are Downpatrick, Newry, Newtownards, Bannbridge, and Donaghadee. D. sends four members to parliament, two for the county, one for Downpatrick, and one for Newry. Pop. (1871) 277,294, of whom 116,017 were Presbyterians, 88,003 Roman Catholics, 60,868 Episcopalians; (1881) 269,926. Presbyterianism prevails in the towns and low country, and Roman Catholicism among the mountains, and in the barony of Lecale. D. has many ancient remains, as raths, round towers, castles, and abbeys. On the top of Slieve Croob (1755 feet high) are 23 stone cairns, one being 54 feet high.

DOW'NHAM MARKET, a town in the west of Norfolk county, on a hillside, on the right bank of the Ouse, 40 miles west of Norwich, and 10 $\frac{1}{2}$ south of Lynn Regis. It lies amid fen and dairy land. Pop. (1881) 2631. It has a bell-foundry, and a celebrated butter-market. By the Ouse and Cam, vessels proceed from Lynn on the coast to Cambridge, 30 miles above Downham Market. A market was confirmed here in the time of Edward the Confessor.

DOWNING COLLEGE, CAMBRIDGE, founded solely by Sir George Downing of Gamlingay Park, Cambridge, who, by a will of date 20th December 1717, devised his estates in the counties of Cambridge, Bedford, and Suffolk, to various relations in succession, and on failure thereof, to build and found a college on a plan to be approved of by the two archbishops of England and the masters of St. John's and Clare Colleges. Owing to various litigations and other difficulties, it was not till 22d September 1800 that the college received its charter, sealed with the Great Seal, nor till May 1821 that the buildings were sufficiently advanced to admit of under-graduates residing and keeping terms. The college will consist of a master, two professors (one of Law and one of Medicine), at least eight fellows, and at least ten scholars; but at first only the master, professors, and three fellows were appointed. In 1881 only six of the eight fellowships were filled up. Of the eight fellows two must be resident, and of these one must be in holy orders; the resident fellows hold their fellowships for life, but the tenure is affected by marriage; the six non-resident fellows who are presumed to be persons actively engaged in the studies of law and medicine, hold their fellowships for 12 years. This college had in 1881 about 70 members of senate, 80 under-graduates, and 200 members on the boards.

DOWNPATRICK (Mount of Patrick), or **DOWN**, a parliamentary, municipal, and cathedral town, in the south of Down, of which it is the capital. It is situated near the mouth of the Quoyle, which flows into the south-west end of Lough Strangford, 74 miles north-north-east of Dublin, and 21 miles south-south-east of Belfast, with which town it is connected by railway.

The cathedral was restored in 1790 on the site of one built in 1412, and burned in 1538 by Lord Deputy Gray. A handsome Catholic church was erected here in 1872. Vessels of 100 tons reach the quay a mile from Downpatrick. It has manufactures of linen, soap, leather, and malt liquors. Pop. (1871) 3621, of whom 1630 were Roman Catholics, 1124 Episcopalians, 749 Presbyterians; (1881) 3902. It sends one member to parliament. To the north-west of D. are the remains of great earth-works, $\frac{1}{2}$ mile in circuit, enclosing a conical rath 60 feet high and 2100 in circumference. D. was famous before the arrival of St. Patrick, who founded religious establishments here. D. was burned by Edward Bruce in 1315, and plundered by O'Neil in 1552. The holy wells of St. Patrick at Struel, $\frac{1}{2}$ mile east of D., were formerly resorted to by Roman Catholic pilgrims from all Ireland, but for the last fifty years the pilgrimage has ceased.

DOWNS, THE, an important roadstead or shelter for shipping, off the south-east coast of Kent, opposite Ramsgate and Deal, between North and South Foreland, and protected externally by the Goodwin Sands—a natural breakwater with one to four fathoms of water, and often partly dry at low tide. This large natural harbor of refuge is eight miles by six, with an anchorage of four to twelve fathoms. It is resorted to temporarily by outward and homeward bound vessels, and squadrons of ships of war, and is unsafe only in south winds. The Small Downs, an appendage of the Downs proper, lies inside the Brake Sand, has from 2 $\frac{1}{2}$ to 5 fathoms water, and is about 2 miles wide.

DOWNS (Ger. *dünen*, Fr. *dunes*, from the root *dun* (q. v.), common to the Gothic and Celtic languages, signifying a *hill*), a term usually applied to hillocks of sand thrown up by the sea or wind along the sea-coast. It is also a general name for any undulating tract of upland too light for cultivation; and covered with short grass. It is specially applied to two broad ridges of undulating hills south of the Thames, beginning in the middle of Hampshire, and running eastward, the one (the North D.) through the middle of Surrey and Kent to Dover (about 120 miles), and the other (the South D.) through the south-east of Hampshire and near the Sussex coast to Beachy Head (about 80 miles). Between the two ranges lies the valley of the Weald, from which the chalk strata are supposed to have been removed by denudation. Towards the Weald, the descent from both D. is rapid, and presents cliffs as of a sea-margin; while the opposite slopes are gradual. The highest point of the North D. is Botley Hill, 880 feet; and of the South D., Ditchelling Beacon, 558 feet. These uplands are covered with fine short pasture, which, from its aromatic quality, forms excellent feeding-ground for the famous South Down sheep. The valleys occurring among the hills are usually fertile, and admit of cultivation, so that an excellent field is furnished for mixed husbandry. By pasturing the sheep on the D. during the day, and folding them on the arable fields at night, the latter are highly fertilized.

DOW'NTON, a town in the south-east of Wiltshire, on the right bank of the Avon, here split into three branches, six miles south-east of Salisbury. It chiefly consists of one long street with the houses irregularly placed. Pop. (1881) 4713. It has a paper-work, and an ancient cross. D., in the middle ages, had a castle, of which the mound or moat remains, and is a singular earthwork, on which Saxon justice was dispensed. Two miles north of D. is the mansion and estate of Standlinch, the national gift to the heirs of Lord Nelson, for which parliament voted £100,000.

DOXO'LOGY, a Greek word, signifies an exclamation or prayer in honor of the majesty of God, such as Paul uses at the close of his epistles, and sometimes even in the middle of an argument (Romans ix. 5). The hymn of the angels (Luke ii. 14) is also called a doxology by the Christian Church; so likewise is the close of the 'Lord's Prayer.' The so-called 'Great Doxology' is simply an expansion of the angelic hymn, and is sung in the Roman Catholic Church at the celebration of the Lord's Supper, and at matins. It commences with the words, *Gloria in excelsis Deo* ('Glory to God in the highest'). The ordinary doxology, 'Glory be to the Father, Son, and Holy Ghost, as it was,' &c., is repeated at the end of each psalm in the service of the Church of England; there is a similar doxology in verse to suit different meters.

DOYLE, RICHARD, son of the celebrated caricaturist H. B., whose name was John Doyle, was born in London in 1826. He became a contributor to *Punch*, and furnished its pages with the well-known sketches of 'Ye Manners and Customs of ye English.' In 1850, his connection with that publication ceased, and since that period he has employed himself in the illustration of books.

Among his works of this nature may be mentioned the *Adventures of Brown, Jones, and Robinson*, and the illustrations to the *New-comer* and the *Scouring of the White Horse*. He contributed 'Sketches of Modern Society' to the *Cornhill Magazine*, and published a Christmas book for 1869, called *In Fairy Land*. His caricatures are all distinguished by the most genial humor, and the most graceful drawing.

DOZY, REINHART, one of the most learned orientalists of the present day, was born 21st February 1820, at Leyden. He belongs to a family of French origin, which settled in Holland after the revocation of the Edict of Nantes. He studied at the university of his native town, and devoted himself especially to oriental studies. In 1850 he was appointed extraordinary, and, in 1857, ordinary professor of history at Leyden. Besides his writings in the *Journal Asiatique* and other periodicals, D. has published *Dictionnaire détaillé des Noms des Vêtements chez les Arabes* (Amst. 1845). *Historia Abbadidarum* (Leyden, 1846—1852), and editions of Abdo'l Wahid al Marrékoshi's *History of the Almohades* (1847), of Ibn-Badrün's *Historical Commentary on the Poem of Ibn-Abdun* (1848), with introduction, notes, glossary, and index, and of Ibn-Adhari's *History of Africa and Spain* (1848—1852). In 1849 appeared his masterly performance, *Recherches sur l'Histoire politique et littéraire de l'Espagne pendant le Moyen Age*.

A second edition, enlarged and completely recast, was published in 1860. In this work, D. has exposed the gross and wilful corruptions of the monkish chroniclers, who persisted in falsifying history for the benefit of Christianity, and who could form no more rational idea of the Moors than that they were 'devils,' or abetted by the devil, and sent to torment the Spaniards because of their sins. Other valuable productions of D. are his *Al-Makkarî, Analectes sur l'Histoire et la Littérature des Arabes d'Espagne* (Leyd. 1855—1861); *Histoire des Musulmans d'Espagne jusqu'à la Conquête de l'Andalousie par les Almoravides* (Leyd. 1861); *Het Islamisme* (Hart. 1863), and *Die Israeliten zu Mekka* (1864).

DRA'CHENFELS ('Dragon's Rock'), a mountain on the Rhine, one of the range called the *Siebergelirge*, is renowned through Byron's verses commencing

The castled crag of Drachenfels
Frowns o'er the wide and winding Rhine.

It is situated on the right bank of the river, about eight miles south-east of Bonn, and has an elevation of 1056 feet. It is of volcanic origin, consisting of lava, trachyte, and basalt. D. rises abruptly from the river, and is covered with brushwood almost to the top, whence the prospect is magnificent, extending down the river as far as Cologne, and having a charming foreground in Bonn, with its university, and numerous villages, and time-worn castles. The cave where the dragon—from which the mountain takes its name—was wont to abide, is pointed out to the traveler. The ruins of an old castle crown the summit, and add picturesqueness to the Drachenfels.

DRA'CHMA, DRACHM, DRAM. The drachma was a silver coin, the unit of the money-system in ancient Greece. It varied in value in different parts of Greece and at different times. The Attic drachma is estimated as equivalent to 94d. of our money—very nearly a French franc. The Æginetan drachma was considerably more. But whatever its absolute worth, it always remained the 6000th part of the *talent* (about £244), and the 100th part of the *mina* (about £4), and was divided into six obols. There were also coins of two, three, and four drachmas. The drachma (originally a *handful*) was also the name of a weight, and 100 drachmas made a *mina*, in weight, as in money. The weight of the drachma is stated at from $\frac{1}{2}$ oz. avoirdupois to little more than half as much. At this lowest estimate, the *mina* = 1 lb. nearly. The unit in the monetary system of modern Greece, since 1833, has also been called *drachma*; it is equivalent to $\frac{88}{100}$ of a franc, or about 8½d. sterling, and is divided into 100 lepta. In the British system of weights there were, till recently, two drachms or drams: the avoirdupois *dram*—equal to 27 $\frac{1}{8}$ troy grains—and the apothecaries' *dram* (not now used), equal to 60 troy grains, or $\frac{1}{8}$ of an ounce troy. It is this last which is the representative of the ancient drachma.

DRACO (Gr. *Drakon*), an Athenian lawgiver and archon, who, in the year 624 B.C., was appointed to draw up new laws for the disordered state. These, however, effected little change in the form of the state; but by being committed to writing, put an end to the arbitrary administration of justice on the part of the archons, and resulted in the establishment of a court of appeal—that of the Ephete. D.'s legislation had a beneficial and permanent effect upon the political development of Athens. The extraordinary severity of these laws, however, which punished the slightest theft, or even laziness, with death, no less than sacrilege, murder, and treason, caused them to be often neglected, and made them so hated, that Solon was appointed to draw out a new code. Solon, though he softened their severity in most instances, retained that law which punished a murderer with death. D., at

a later period, went to Ægina, where, after having introduced his laws, he is said to have been stilled in the theater by the garments thrown upon him as a mark of respect by the people. The severity of his laws gave rise to a pun by Herodotus, who declared that D.'s laws were those of a dragon (Gr. *drakon*) and not of a man. Hence also originated the metaphorical remark of Demades, 'that they were written not in ink but in blood.' Extremely severe and sanguinary laws are still called *Draconic*.

DRA'CO, a constellation in the northern hemisphere. The star γ Draconis is celebrated as the one used in determining the coefficient of aberration of the fixed stars. It is a bright star, nearly in the solstitial colure, and consequently the minor axis of the small ellipse which its apparent place describes in the heavens, lies in the meridian at its transit. Moreover, at the two equinoxes, when its apparent place is at the extremities respectively of this minor axis, it can be observed on the meridian at one equinox about sunrise, and at the other about sunset, so that both observations may be made without the interference of a too bright daylight. These two observations, therefore, are easily taken, and the difference in the north polar distance which they give, is the minor axis of the ellipse described by the apparent place of the star.

DRACO'NTIUM, a genus of plants of the natural order *Araceæ*, of which one species, *D. polyphyllum*, a native of Guiana, Surinam, and also of India and Japan, has a powerful action on the nervous system, and is useful in asthma; although at present its chief reputation is the somewhat doubtful one of curing the bite of a snake, to which its mottled stem gives it some resemblance. The flower, when it first expands, emits an intolerable stench.

DRAFT, an order addressed to a debtor by his creditor, calling upon him to pay a certain sum either to the drawer or to a third party. See BILL, CHEQUE.

DRAFT, or DRAUGHT, a tentative copy of a legal document, or other formal writing, made for the purpose of adjusting the matter afterwards to be admitted into the fair copy, or engrossed, as it is called. Manuscripts and proof-sheets are the drafts of printed works.

DRAG, a mechanism for slackening the speed of carriages, by operating on one or more of the wheels. The form of drag best known to old travelers by coach is that of the 'shoe,' a hollow piece of iron attached by a chain to the carriage, which being put below one of the hind wheels partially reduced the vehicle to the quality of a sledge; by which dragging process the carriage was suitably retarded on going down-hill. As the shoe-drag required to be applied and removed with some inconvenient detention of the vehicle, a step was made in advance when a method of retarding a wheel without detention was discovered. This new process, which is known as the patent drag, consists of a connected piece of mechanism, altogether operated upon by the driver without moving from his seat. A handle affects a series of rods and levers by which a species of shoe is pressed against one of the wheels, so as to slacken its motion. Such is the kind of drag now very generally attached to gentlemen's traveling-carriages, omnibuses, and other vehicles for passengers on the roads of Great Britain. It is of French origin. Applied in either form, the use of the drag, independently of its safety, is to allow horses to continue running at ordinary speed down-hill, without being unduly pressed on by the carriage behind them. A similar contrivance, but of a more powerful kind, called a *break* or *brake*, is applied to arrest the motion of railway-trains. See RAILWAYS.

DRAGO'MAN, from the Turkish *trukéman*, the general name given in Turkey to an interpreter, or to a guide to foreigners. The common dragoman corresponds exactly to the Italian *cicerone*, or the French *commissaire* or *valet de place*. There are several connected with the hotels at Constantinople and other Turkish cities, who pounce eagerly upon European travelers, to perform every imaginable service. The diplomatic dragomen, are, however, important personages, being the medium of communication between the Christian ambassadors and the Sublime Porte. Though usually natives, they and their families enjoy the privilege of being under the protection of the embassy they serve, and are subject to the laws of the country of that embassy, and not to the Turkish law. This privilege, which is also enjoyed by all the subjects of the great Christian powers resident in Constantinople, &c., is much valued, on account of the greater severity of the Turkish laws, and the summary manner in which they are executed. These dragomen are mostly of Italian extraction, either descendants of the old Genoese and Venetian merchants or Maltese. Strange stories are told of their tricks in garbling the communications they have to make, when private interests can be served by such means, and bribes obtained; and there is no doubt that newly appointed consuls, quite ignorant of the Turkish language, are in some respects almost completely in their power, and that this power is frequently used very unscrupulously.

DRAGON, a name applied in modern natural history, both popularly and by scientific authors, to different kinds of saurian reptiles. Some of these (the genus *Draco* of Linnaeus) are remarkably characterized by false ribs extending from the sides, so as to support a membrane which is used as a parachute. These are called Flying Dragons (q. v.), or Flying Lizards. Another reptile which has received the name D., and is also called D. LIZARD (*Ada*), belongs to a family of saurians, *Teyidae*,



Fringed Dragon (*Draco fimbriatus*).

found only in America, closely allied to the *Varanidae* of the Old World, and to which, in common with them, the names **MONITOR** and **SAFEGUARD** have sometimes been given, in consequence of their being supposed—although erroneously—to give warning by a hiss of the proximity of a crocodile or alligator. It inhabits the marshy plains of Guiana, climbs trees with facility, bites severely, has a long compressed tail, the back and tail crested, the tongue forked like that of a serpent, and attains a length of about six feet. Both its flesh and eggs are used as articles of food.

DRA'GON. In the mythical history and legendary poetry of almost every nation, the D. appears as the emblem of the destructive and anarchic principle, as it manifests itself in the earlier stages of society—viz., as misdirected physical power and untamable animal passion. Like the serpent, the D. is always a minister of evil, of the principle which aims at negation, opposition, and contradiction, the object of which is to fight against order, harmony, and progress. But whilst the serpent seeks the attainment of its object by cunning and deceitful artifices—crawling on its belly, and always assuming ostensibly characteristics the very opposite of its own—the D. proceeds openly to work, running on its feet, with expanded wings, and head and tail erect, violently and ruthlessly outraging decency and propriety, spouting fire and fury from both mouth and tail, and wasting and devastating the whole land.

The destruction of this disorderly element was one of the first objects of human energy, but it was an object which was unattainable by merely human means, and mankind were accordingly indebted for its accomplishment to that intermediate class of beings known as heroes in classical antiquity. As the highest ideal of human strength and courage, the task properly fell to Hercules; but it was not confined to him, for we find both Apollo and Perseus represented as dragon-slayers. From legendary poetry, the D. passed into art, some of the earliest efforts of which probably consisted in depicting it on the shield, or carving it for the crest of a conqueror's helmet. The D. does not seem to have been a native emblem with the Romans, and when they ultimately adopted it as a sort of subordinate symbol, the eagle still holding the first place, it seems to have been in consequence of their intercourse with nations either of Pelagic or Teutonic race. Amongst all the new races which overran Europe at the termination of the classical period, the D. seems to have occupied nearly the same place that it held in the earlier stages of Greek life. In the *Nibelungen Lied*, we find Siegfried killing a D. at Worms; and the contest of Beowulf (q. v.), first with the monster Grendel, and then with the D., forms the principal incident in the curious epic which bears the name of the former. Even Thor himself was a slayer of dragons (J. Grimm, *Deutsche Mythologie*, ii. 653). Among the Teutonic tribes which settled in England, it was from the first depicted on their shields and banners; and Dr. Plott, in his History of Oxfordshire, ascribes the origin of the very ancient custom of carrying the D. in procession at Burford, in great jollity, on Midsummer Eve, to the fact of a banner adorned with a golden D. having been taken by a king of the West Saxons from a king of Mercia. The custom, however, is said by Brand, on the authority of Aubanus, to have prevailed in Germany, and was probably

common in other parts of England (Brand's *Pop. Antiq.* i. 321). Nor was the D. peculiar to the Teutonic races. Amongst the Celts it was the emblem of sovereignty, and as such borne as the sovereign's crest. Mr. Tennyson's *Idylls* have made every one familiar with 'the dragon of the Great Pendragonship,' blazing on Arthur's helmet, as he rode forth to his last battle, and 'making all the night a stream of fire.'

The fiery D., or Drake, and the flying D. in the air, were meteoric phenomena, of which we have frequent accounts in old books, and, indeed, as Brand remarks, 'the dragon is one of those shapes which fear has created to itself,' and which appears in circumstances, and clothes itself in forms, as various as our fears.

In Christian art, the D. is the emblem of sin, the usual form that is given to it being that of a winged crocodile. It is often



St. George and the Dragon.

represented as crushed under the feet of saints and martyrs, and other holy personages. Sometimes its prostrate attitude signifies the triumph of Christianity over paganism, as in pictures of St. George and St. Sylvester; or over heresy and schism, as when it was adopted as the emblem of the Knights of the order of the D. in Hungary, which was instituted for the purpose of contending against the adherents of John Huss and Jerome of Prague.

The D. is often employed in heraldry; and other animals, such as the lion, are sometimes represented with the hinder parts resembling dragons. An animal so represented is said to be *dragonné*. See **GRIFFIN**. A D. without wings is called a lindworm, or lintwurm, which Grimm (*Deutsche Mythol.* ii. 652) explains to mean a beautiful or shining worm.

DRAGON, GREEN (*Dracunculus vulgaris*), a plant of the natural order *Araceæ*, which receives its name from its spotted stem. It is a native of the south of Europe. Its flowers are black, remarkably fetid, and give out exhalations which cause headache, giddiness, and vomiting. The root is emetic, and, probably for no better reason than the peculiar appearance of the stem, has been supposed useful for curing serpent-bites.

DRAGONET (*Callionymus*), a genus of fishes of the Goby (q. v.) family (*Gobiadæ*), remarkable for having the gill-openings reduced to a small hole on each side of the nape, and the ventral fins



Gemmeous Dragonet (*Callionymus lyra*).

placed under the throat, separate, and larger than the pectorals. They have no air-bladder. The species are pretty numerous; most of them finely colored, as the **GEMMEOUS D.** (*C. lyra*) of the British coasts—called *Gowdie* (*gowd*, gold) in Scotland—a fish

about ten or twelve inches long, the prevailing yellow color of which is varied with spots of sapphire blue, &c.

DRAGON ROOT (*Arisæma atrorubens*, formerly *Arum triphyllum*), a plant of the natural order *Araceæ*, a native of North America, the tuber of which is a powerful local irritant, and is used as a stimulant of the secretions in chronic bronchitis, asthma, rheumatism, &c. The powder, made into a paste with honey, is beneficially applied to the mouths and throats of children in aphthæ; and milk, in which the root has been boiled, is a useful ointment in cases of scalled head, ringworm, &c.

DRAGON-FLY (*Libellula*), a Linnæan genus of neuropterous insects, now constituting the family *Libellulidæ*. They are in general very beautiful, rivalling butterflies in their hues, and like them loving the sunshine. They are, however, easily distinguished



Dragon-fly and Nymph (*Libellula depressa*).

from butterflies, even at a distance, by their more slender form and comparatively narrow gauze-like wings; and differ from them still more widely in their habits, as they do not feed on the nectar of flowers, but prey on other insects, which they pursue with rapid flight. Dragon-flies have a large head; the mouth is formed for mastication, and its parts, especially the mandibles, possess great strength.—See the article *COLEOPTERA* for an explanation of the structure of the mouth in *masticating* insects, and the names of its parts.—The antennæ are short, awl-shaped, and of few joints. The eyes are large, lateral, and projecting. The wings—four in number—are equal in size, or nearly so, long, very thin, and very much reticulated. The legs are short. The abdomen in some is compressed, in others slender and cylindrical, in some remarkable for its extreme slenderness. The French name *demoiselle*, given to these insects, seems to be due to their beauty. They are, however, equally remarkable for their voracity. The Great D. (*Aeshna grandis*), an insect about four inches long, the largest of the British species, has been seen to dart upon a large cabbage-



Metamorphoses of Dragon-fly (*Aeshna grandis*).

a, larva; b, pupa; c, perfect insect issuing from pupa case; d, perfect insect, with wings fully developed.

butterfly which passed as it was flitting up and down in search of prey; and then settling on a twig, it bit off the wings, and in less than a minute devoured the body.

Dragon-flies are usually most abundant in the vicinity of lakes, rivers, and marshes. They deposit their eggs in water, and the larvæ and pupæ are entirely aquatic, living chiefly at the bottom of the water, and creeping on the submerged parts of aquatic plants. They are as ravenous as the perfect insect, which in general form they pretty much resemble; aquatic insects are their food. The pupæ, unlike those of the greater number of insects,

are active. They are provided with the means of drawing water into their bodies to supply air for respiration, and expel it again by the same orifice at the extremity of the abdomen, with such force, that they thus propel themselves through the water, whilst their legs are at rest. When the final transformation is about to take place, the D. pupa crawls out of the water on a stick, rush, or other object; fixes itself by hooks, with which its legs are furnished; and the skin then splitting at the back, the perfect insect comes forth, but with body and wings quite soft and moist, and the wings still folded up into small compass. In the sub-family of *Agrionidæ*, the wings are elevated vertically in repose: in the true *Libellulidæ* (*Libellula*, *Aeshna*, &c.), they are extended horizontally.

Dragon-flies extend even into very northern regions, but are most abundant in warm climates.

DRAGONNA'DES, the name applied to a series of religious persecutions which took place in France in the reign of Louis XIV. and that of his successor, and which were intended to compel the Protestants of that country to renounce their religion. They consisted of armed expeditions, led by a bishop, an intendant, a sub-delegate, or a priest, who marched through the provinces, demanding of the heretics that they should abjure their faith, and leaving such as were refractory to be dealt with by the unscrupulous troops. Foremost among the armed force rode dragons, who, from the fact of their taking the precedence, and also from the merciless treatment to which they subjected the Protestants, had the unenviable honor of giving a name to the persecutions. Louis XIV., who had been entirely misinformed as to the means employed in the D. by the courtiers and fanatics who surrounded his throne, was delighted to find that from 250 to 400 Protestants were daily being received into the bosom of the church, and in consequence, on the 22d October, 1685, a few months after the date of the first of the D., he revoked the Edict of Nantes (q. v.), that the good work might be fully accomplished.

DRAGON'S BLOOD, sometimes called Gum Dragon, an astringent, resinous substance, obtained from several trees of different natural orders, natives of warm countries. The greater part of the D. B. of commerce is probably the produce of *Pterocarpus Draco*, a large South American tree of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, which at some seasons appears as a magnificent mass of yellow blossom. A similar substance is yielded in the East Indies, by the Red Sandal-wood tree (*Pterocarpus santalinus*); and *Dalbergia monetaria*, a tree of the same order, yields it in Guiana. Mexican D. B., used in Mexico as a vulnerary and astringent, is obtained from *Croton Draco* (see *CROTON*), of the natural order *Euphorbiaceæ*. The best kind of all is supposed to be produced by *Calamus Draco*, an East Indian palm, and part of it is said to be obtained from the fruit of the palm.—D. B. exudes from the surface of the leaves, and from cracks in the stem of the



Dragon Tree (*Dracæna Draco*).

the surface of the leaves, and from cracks in the stem of the **DRAGON TREE** (*Dracæna Draco*), a tree of the natural order *Liliacæ*, remarkable for the size which it sometimes attains, rivaling even the baobab, and of which a celebrated specimen near Orotava, in the island of Tenerife, was found by Humboldt in 1799 to have a stem about 45 feet in circumference, and is described as having been of similar gigantic size in the beginning of the 15th century. The stem of the dragon tree is, however, generally short in proportion to its thickness, and its head consists of numerous short branches, terminating in tufts of sword-shaped leaves. It is not supposed to yield any of the D. B. of commerce.

D. B. is opaque, of a deep reddish-brown color, brittle, smooth, with a shining shell-like fracture, and when burned, emits an odor resembling that of benzoin. It is nearly insoluble in water, but is soluble in alcohol, and the solution will permanently stain heated marble, for which it is often used, as well as for staining leather and wood. It is also soluble in oils and turpentine, and enters into the composition of brilliant and much-esteemed varnishes. It was formerly employed in medicine, but is now almost out of use.—An astringent resin obtained from the *Eucalyptus resinifera* of Australia is there called Dragon's Blood.

DRAGON'S MOUTH, or, in Spanish, **BOCA DEL DRAGO**, is the name of two straits or passages in the New World. One of them is in South America, separating Trinidad from the mainland,

and connecting the Gulf of Paria with the south-east extremity of the Caribbean Sea. The other is in Central America, being on the north-east coast of Veragua, the most north-westerly portion of New Granada, and it communicates between the Caribbean Sea and Lake Chiriqui.

DRAGOO'N. From the old fable that the dragon spouts fire, the head of the monster was worked upon the muzzles of a peculiar kind of short muskets which were first carried by the horsemen raised by Marshal Brissac in the year 1600. This circumstance led to their being called dragoons; and from the general adoption of the same weapon, though without the emblem in question, the term gradually extended itself till it became almost synonymous with horse-soldier. Dragoons were at one time a kind of mounted infantry, drilled to perform the services both of horse and foot. At present, *dragoon* is simply one among many designations for cavalry, not very precise in its application. In the British army, the *heavy* dragoons and the *light* dragoons are carefully distinguished in regard to the weight of the men, horses, and appointments. The first dragoons in the army were the Scots Greys, established in 1683.

In the British army, there are at present seven regiments of 'Dragoon Guards,' and twenty-one regiments of 'Dragoons,' besides the three cuirassed regiments of household troops. See **HORSE GUARDS**.

DRAGUIGNAN, a town of France, in the department of Var, on a tributary of the Argens, about 40 miles north-east of Toulon. It is charmingly situated, in the midst of a valley surrounded by hills, the slopes of which are covered with vineyards and olive plantations. It is tolerably built; and its streets are adorned with numerous fountains and trees. Its principal structures are the prison, the court-house, a hospital, and a stately clock-tower. It has manufactures of coarse woollens, leather, hosiery, silks, soap, brandy, oil, and earthenware. Pop. (1876) 8029. D. is an ancient place. During the middle ages it was strongly fortified. The fortifications were destroyed in the civil wars, but were reconstructed in 1615.

DRAINAGE, in Husbandry, is the art of carrying off water from the soil and subsoil of land by means of open or closed drains or trenches—the term, however, is generally understood to apply to closed drains. By its means, the fertility of wet land has been greatly increased. When the drains are put in every six or ten yards, it is called *furrow* or *frequent* draining.

The vast amount of capital which has been expended in drainage within a quarter of a century, attests its utility and necessity. Before the introduction of furrow-draining, stiff and tenacious clays were of comparatively little value. They were cultivated at much expenditure of labor, and the crops which grew upon them were influenced to a great extent by the variations of the seasons. A system by which wet and worthless land could be rendered dry and valuable, was an improvement so patent to practical men, that we need not wonder at its general adoption.

Drainage by open ditches was no doubt the first mode of freeing land from superfluous water. The Roman agricultural writers mention the good results arising from covered drains, which were formed of wood and other substances, which served so far to render the land dry. More than a century ago, a large extent of clay-land was drained at narrow intervals in Norfolk and Essex, by putting in brush-wood and even straw in the bottom of the drains. The progress of draining, which is now regarded in many soils as essential to economic culture, was slow and partial, until Mr. Smith of Deanston (well on in the 19th c.) reduced the practice to a system, and showed the principles upon which its efficiency depended. Through the exertions of this advocate, furrow-draining soon became a *sine qua non* in the culture of clay-soils, or indeed any soil, in moist climates.

Practical men consider the line of greatest fall, or quickest descent, as the best for cutting drains in a field. The smaller drains are usually conducted into larger or *main* drains, instead of each discharging its quota of water into the open ditch. This is rendered necessary, as the mouths of the smaller drains would be more liable to be choked up by the growth of weeds; while the collecting of water into main drains secures a fuller flow to sweep out any matters which might accumulate where the discharge was small. Moreover, the less of the action of the air in the drains the more efficient they are.

The most efficient, and at the same time cheaply cut drain, is one represented at fig. 1. It is made so that a pipe of a cylindrical form may be laid along the bottom, which need be of no greater width than what is necessary to allow of the pipes being properly laid.

Drains of this form are cut with a set of spades which are of different widths—the broader being used for taking out the top, and the narrowest for the bottom. The one which cuts the last spit is called the *bottoming tool*, and its introduction has effected a considerable saving in cutting drains. The pick has often to be used, too,

where the subsoil is hard. The cutting of drains is heavy, crushing work. Men employed at this sort of labor are generally paid by the piece; and a professional will make rather above the ordinary rate of laborer's pay. One not accustomed to drain-cutting finds it for some time very hard labor; but experienced hands prefer draining to trenching.

Before the general use of pipes, stones were the common materials with which drains were formed. Mr. Smith recommended that they should be broken so small, that they might pass through a ring two inches and a half in diameter. From nine inches to a foot in depth was the quantity which was commonly put in. Where stones can be easily got, they are still preferred to tiles, as cheaper, and if well put in, more efficient and durable. The best plan is to set a pretty large block at each side of the bottom of the drain, and then use a third as a sort of wedge. A coating of smaller stones is surmounted by some turf and the muck.

When tiles and pipes were first used, it was even thought necessary to have some gravel, or small stones, placed above them in the drains, for the purpose of enabling the water to find its way into them, as seen at fig. 2. It was soon found, however, that the drains were quite as efficient without any stones or gravel; and that they were less liable to be choked up, as the clay or earth acted as a filter in preventing the intrusion of any kind of solid matter.



Fig. 2.

Many kinds of tiles and pipes have been tried, but the cylindrical form is most used. At one time, a bore in the tile of an inch in diameter was thought sufficient, but two-inch tiles are now preferred. They are usually made about fifteen inches in length. The continuity of the drain is maintained completely by *collars*, which should always be used as a means for securing efficiency and permanency. In soft mossy or clayey subsoils, semi-cylindrical tiles called *mugs* have been laid, with the bend up, on lath. This is expensive, but is necessary in some cases.

Much discussion has taken place in regard to the proper depth of drains, as well as the distance at which they should be placed. Mr. Smith at first advocated the making of drains from two and a half to three feet deep, and at intervals of from ten to forty feet, according to the nature of the land. Experience, however, has been gradually favoring deeper drains, at wider intervals. Even on the most tenacious soils with subsoils of *till*, few now think of having drains less than three feet in depth, though the distance apart should not in many cases be more than from 15 to 18 feet. The depth, however, depends greatly on the soil—3½ and 4 feet, with the leader drains 6 inches more, are common dimensions. In mossy land the depth has sometimes to be 7 feet. The width between drains depends on the wetness of the land and the character of the subsoil.

The mere tenacity of clays is not the element which determines the depth of drains, or the distance at which they should be placed apart. It is now well understood that the success of draining by pipes depends upon the fissures which are produced in the subsoil by the droughts of summer never entirely closing up; and thus minute channels are formed, which lead the water into the drains. As the properties of clays become better understood and classified, practical men come to be more at one in regard to this important point connected with the economy of drainage.

The principal advantages of drainage are, the deepening of the staple soil, and rendering it more friable, so that a superfluity of water, which would cause the formation of those chemical compounds that are found in stagnant water, is prevented. The greater depth of mould, and more perfect culture, render the soil more absorbent of moisture in dry weather. As crops can usually be sown sooner on drained lands, they also ripen earlier, and produce more abundantly. In short, while drained land obtains a greater capacity for moisture and manure, it imparts to plants greater capabilities for economically working up the materials which they find in the soil and atmosphere, seeing they are maintained in the most healthy conditions of growth.

Drainage in its various forms has, as is well known, not only improved the fertility and value of land in Scotland, but materially changed the aspect and climate of the country. Mosses and wet rushy lands have been transformed into dry and productive fields, while by the removal of all superfluous pools, the air is freed from those hovering vapors which are injurious to general amenity and salubrity. To the farmer, the more immediate advantage of drainage consists in that rapid running off of the water which falls as rain, so as to admit of working lands without any undue delay, while natural springs and dampness, from whatever source arising, are also run away with wonderful success. In short, subsoil drainage has been perhaps the most valuable improvement connected with British agriculture.



Fig. 1.

DRAINAGE-TUBES, in Surgery, are a recent but important addition to the surgical appliances for which this profession is indebted to a distinguished French surgeon, M. Chassaignac. They are composed of india-rubber, from $\frac{1}{4}$ th to $\frac{3}{4}$ th inch in diameter, perforated with numerous holes, and of various lengths. They are especially useful in chronic abscesses (which it may be unadvisable to empty at once) and Empyema (q. v.), but also in large wounds, such as those made by amputation, and in all cases where there is apt to be a deep accumulation of discharge. They are introduced in such a manner that one end is on a level with, or projects above the skin; the other is in communication with the seat of discharge; and by allowing that discharge constantly to escape from the external wound, they diminish both chemical irritation from putrid accumulation and mechanical irritation from pressure. Like all new inventions, it has its advocates and opponents. Thus, while Sir William Paget, in his article 'Sinus and Fistula,' in Holmes's *System of Surgery*, says that 'drainage, for which the perforated caoutchouc-tube of M. Chassaignac is a very happy invention, is applicable to a great number of cases; but chiefly to those in which a sinus or incomplete fistula depends mainly on pus collecting at a level below or distant from the aperture of discharge, or more generally, when pus is apt to be retained.'—Sir William Paget's surgical colleague at St. Bartholomew's Hospital, in his article 'Abscess,' which immediately precedes that from which we have just quoted, objects to the drainage-tube on the grounds that, as a foreign body, it sets up irritation, and adds that 'if a proper opening be made, there can be rarely any occasion for a drainage tube; and however carefully it is inserted, it must of necessity inconvenience and distress the patient.' Notwithstanding Mr. Coote's objections, drainage-tubes are now very generally used in surgical practice.

DRAKE, SIR FRANCIS, was born about the year 1589, in a cottage on the banks of the Tavy, in Devonshire. His father was a yeoman, and had a family of twelve sons. He was a zealous Protestant, and during the persecution under Queen Mary, he fled from Devonshire into Kent, in which county his family was brought up. He obtained some kind of clerical appointment among the seafaring-men of the district, and in consequence, D.'s younger years were passed among sailors. He was at an early age apprenticed to a neighbor of his father's, who possessed a bark, and occasionally made voyages to Zealand and France. When his master died, D. fell heir to the vessel, and carried on the old trade with considerable success. While coasting about, he heard of the exploits of Hawkins in the New World, and the recital took such a hold of his imagination, that, selling his ship, he proceeded to Plymouth, and joined Hawkins in his last expedition to the Spanish Main. The adventure was disastrous to all concerned, and D. came home much poorer than when he set out. Undismayed, however, he gathered around him wild and reckless spirits, and having raised sufficient money, they fitted out a vessel, and under the command of D. made several voyages to the West Indies. In 1570, he obtained a commission from Queen Elizabeth, and cruised in the West Indies, enriching himself with plunder. In 1572, he again sailed for the Spanish Main, and, assisted by some other English ships, he plundered the town of Nombre de Dios. He then crossed the Isthmus of Darien, and beholding the Pacific, prayed God to grant him leave to sail an English ship in that sea. On Sunday the 9th August 1573, he came into Plymouth laden with spoil; and when the news spread of his arrival, the people forsook the preacher, and came out to gaze on the brave and successful sea-rover.

Under the sanction of Queen Elizabeth, D. again set sail in 1577, taking with him five vessels. He sailed to South America, and plundered the coasts. In September of that year he entered the Pacific. During his voyage, he was singularly successful. He sacked the Spanish towns on the coasts of Chili and Peru, and he captured a royal galleon laden with plate. He then steered for the north-east, hoping to find a passage back to the Atlantic; but the severity of the cold discouraged his crew, and he took shelter in Port San Francisco. He stayed there several weeks, and formally took possession of the country in the name of the queen of England. He then steered across the Pacific for the Moluccas; reaching Ternate, he sailed for Java, thence he stretched right across the Indian Ocean for the Cape of Good Hope, which he doubled in safety, and arrived at Plymouth on Sunday the 26th September 1579. He was graciously received at court. Elizabeth banqueted on board his vessel, and conferred on him the honor of knighthood.

During part of 1585 and the whole of 1586, D. was employed, with a fleet of 21 ships, against Philip II. of Spain, chiefly in the West Indies and the coasts of South America. In this, as in his former voyages, he plundered many towns, and enriched himself with spoil. During this voyage, he visited Virginia, which colony had been recently planted by Raleigh. Thence he returned home, and it is said brought tobacco with him.

Spain was now preparing an Armada for the invasion of Eng-

land, and Elizabeth sent D. with a fleet of 30 sail to destroy the enemy's ships in their own harbors. He entered the Roads of Cadiz, passed the batteries on the morning of the 19th April 1587, and before night, destroyed 100 vessels, and possessed himself of immense booty. He then sailed along the coast burning and plundering. He entered the Targus, and flouted the Marquis Santa Cruz, who was lying in that river with a large force of galleys, having done all the mischief in his power to Spain, D., with that keen appetite for plunder which never forsook him, steered for the Azores, on the look-out for homeward-bound treasure-ships. He was fortunate enough to encounter a richly laden carrack, of which he took possession. On his return, he spent a considerable portion of his prize-money in supplying the town of Plymouth with wine.

D. was next employed as vice-admiral in the fleet under Lord Howard, which scattered the Armada, and broke the naval supremacy of Spain. In 1589, he was sent to Portugal with a fleet, to expel the Spaniards, who had taken possession of that kingdom; but the expedition was unsuccessful. On his return he was elected member of parliament for Plymouth. In 1595, along with Sir John Hawkins, he was sent with a fleet to the West Indies. In the course of the expedition, the commanders quarrelled. Hawkins died before reaching Puerto Rico. Attacking the place, D. received a repulse. Sailing away, he burned and plundered several towns. He came to anchor in Nombre de Dios, where a deadly disease broke out among the soldiers and sailors of the fleet. D. was at last smitten, and after struggling 20 days with the malady, he expired on the 27th December 1595. On the day of his death, the fleet anchored at Puerto Bello, and there the bold sailor and buccaneer received his sea-funeral.

DRAKE, FRIEDRICH, a celebrated German sculptor, born at Pymont, 23d June 1805, and trained under Rauch of Berlin. Among his principal works are a 'Madonna with her Infant' (purchased by the Empress of Russia), a 'Dying Soldier,' a 'Vintager,' 'The Eight Provinces of Prussia' (colossal allegorical figures, adorning a ball in the royal palace at Berlin), and a 'Warrior crowned by Victory,' which is reckoned one of the master-pieces of Prussian sculpture. But D. owes his celebrity chiefly to statues, busts, and medallions. There are few great countrymen of his of whom he has not preserved a marble memorial. His statues of Schinkel, the two Humboldts, Rauch, Justus Moeser, his bust of the naturalist Oken, his two colossal statues of Frederick-William III., King of Prussia, and that of the Emperor William I. at Cologne, deserve especial mention; as also the busts of Bismarck and Moltke, and the figure on the Victory-column at Berlin. D. is professor of sculpture in the Academy of Fine Arts at Berlin.

DRAMA (Gr. *drama*, from *drao*, I act), or dramatic poetry, in its most general signification, represents *actions*, which are not stately narratives, as in epic poetry, or which do not aim at the musical expression by language of mental emotions, as in lyric poetry. The drama consists of an impersonal representation, by the dramatist, of an animated conversation of various individuals, from whose speech the movement of the story is to be gathered. Thus, it is contrasted, on the one hand, with dialogue, or the dull and changeless flow of discourse, and on the other, with every other species of poetry, whether epic or lyric. In simple dialogue, the minds of the speakers remain unchanged; in the drama, the movement of the thoughts is so lively, and the expectation of the issue so vivid, that this species of poetry surpasses every other in interest and in intensity. In epic poetry, persons are frequently introduced engaged in lively conversation, and this is sometimes the case even in lyric poetry, but the prevailing tone of the epopee is descriptive and indirect. A novel, or an epic poem, can only be described as dramatic when it abounds in animated conversations, or when direct action prevails over description. All dramatic poetry may be divided into *tragic* and *comic*. Tragic poetry has for its aim to interest the earnest mind, while comic poetry merely endeavors to produce amusement. Tragic poetry may be described as that which interests the mind in the highest degree possible, and comic poetry as that which engages it in the most complete lawlessness. In comedy, gloom, sadness, sobriety have no recognized existence; while in tragedy, gayety, joviality, riotous mirth are unknown.

While the drama, doubtless, arose from that natural love of imitation peculiar to man, and from the childlike liveliness with which a simple narrator loves to recount anything which he has heard or seen, yet the creation of dramatic composition was, nevertheless, a feat of singular boldness. This arises from the wide difference there is between the disjointed elements of occasional imitation and the perfect invention of the genuine drama. The Old Testament, no doubt, contains numerous instances of dramatic dialogue, as in the Book of Job; and of lyric poems placed in a dramatic connection, as Solomon's Song; but there is no instance in Hebrew literature of the existence of the drama properly so called. The Hindus have an early dramatic poetry, but, unfortunately, this poetry only dates back to a time when the

intercourse between Greece and India was close and frequent. It is to Greece alone that we, accordingly, must look for the invention of the drama, and to Athens, in particular, for its perfection. But even here it was originally exhibited only at a few festivals of a single god, Dionysus. There can, then, be no doubt that the origin of the drama is to be sought for in the enthusiasm attendant on the worship of Bacchus.

The ancient Greek writers tell us, that the drama originated in a choral song; and Aristotle (*Poet.* 4), that it had its origin in the singers of the dithyramb. Supposing that it originated in the pantomimic dances, the dramatic art, like every other, was only slowly purified from extraneous mixtures. Even the origin of the word tragedy has been disputed, although the inventor of it, Arion (580 B.C.), the celebrated dithyrambic poet, is known. Tragedy (*tragodia*, from *tragos*, a goat, and *ode*, a song) is said to have taken its rise from the fact of the old dramas being exhibited when a goat was sacrificed, or because a goat was the prize, or because the actors were clothed in goatskins. Comedy, again (*kōmōdia*, either from *kōmos*, a revel, or *kōme*, a village), signifies, literally, either the *revellers' song* or the *village song*, from the practice of strolling-players publicly exhibiting their dramatic skill about the streets. Thespis (536 B.C.) introduced the regular dialogue into the choral representations, and joined a person to the dithyrambic songs, who was the first actor. Phrynichus (512 B.C.) used this single actor of Thespis for the representation of female characters, although with him the lyric element predominated over the dramatic. No further improvement of any note was introduced into tragedy before the time of Æschylus.

Comedy, again, arose about 580 B.C., with Susrion, who traveled about through Greece, ridiculing, from a small movable stage, the follies and vices of his time. Tragedy, from its first recognition, was deemed worthy, by reason of its superior gravity and staidness, to entertain the refined inhabitants of cities; while comedy, at the outset, from its riotous fun and jollity, was judged more in harmony with the rustic habits of the country people. In time, comedy made its way into the city, and Epicharmus (485 B.C.), besides modelling this form of dramatic wit, after its more successful rival, tragedy, likewise introduced a number of distinguished comedians to the notice of the Athenians. Phormes, Magnes, Crates, Cratinus, Enpolis, Pherecrates, and Aristophanes, are the highest names in connection with the old Greek comedy, the last mentioned being, however, by far the greatest. Tragedy, both from its ideal character, and from the stately cothurnus and long masks in which the actors of it appeared, aimed at a representation of what was dignified, noble, and grand in human nature. Comedy, again, from its style of caricature, its low-heeled sock, and its grotesque masks, tried to degrade humanity beneath its natural level. Comedy, during the Greek period of its history, divides itself into three forms—viz., Old Comedy, Middle Comedy, and New Comedy. The old comedy is the directly opposite of tragedy; its form is essentially sportive, and a seeming aimlessness reigns throughout it. It is, in the opinion of A. von Schlegel (*Lectures on Dramatic Literature*), the only genuine poetic species of comedy, while the other forms of it show a tendency to decline into prose and matter of fact. In the new comedy, again, the form is rather serious than otherwise, and it is regularly tied down to the accomplishment of a certain aim. This is what is understood by comedy at the present day. It is a mixture of tragedy and comedy proper, of earnestness and mirth. Only fragments of Menander and of Philemon, the genuinely witty poets of the new comedy, have come down to us. The middle comedy, again, which came in between the old and the new, arose after the termination of the Peloponnesian war. The new oligarchy strictly prohibited the introduction of living persons by name on the stage; and the chorus, till then the chief instrument of vituperation, is said to have been abolished.

With Æschylus, Greek tragedy properly begins. He instructed his actors himself in the rehearsal of his pieces. In his dramatic compositions he aimed more at sublimity than beauty, more at the heroic than the human. Sophocles, again, who was, perhaps, superior to Æschylus in his appreciation of human nature, strove more to depict idealized men than to paint heroic excellence. He introduced a third actor on the scene, and materially improved the mechanism of the stage. Euripides was too much of a nice speculator to attain the highest forms of poetic expression. Instead of quietly contemplating life as Sophocles did, he seems to have been morose and peevish; but in point of moral denunciation, no dramatist surpasses him. With these three great poets, Greek tragedy may be said to close. With them it ceased to be the tragedy which Aristotle has described in his celebrated definition of it. 'Tragedy,' he says (*Poetics*, 6), 'is the imitation of some action that is serious, entire, and of a proper magnitude; effecting, through pity and terror, the refinement of these and similar affections of the soul.' In the hands of the subsequent authors this form of the drama grew lax and effeminate, and in the performances of Theodectes especially, tragedy was made to give way to rhetoric. (See the works of Böckh and Welcker

on the Greek tragedians; also, Müller's *Literature of Ancient Greece*.)

The Romans were not a great dramatic people. They borrowed, according to the common account, during a period of national despondency occasioned by a desolating pestilence (A.U.C. 391), their first idea of a play from the Etrurians; their effusions of sportive humor, their *Fabule Atellane*, from the Oscans; and the higher class of dramatic compositions from the Greeks. Philology, likewise, countenances this story; for *histrion*, the Latin word for a player, is pure Etruscan. No remains of any note have come down to us of the comic writers of Rome, except Plautus and Terence. The former was a poor day-laborer, the latter a Carthaginian slave. The habits of each appear in their writings. Plautus has a degree of rough vigor and broad jocularity, born of the hand-mill and the plough, while Terence is more refined and delicate in his wit and characterizations. Both these writers borrowed largely from the Greeks. Of the early period of Roman tragedy no remains exist, but it is probable that its poets were merely translators or imitators of Greek models. The tragedians of the Augustan age were ambitious of rivaling the Greeks. Unfortunately, none of these grand attempts have come down to us, except ten bombastical and frigid dramas, that go under the name of Seneca.

Ancient art fell with pagan Rome. In the early ages of Christianity, any one connected with the theater was not allowed baptism. The unwise zeal of the fathers was followed by an edict of the Emperor Julian to the same effect. The two Apollinarii, father and son, and Gregory of Nazianzen, attempted to introduce religious plays or mysteries, drawn from the Scriptures to amuse the Christian people during the operation of Julian's law. In a short while, instead of the drama proper, there was nothing to lighten up the surrounding darkness but such productions as the saturnalian pageants, the Feast of Fools and the Feast of the Ass.

The Italians are the first people of Europe, who, after the long sleep of the true dramatic spirit in the middle ages, strove to enkindle the ancient fire upon Roman hearths that had for long years been cold. Early in the beginning of the 16th c. the first regular modern drama was published. It was called *Sophonisba*, and the writer was a very common-place author by name Trissino. Shortly after, this tragedian was followed by Ariosto, by Babbiena, and by Machiavelli, all distinguished cultivators of the classic comedy. Towards the end of the century, Giambattista de la Porta, philosopher and comic writer, exhibited a number of pieces of a familiar, and sometimes even farcical kind, but full of happy invention and agreeable originality. The political influence of Spain was now at its height on Italian territory, and the romantic drama of the west gradually found favor in Italy. Even so early as 1529, Ricci had attempted to overthrow the classic taste in Italy, but without success. It remained for Borghini, Oddi, and M. A. Buonarroti, the nephew of the great artist, and one or two writers, to break in upon the current taste, and to do much to introduce the romantic drama in Italy. In the 17th c., Rinuccini, by the union of music with the romantic drama, succeeded in establishing the *melodrama*. Tragedy and comedy were now entirely laid aside as antiquated, and nothing but the *musica opera* was heard of from Milan to Ravenna. Maffei led the way in reforming the Italian stage. The political preponderance of Spain, had now given way to that of France, which facilitated his labors not a little. His *Merope* is a fine attempt to restore the tragic drama to Italy, but as Lessing says of it, in his *Dramaturgie*, it is rather the production of a 'learned antiquary' than of a great tragic poet. The musical drama had now to be rendered classic, and this task was undertaken by Zeno and Metastasio. The latter, who has all the attractiveness for the Italians that the classic Racine has for the French, by subtle harmony and grace in his songs, by his power of painting pathetic situations, and by his melting effeminacy of manner, charmed the hot southerners as no other poet yet had done. After Goldoni, a great comic authority in Italy, and a careful student of Machiavelli and Molière except Riccoboni and Gozzi his rivals, we have few dramatists of any note till we come down to last century. The bold and passionate Alfieri inaugurated a new era in Italian tragedy. He is a follower of the classic school, and a strict observer of the Aristotelic unities. His successors have relaxed more their adherence to classic forms, and have produced some very admirable dramas. Among the most estimable of those writers are Monti, Manzoni, and Niccolini.

In the other European nations as soon as dramatic composition rose to any degree of purity, it became thereby disconnected with the church. But in Spain this is by no means the case, for their best poets, while writing for the stage, have busied their pens in the composition of religious dramas. Passing over the names of Villena, Santillana, Naharro, and Rueda, as diligent but comparatively weak builders of the fame of the Spanish drama, we come to the periods of Cervantes, of Lope de Vega, and of Calderon, when the Spanish stage may be regarded as in its best condition.

In his *Numantia* particularly, Cervantes, whose genius was more decidedly epic than dramatic, has left to the world a specimen of tragic invention and of moral dignity which it is not likely to forget. While the critics were clamoring about the classic rules and the Aristotelic unities, Lope de Vega appeared on the scene, to set nearly all the dramatic laws at defiance. He is the most fertile dramatic writer in the world, besides being one of the best. Yet he prostituted his pen to serve the public, and sacrificed his future fame to his living popularity. Calderon, who succeeded him, possessed all his advantages, with the important additional merit of being thoroughly devoted to dramatic art as to a mistress. So great was Calderon reckoned in the composition of religious plays, that by letters-patent he enjoyed a monopoly of these productions for 37 years. The brilliant period of the Spanish theater, comprising the first half of the 17th c., had with the death of Calderon well-nigh closed. Except Moreto, Tirso de Molina, and Solis the historian, there is no writer of any note to engage the attention.

We come now to France, where the unities, as they are called, have been observed with as much strictness as if the country had been an old Grecian province. This is chiefly owing to the influence of the criticisms of Boileau, who adopted the dramatic unities in all their severe rigor. The critics of other nations, particularly of Germany and of England, have chosen to condemn this exposition of the drama, and sometimes to despise even the Stagirite as a dramatic critic. The dramatic unities are threefold—Action, Time, and Place. According to the French, these unities have the following significance: 1. That the action of drama must be one—that is, that the interest or attention must not be distracted by several plots, but everything must be subservient to the main action; 2. That all the actions must take place on the same spot, or very nearly so, in order that the illusion may not be disturbed; and 3. Everything should happen on the same day for the same reason. Much has been written for and against these rules. Suffice it to say, that these are the landmarks on which the classic dramatist fixes his eye. Previous to Jodelle, or indeed to Corneille, hardly any progress had been made in the regular drama in France.

A number of writers, of more or less ability, had produced *mystères*, *soeties*, *moralités*, *farces*, in which, in numerous instances, the romantic or anti-classical tendencies of human nature had manifested themselves; but neither in the case of the Brethren of the Passion, nor in the case of the *Enfants sans Soucis*, was there any progress made in the proper business of dramatic composition. Jodelle was the first writer who composed a regular five-act tragedy, and he publicly exhibited it in the presence of the court of Henry II. of France. He composed other pieces of equal, many of superior, merit, but nothing of any importance in the drama appeared before the time of Corneille. This writer, who appeared in the reign of Louis XIV., during the time that the star of Richelieu was in the ascendant, had to humor the court by humoring the academy, and to please the academy he required to observe the rules of Aristotle. He produced seven plays, as cold and as severe as if they had been written by Sophocles, but of great elegance and dignity of style, when it struck him that he might give more free scope to his romantic tendencies in the tragedy of the *Cid*. All Paris rang with its praises, but the academy gloomed, and poor Corneille had to betake himself again to the dignity and severity of the Greek drama. He got what he longed for, however—a seat among the members of that institution which had been so instrumental in repressing the spontaneous outflow of his genius. It was more than his successor, Molière, obtained, who insisted to the last on playing his part as well as penning his pieces—an abuse which the dignified academicians could by no means tolerate. The genius of this dramatist was decidedly comic, and it may perhaps be questioned, whether, in all the essentials of true comedy, Molière's is not the very foremost name in the history of the stage. He borrowed much from the Spaniards, though perhaps less than Corneille; a great deal from the Latins; and more perhaps from the Italians. But the favorite tragic poet of the court of Louis XIV. was Racine. His genius lay decidedly towards the serious and the exalted, so that he had no temptations, like Corneille, to trespass the bounds of the academic proprieties. In tenderness and elegance, all French writers gave way before him. In his *Athalie*, his last and best drama, he gave to the Parisian public a composition, such as in breadth, in elegance, and in severe grandeur, it could nowhere find out of the Greek theater. But we must push through the crowd of lesser lights which shone on the decline of Racine and Molière, and glance at that bright and fitful luminary—Voltaire. He pressed boldly forward, and astonished all Europe with the force and power of his romantic dramas, a style of composition which, since the *Cid* of Corneille, had been altogether excluded from the theater. His spirit of intolerance was perhaps felt in his dramas, and his increasing warfare with superstition and fanaticism was too distinctly experienced even in the theater. But his genius and spirit have earned for him a place beside Corneille and Racine as one of the tragic names whom France delights to

remember. Boursault, Regnard, Legrand, Lemerrier, Victor Hugo, Dumas, and Alfred de Vigny, would all require to be noticed in a full view of the French drama.

The German drama is almost wholly dependent for its fame on the names of Lessing, Goethe, and Schiller. For while Rosenpluet, Hans Sachs, and Ayer were original, and some of them fertile; while Gryphius, Gottsched, Gellert, and Schlegel show a decided advance in the appreciation of the laws of dramatic composition; yet from the feebleness of the writers, and from the backward state of theatrical taste in the end of the 17th and the beginning of the 18th centuries, very little was done towards a clear and distinct recognition of the excellence of dramatic literature, till the critic Lessing, in his *Miss Sara Sampson*, taught Germany to appreciate the productions of the romantic drama. As a critic, he blamed the French, praised Shakspeare, and professed belief in Aristotle. He held more than one dramatic heresy, and his antipathy to versification was among the number. Goethe is, without doubt, one of the greatest geniuses which the world has seen, but whether he is entitled to so high a place for his theatrical dramas remains an open question. As his aim was more emphatically the culture of his genius in its fullest form, the circumstance of his writings assuming the dramatic form is rather an accident than otherwise. From first to last he seems to have been distinctly aware of this, and in the prologue to his last, and by far his grandest production, he declares why he could not accommodate his genius to the demands of a mixed theater. Yet his *Faust* must ever be regarded as one of the grandest and most remarkable compositions which modern Europe has witnessed. Schiller was more expressly the dramatic poet of Germany than Goethe. While Goethe's genius was fuller and more complete, Schiller made up for what he wanted in breadth of vision by the moral intensity of his genius. From his wild play of the *Robbers*, down to his last drama of *Wilhelm Tell*, he worked with a vehemence such as has very seldom been witnessed. But he filled Germany, and indeed all Europe, with his tragic fame, and his name is one which 'posterity will not willingly let die.'

Dramatic exhibitions in England, if they did not originate in the church, were nevertheless speedily appropriated by the clergy. Ecclesiastics were frequently the composers of the religious pieces, or mysteries, and they were found not seldom to be the actors. The mass of the people, no doubt, owed a good deal of grotesque amusement, and even of occasional information, to the biblical and legendary history, which those rude attempts at the drama were fitted to convey. Those old religious plays are generally divided into two classes—*miracles* or miracle-plays, and *moralities* or morals. The former were founded on Scriptural narratives, or on the legends of the saints; the latter arose from the former, by the increased introduction of imaginary features. These pious pastimes existed long before the Reformation, and were not overthrown by that great revolution in the opinions and beliefs of the country. See MYSTERIES AND MIRACLE PLAYS. It was about the middle of the 16th c. that the drama extricated itself completely from these ancient fetters. By this time both comedy and tragedy had begun to exist in a rude reality in England. The oldest known comedy (before 1557), that of *Ralph Roister Doister*, was written by Nicholas Udall, a schoolmaster of considerable learning, probably about the middle of the 16th century.

Ten years after appeared our first tragedy, known variously as *Gorbudoe*, or as *Ferrex and Porrex*, by Mrs. Norton and Lord Buckhurst. And not only is this work the earliest tragedy in our language; it contains, beside, the first application of blank verse to dramatic composition. But the play is dull, heavy, and declamatory. The drama lingered in this incipient condition until very near the time of Shakspeare. Bishop Still's *Gammer Gurton's Needle* is no improvement on *Roister Doister*. The names of Kyd, Lodge, Greene, Lyly, Peele, Marlowe, Nash, &c., must pass before us almost without comment. Many of these writers are not without their merits, particularly Marlowe, whose plays of *Edward II.* and of *Dr. Faustus* are acknowledged by Charles Lamb to contain passages that Shakspeare himself has not surpassed. Marlowe, besides, is the first author who introduced blank verse upon the public stage. But all these dramatists are obscured by their nearness to the great luminary of the English drama. Shakspeare is now almost universally acknowledged to be the greatest dramatic genius that has ever appeared in the world. He brought the romantic drama to a perfection which it is not likely to surpass. His writings present the finest example of the depth, sublimity, refinement, and variety of which the drama is capable; and they are abundantly marked by those peculiar characteristics which sprung from the union, in the person of its author, of such wonderful powers of conception with such familiar experience of theatrical management. Of course he despised the unities, or rather, we might say, he worked in ignorance of them, for he knew nothing of Aristotle and Boileau; and the rest of the French critics were not born when he died. Hence his drama is known in literature as 'irregular;' and, we fear, human nature is likewise very irregular. The poet trusted to his

own instinctive judgment, and of its exercise we have all fortunately plenty of examples. The principal of Shakspeare's contemporaries are Ben Jonson, and Beaumont and Fletcher. Like Shakspeare, Jonson wrote both tragedies and comedies. Milton speaks of 'Jonson's learned sock,' and thus hits off the main feature of his character as a dramatist in a phrase. Beaumont and Fletcher, who were, like many brotherly men in that age, joint-workers, have the honor of standing next to Shakspeare in the romantic drama of England. But, like Lope de Vega, they wrote too much for the mere success of the moment to be ranked in the foremost file of England's dramatic writers. With Massinger, Ford, and Shirley, the old English drama is closed. Dryden, the literary chief of his age, who flourished during the latter half of the 17th century, wrote some fine pieces of Frenchified declamation. Lee, and the unfortunate Otway, bring down the drama to the beginning of the 18th century. For, while Gay, Congreve, Cibber, Wycherley, Vanbrugh, and Farquhar, all display considerable dramatic spirit and invention, their works are, nevertheless, morally considered, the foulest things in the language.

They paint well the externals of society, and have left behind them good specimens of the 'comedy of manners,' as it has been called; but vice is both warp and woof of nearly everything they have produced. Addison, Johnson, Young, Thomson, &c., wrote some good poetry, but poor dramatic verse; while Lillo, Moore, Garrick the actor, Goldsmith, the Colmans, and Cumberland, nearly all took to prose instead of verse. They produced agreeable comedies, but nothing of a very marked kind in the history of the drama appears until the time of Sheridan, who gave an impulse to 'genteel comedy,' such as has placed him ever since at the head of the writers of that species of composition. Holcroft, Mrs Inchbald, 'Monk' Lewis, and Maturin, mostly influenced by inferior German writers, have left behind them a legacy of terror and of wonder fit to render their period marvelous, if for nothing else. Joanna Baillie and Sheridan Knowles remind the reader of the excellences of the old English drama, and the *Lady of Lyons* of Bulwer Lytton is a favorite with playgoers of the present day. Byron, Coleridge, and Henry Taylor, are the authors of fine meditative dramas, but they are more suitable for the closet than for the stage. Our sketch would not be complete without allusion to Talfourd, Jerrold, Shirley Brooks, Marston, Tom Taylor, Charles Reade, Robertson, Willis, H. J. Byron, and Gilbert. Swinburne, Tennyson, and Browning have also written works in the dramatic form.—See Klein, *Geschichte des Dramas* (12 vols., 1876); Ward, *History of English Dramatic Literature* (1875); Payne Collier, *History of Dramatic Poetry*; Fitzgerald, *New History of the English Stage* (1882); Archer, *English Dramatists of To-day* (1882).

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DRA'MMEN, a seaport town of Norway, in the province of Agderhus, on both sides of the river Drammen, which here discharges its waters through the Drammen fiord into the Gulf of Christiania, about 24 miles south-west of Christiania. D., which is built in a valley, is divided into three quarters—Bragences on the north bank of the river, and Stromsee and Tangen, on the south, united to the first-mentioned quarter by a handsome bridge. The chief streets, which run along each side of the river, are mainly composed of warehouses. The manufactures of D. are leather, ropes, sailcloth, tobacco, spirits, and earthenware; but the chief industry is the export of timber. Pop. (1875) 18,838.

DRAPER, JOHN WILLIAM, American chemist and physiologist, was born near Liverpool, England, May 5, 1811, and educated at a Wesleyan school at Woodhouse Grove, and later pursued his studies in chemistry under Dr. Turner of the London University. In 1833, he joined some of his relations who had emigrated to America, and in 1836, took his degree of Doctor of Medicine in the university of Pennsylvania, and was appointed Professor of Natural Philosophy, Chemistry, and Physiology, in Hampden Sidney College, Virginia. In 1839, removing to the city of New York, he was connected with the preparatory department, and in

1841, joined Doctors Mott, Patterson, &c. in founding the Medical College of New York University, in which he was at first Professor of Chemistry, and in 1850, of Physiology. He was a clear and able lecturer, and a voluminous writer, having been a liberal contributor to the American *Journal of Medical Science* and the *Edinburgh Philosophical Journal*. Amongst his works are *The Forces which produce Organization in Plants* (1844); *Text-book of Chemistry* (1846); *Text-book of Natural Philosophy* (1847); *Human Physiology, Statical and Dynamical, or the Conditions and Course of Life in Man* (1856); *History of the Intellectual Development of Europe* (1862); *Thoughts on the Future Policy of America* (1865); *Philosophical History of the Civil War in America* (1867—1870); *History of the Conflict between Religion and Science* (1874). He died in January 1882.

DRA'PERY (Fr. *drap.* cloth), any kind of woollen cloths for dress, the dealers in which in England are known as Drapers. In London, the Draper's Company is one of the more wealthy civic corporations, with a Hall and Almshouses.

DRA'PERY in Art. From the very great difficulties with which the artist has to struggle in dealing with the arbitrary and ungraceful forms of modern dress (see COSTUME), we are often led to regard drapery as an impediment, in place of an aid and accessory, to the representation of the human form in plastic art. The erroneous nature of such a conception will be manifest at once to those who direct their attention to the study of drapery in antique art, with a view to discovering not so much how as why it was employed by a people whose national customs admitted of their almost wholly dispensing with it had they felt so disposed. Such a study will convince us that, when properly disposed, drapery tends, in many cases, to exhibit the form, to enhance the characteristics, and to intensify the attitude, whether in action or in repose. It tells, moreover, something of the circumstances in which the action takes place beyond what could possibly be told by the naked figure. The waving drapery of a hunting Diana, or an Apollo shooting with the bow, tells us at once that the action is taking place in the open air, with the fresh breezes of the Ægean blowing around them. On the other hand, that repose which is the peculiar characteristic of sovereignty, is indicated by the still and heavy character of the drapery which surrounds a Jupiter on Olympus, or a Caesar on his throne. The simple rule—simple in principle, though by no means always easy in practice—for the disposal of drapery, seems to be that it shall never be employed without an object; and that every fold shall, so to speak, be a logical result, either of the form of the figure, of the circumstances in which it is placed, or of some previous fold to which the latter is subordinated.

DRAUGHT or DRAFT OF WATER, in maritime affairs, is a technical name for the depth to which a ship sinks in the water when fairly afloat. The draught is marked on the stem or stern-post, or both, from the keel upwards. When a ship is in good trim, the draught does not differ much at the two ends. Ships with sharp bottoms draw more water, or have 'a greater draught,' than those of flatter construction. For draught as applied to ploughs, wagons, &c., see TRACTION.

DRAUGHTS, like chess, is a game played with 'men' on a checkered board. As far as the science of the game is concerned, it falls far short of chess, but is nevertheless a favorite recreation with many classes of people. In France, it is called *Les Dames*,

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	9		10		11		12
13		14		15		16	
	17		18		19		20
21		22		23		24	
	25		26		27		28
29		30		31		32	

from its having been a favorite game with ladies; and in Scotland, the draught-board is called the *Dambrod*. The above is a representation of the draught-board, numbered for the sake of illustration:

Two persons usually play this game, each having a set of twelve men—one set black, the other white. The men may be placed

either on the black or white squares, but the whole must be placed on one color only. Thus, in England, it is usual to play upon the white squares, with a black square to the lower right, as above shown; and in Scotland upon the black, with a white square to the lower right. The above illustration, therefore, shows the English method, and as such we shall consider the mode of playing the game. In chess, the men may be moved straight forward, sidewise, or diagonally, and over many squares at once; but in draughts, the men may be moved diagonally only, and by *one* square at a time. If an enemy's man stand in the way, no move may take place unless there be a vacant square beyond into which the piece can be lifted. The man leaped over is then taken and removed from the board. The grand object of the game is, therefore, to clear the board of the enemy's men, or to hem them in so that they cannot be moved, and whichever party does so first, wins the game. As no piece can move more than one step diagonally at a time, there can be no taking till the antagonists come to close quarters; and the advancing of them cautiously into each other's neighborhood is the chief art of the game. When a man on either side has made his way either by taking or by a clear open path, to the opposite side of the board, he is entitled to be 'crowned,' which is done by placing another man on the top of him. Crowned men may move either backwards or forwards, but always diagonally and by one square at a time, as before; and this additional power thus gained gives a great advantage to the player who owns the greatest number of crowned heads, and usually decides the game in his favor.

DRAUGHTSMAN. A draughtsman differs from a designer inasmuch as he lays no claim, in that capacity at all events, to the character of an originator.

DRÁVE (Ger. *Drau*), a river of Austria, rises in the east of Tyrol, in lat. 46° 45' N. and long. 12° 25' E., flows north-east through the Pusterthal towards Lienz, where it is joined by the Isel. It then flows east through Carinthia, passes Villach, where it becomes navigable, after which it passes Marburg, receives the Dran from the right, and the Mur, its principal affluent, from the left; then turning towards the south-east, it forms the boundary between Croatia and Slavonia on the right, and Hungary on the left, and pours its waters into those of the Danube at a point ten miles east of Essek, the capital of Slavonia. The D. is nearly 450 miles long. In the first part of its course, it is a mountainous torrent, rushing furiously through the mountain passes of Tyrol; but joined by numerous streams, its volume increases, and its course becomes more staid. The valleys through which it flows in its course through Carinthia, Styria, and Croatia, are distinguished by great fertility and picturesque scenery, while the population upon its banks is numerous and industrious. In Slavonia, the D. is frequently bordered by dense forests.

DRAWBACK, a term in commerce, employed in connection with the remitting or paying back of excise duties on certain classes of articles exported. Excise duties, as a matter of course, enhance by so much the natural price of the commodity on which they are imposed. Were these duties not remitted, the commodity so taxed would not be ordered from those foreign countries where articles of the same kind could be purchased free of such duties. To afford facility for the exportation of these articles, the state resorts to the expedient of returning to the exporter a sum equal in amount to what he or the manufacturer had paid to the excise. Such is drawback. Among other matters of fiscal policy, Adam Smith, in his *Wealth of Nations*, discusses the propriety of giving drawbacks, and sees in them nothing that is adverse to a sound political economy. 'To allow,' he says, 'the merchant to draw back upon exportation, either the whole or a part of whatever excise or inland duty is imposed upon domestic industry, can never occasion the exportation of a greater quantity of goods than what would have been exported had no duty been imposed. Such encouragements do not tend to turn towards any particular employment a greater share of the capital of the country than what would go to that employment of its own accord, but only to hinder the duty from driving away any part of that share to other employments. They tend not to overturn that balance which naturally establishes itself among all the various employments of the society, but to hinder it being overturned by the duty: they tend not to destroy but to preserve, what it is in most cases advantageous to preserve, the natural division and distribution of labor in the society.'

Correct as is this view in general principle, it could perhaps be shown, by the closer experience of the present day, that the practice of giving drawbacks is liable to abuse; as, for example, when an excisable article falls greatly in value, and it is exported in order to get the drawback, with little or no reference to sales abroad, or in the hope that the drawback will at least bring the amount of the freight. So far, therefore, the state is made to foster an improper species of commerce. To prevent deceptions as far as is practicable, certain rules and formalities have to be attended to by exporters, to which we shall briefly refer.

In preparing goods for drawback, they must be packed in presence of an excise officer, who sees them weighed, if the drawback depends on weight. When the package is completed, he encloses it with a tape, which is properly fixed with a seal. Under this seal it is transferred to the port of shipment, and cleared for export by a person authorized by license from the officers of customs. In the case of press-packed goods, the quantities and qualities must be verified by the oath of the master-packer or his foreman. Drawback is given only on goods which have been charged with duties within three years, and no drawback is given on damaged or decayed goods. It is payable only to the real owners of the articles shipped. It is not payable for a certain period after shipment and departure; but cannot be demanded later than two years after shipment. As a verification of the principal particulars mentioned, the excise-officer concerned executes a certificate or Debiture (q. v.), and under its operation the drawback is paid by the inland revenue department.

DRAWBRIDGE. See **BRIDGE**.

DRAWER OF A BILL. See **DRAFT, BILL**.

DRAWING is the art of delineating form, as opposed to color and light and shade. The term is not confined to the first outline produced by the pencil or crayon, though this is a narrower sense in which it is also used, and what we commonly mean when we speak of a drawing. In its wider sense, drawing is used to describe what is in reality the most important feature of a finished painting of Raphael or Correggio, as well as of an outline by Flaxman or Retch. Drawing, in this sense, has been termed the grammar of art. But the analogy is incomplete; for the one quality which is requisite in the application of grammar, is correctness, whereas drawing, even when correct, even when faultless, admits of degrees of perfection. It may be more or less powerful, more or less free, more or less graceful; and indeed there is no characteristic in which the great artists of the Italian and Flemish schools more unmistakably excel all their successors than in the power and beauty of their drawing. Neither is there any feature which more unmistakably stamps the individuality of the artist upon the picture.

DRAWING AND QUARTERING. The punishment for treason still is, that the offender be *drawn* to the place of execution on a Hurdle (q. v.); that he be hanged by the neck till he be dead; that his head be severed from his body, and that body be divided into four parts, or *quartered*. The sovereign may, and now certainly would, by a warrant under the sign-manual, countersigned by a principal secretary of state, change the sentence into beheading. In the case of females, the quartering is dispensed with. Stephen's *Commentaries*, iv. 234. See **TREASON**.

DRAWING-BOARD, a board on which drawing-paper is strained for painting on in water-colors. The paper is wetted for the purpose of being strained, and when attached at the edges, it is permitted to dry and contract. Formerly, the drawing-board was fitted into a frame, the edges of the wet paper being made fast by the pressure of the frame on the board. But the much simpler drawing-board which is now in use is made of a flat piece or pieces of wood, held together, and prevented from warping by an edging of other pieces, the grain of which runs in the opposite direction. The wet paper is attached to the edges of the board with paste or thin glue, and when dry, becomes perfectly firm and flat. When the work is finished, the paper is cut beyond the drawing with a knife.

DRAW-PLATE, a steel-plate with a graduated series of holes, through which metals are drawn in making them into wires or bars.—Also a name given to a plate of metal placed before a fire or before the lateral opening between the top of the fireplace and the throat of the chimney. Its use is to force the air to pass through the fire on its way into the chimney, instead of allowing it to pass over the fire.

DRAYTON, MICHAEL, was born in 1563 at Hartshill, in Warwickshire. Of the events of his life but little is known. He is supposed to have studied at the university of Cambridge, and to have been in the army when young. His earliest work, *The Shepherd's Garland*, was published in 1593. He afterwards published the *Barons' Wars*, *England's Heroical Epistles*, &c. *The Polyolbion*, the work by which he is best known, appeared in 1613. He was poet-laureate in 1626; he died in 1631, and was buried in Westminster Abbey. As a poet, D. is but little known, save to readers like Charles Lamb, who delighted in the obscure corners of literature. His *Polyolbion* is a topographical poem; and passages from it, now and then met with in county histories and works of an antiquarian character, surprise the reader with their stately rhythm, their nervous force, and their felicity of diction. Vols. I. II. and III. of a complete edition of D.'s works, by the Rev. Richard Hooper, M.A., were published in 1876.

DRAYTON-IN-HALES, or **MARKET DRAYTON**, a town in the N.E. of Shropshire, on the Tern, 19 m. N.E. by N. of Shrewsbury. Pop. (1871) 4039, chiefly agricultural. There are

manufactures of paper, and of hair-seats for chairs. The parish church was built in Stephen's reign, but quite altered by repairs in 1787. Here, in 1459, the Yorkists defeated the Lancastrians.

DREAMING. In complete sleep, there is probably an entire absence of consciousness of external things. Usually, however, there is a certain amount of mental activity, of which we are more or less conscious at the time, and of which we have more or less subsequent remembrance. This is the state known as dreaming. The chief feature of this state is 'an entire *absence of voluntary control* over the current of thought, so that the principle of *suggestion*—one thought calling up another, according to the laws of association—has unlimited operation.'

We seem to perform all the actions of life; we experience every kind of mental emotion, and sometimes our reasoning processes are remarkably clear and complete. Thus, when the mind, during sleep, takes up a train of thought on which it had been previously engaged during the preceding waking hours, intellectual efforts may be made during sleep which would be impossible in the waking state. Such cases, however, are not common. To name two instances (quoted by Dr. Carpenter in his essay on Sleep in the *Cyclopædia of Anatomy and Physiology*): Condorcet saw, in his dreams, the final steps of a difficult calculation which had puzzled him during the day; and Condillac states that, when engaged with his *Cours d'Etude*, he frequently developed and finished his subject in his dreams which he had broken off before retiring to rest.

Occasionally, but by no means commonly, dreams seem to possess a remarkable coherence and congruity in reference to the reasoning processes, or the combinations of the imagination. Most of our readers are probably acquainted with the incident narrated by Coleridge of himself, that his fragment, entitled *Kubla Khan*, was composed during sleep, which had come upon him in his chair whilst reading the following words in Purchas's *Pilgrims*: 'Here the Khan Kubla commanded a palace to be built, and a stately garden thereunto; and thus ten miles of fertile ground were enclosed within a wall.' Coleridge continued for about three hours apparently in a profound sleep, during which he had the most vivid impression that he had composed between 200 and 300 lines. The images, he says, 'rose up before him as things, with a parallel production of the correspondent expressions, without any sensations or consciousness of effort.' On awakening, he had so distinct a remembrance of the whole, that he seized his pen and wrote down the lines that are still preserved. Unfortunately, he was called away to attend to some business which lasted more than an hour, and on his return to his study, he found, to his intense mortification, that 'though he still retained some vague and dim recollection of the general purport of the vision, yet, with the exception of some eight or ten scattered lines and images, all the rest had passed away like the images on the surface of a stream into which a stone had been cast.' In other cases, a dream may leave a strong general impression on the mind, although particulars, even immediately on waking, cannot be recalled. Tartini is said to have composed the *Devil's Sonata* under the inspiration of a dream, in which the archfiend challenged him to a trial of skill. The dreamer lay entranced by the transcendent performance of his distinguished visitor; but on awakening and seizing his violin, although he was unable to reproduce the actual succession of notes, he produced from his general impressions the celebrated composition which we have named.

Generally, however, dreams are wanting in coherence; all probabilities, and even possibilities of 'time, place, and circumstance' are violated. Friends long since dead appear and converse with us; and events long since past rise up before us with all the vividness of real existence. We may be conveyed to the antipodes, or even to worlds beyond our own, without the difficulty of the distance at all standing in the way. We are not aware of the grossest incongruities, probably because we are unable to test the probability of the phenomena by our ordinary experience; hence nothing that we see or do in a dream surprises us. Professor Wheatstone observes, that 'we may walk along the brink of a precipice, or see ourselves doomed to immediate destruction by the weapon of a foe, or the fury of a tempestuous sea, and yet not feel the slightest emotion or fear; though during the perfect activity of the brain we may be naturally disposed to the strong manifestation of this feeling. Again, we may see the most extraordinary object or event without surprise, perform the same ruthless crime without compunction, and see what in our waking-hours would cause us unmitigated grief, without the smallest feeling of sorrow;' and Cicero, who long previously had made dreaming his study, justly remarks (*De Divinatione*, 59), that if it had been so ordered by nature that we should actually do in sleep all that we dream, every man would have to be bound down on going to bed. Occasionally, however, in place of this passive condition, the emotions may be highly excited; thus, for example, the sailor's wife is apt, especially in stormy weather, to dream of shipwreck, and to shrink with terror from its attendant miseries;

and those who have once in their lives been exposed to some fearful danger, are apt to have the scene recalled to them in their dreams, either with all its appalling and lifelike exactness, or possibly in a grotesque and impossible modification.

Although the predisposing causes of dreams may be sought for in more than one direction, they are probably in general referrible to some peculiar condition of the body, and are often called into action through the agency of the external senses. Dr. Gregory relates, that having occasion to apply a bottle of hot water to his feet at bedtime, he dreamed that he was walking up Mount Etna, and found the ground insufferably hot. Dr. Reid having had a blister applied to his head, dreamed that he was scalped by a party of Indians. M. Gizon de Buzereinges made a series of pre-arranged experiments, with a view of seeing how far he could determine at pleasure the character of his dreams. In his first experiment, having allowed the back of his head to be uncovered during sleep, he thought that he was at a religious ceremony in the open air; the custom of the country in which he lived being to keep the head covered, except on some rare occurrences, among which was the performance of religious ceremonies. On waking, he felt cold at the back of the neck, as he frequently had felt when present at the real ceremonies. He repeated the experiment in two days with the same result. In a third experiment, he left his knees uncovered, and dreamed that he was traveling at night in the diligence; and all travelers know, he observes, that it is chiefly at the knees that they feel cold when traveling by that conveyance at night.

One of the most remarkable phenomena of dreaming, is the rapidity with which long trains of thought pass through the mind. A dream requiring hours for its accomplishment, is begun and terminated in a few seconds. A person who was suddenly aroused from sleep by a few drops of water sprinkled in his face, dreamed of the events of an entire life in which happiness and sorrow were mingled, and which finally terminated with an altercation upon the borders of an extensive lake, in which his exasperated companion, after a considerable struggle, succeeded in plunging him. Dr. Abererombie relates a similar case of a gentleman who dreamed that he had enlisted as a soldier, joined his regiment, deserted, was apprehended, carried back, tried, condemned to be shot, and at last led out for execution. After all the usual preparations, a gun was fired; he awoke with the report, and found that a noise in an adjoining room had both produced the dream and aroused him from sleep. Dr. Carpenter mentions the case of a clergyman falling asleep in his pulpit during the singing of the psalm before the sermon, and awakening with the conviction that he must have slept for at least an hour, and that the congregation must have been waiting for him; but on referring to his psalm-book, he was consoled by finding that his slumber had lasted not longer than during the singing of a single line. Sir Benjamin Brodie, in his *Psychological Inquiries* (1854), mentions the following anecdote of the late Lord Holland: 'On an occasion when he was much fatigued, while listening to a friend who was reading aloud, he fell asleep and had a dream, the particulars of which it would have occupied him a quarter of an hour or longer to express in writing. After he woke, he found that he remembered the beginning of one sentence, while he actually heard the latter part of the sentence immediately following it, so that probably the whole time during which he had slept did not occupy more than a few seconds.' Many facts of the same kind are on record, and as the author from whom we have quoted remarks, 'if we were to pursue this subject, it would lead us to some curious speculations as to our estimate of time, and the difference between the real and the apparent duration of life.' It is from cases of this nature that Lord Brougham has been led to the opinion, that *all* our dreams really take place in the act of falling asleep or of awaking. We cannot, however, explicitly accept this doctrine. 1. There is no sufficient proof of its being true. 2. We have a proof to the contrary in the fact, that it is common for people to moan and even talk in the middle of a sleep; and every one who has kept a dog must frequently have observed him dreaming (from the outward manifestations which he makes in the form of snarling or growling), though he still remains asleep. Some, on the other hand, have argued that the mind can never be entirely inactive, and that every one is dreaming throughout the whole period of sleep, although the dreams may not be remembered in the waking state. We know of no facts that can be adduced in favor of this hypothesis, and the following case goes strongly to disprove it.

A woman, aged 26, who had lost a portion of her scalp, skull, and dura mater, so that a portion of her brain was exposed to view, was a patient in 1821 in the hospital at Montpellier. When she was in a dreamless state, or in profound sleep, her brain was comparatively motionless, and lay completely within its bony case; but when the sleep was imperfect, and the mind was agitated by dreams, her brain moved and protruded from the skull, forming what is termed cerebral hernia. This protrusion was greatest when the dreams, as she reported, were most vivid; and

when she was perfectly awake, especially if actively engaged in conversation, it attained its highest development, nor did this protrusion occur in jerks, alternating with recessions, as if caused by arterial action, but remained permanent while the conversation continued. If the data of this case are to be depended on, the appearance of the brain during profound sleep seems to indicate that during that state there is a total or nearly total suspension of the mental faculties.

The author of *Psychological Inquiries* suggests the question: Do dreams answer any purpose in the economy of living beings? We regret that he has not given us a very definite answer, but he obviously inclines to the view that they cannot be purposeless. No one has hitherto offered any certain explanation of the uses of the spleen, of the thyroid gland, or of the supra-renal capsules; yet no one believes the formation of these organs to be merely incidental, or doubts that they have some special (although at present unknown) function to perform. 'Dreams are,' he observes, 'at anyrate, an exercise of the imagination. We may well conceive that one effect of them may be to increase the activity of that faculty during our waking-hours, and it would be presumptuous to deny that they may not answer some purpose beyond this in the economy of percipient and thinking beings.'

Dreams have, in all ages and countries, been believed in as indications of the future; and of all forms of superstition, this is perhaps the most excusable. Whatever is mysterious as to its cause, and beyond the power of the will, appears as supernatural; and what more so than dreams! The thoughts in dreams, too, arise out of the past and present circumstances of the dreamer, and therefore are not altogether without connection with his future destiny, as most other omens are. In the Homeric age, it was firmly held that 'dreams come from Zeus.' In the most ancient civilized communities of which we have any record—those of Egypt and Babylon—to interpret the monarch's dreams was one of the most important state offices, and was confided to a college of wise men. A common way of consulting the Greek and Roman oracles (q. v.), was for the inquirer to sleep a night in the temple, after performing sacrificial and other rites, when his questions were supposed to be answered in dreams. Grave philosophers wrote treatises on the interpretation of dreams, as they did on astrology. Even Bacon, although he confesses that the interpretation of dreams is mixed with numerous extravagances, yet speaks as if he thought that something might be made of it.

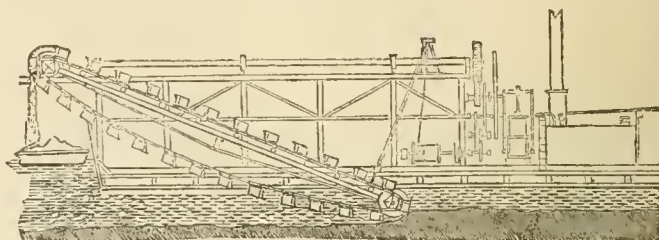
In modern times, and among European nations, dreams are seldom heeded except by the very ignorant or superstitious; and 'as idle as a dream' has become a proverb. Nothing can be conceived more arbitrary than the pretended rules of interpretation; e. g., 'that to dream of gold is good-luck, but of silver ill.' See Brand's *Popular Antiquities*, by Ellis, where a 'Dictionary of Dreams' is given. As to the actual coincidences that sometimes happen between dreams and events, it is only surprising, considering the countless fancies that are passing through our minds while asleep, that the coincidences are not ten times more numerous than they are.

DRED SCOTT CASE. This was a case brought for final decision before the supreme court of the United States in 1856, which excited much interest in America as well as in Europe. The plaintiff was a negro named Dred Scott, who, with his wife and two children, had been held as slaves by a Dr. Emerson, in the state of Missouri. After the death of Emerson, Dred Scott with his family claimed to be free, on the ground that they had resided for some time with their late proprietor in a free territory—so that having, as Scott alleged, been free in that territory, they could not now be held to slavery. The result of the litigation was, that Dred Scott and his family did not become free by having been taken to a free territory, and were accordingly still held to be slaves.

DREDGE. a machine for dragging or dredging the bottom of seas, rivers, or lakes, in order to bring up oysters and other animals that lie on the bottom. The common oyster-dredge is a bag-net, made of iron rings, linked together to form the meshes; the mouth is made of sheet-iron, which acts as a scoop when the dredge is let down and drawn along the bottom as the boat sails on. The dredge has of late been very extensively used by the naturalist with very important results, among the most remarkable of which are those obtained by the *Challenger* expedition, showing the existence of animal life in great variety at depths where it had before been considered impossible. The ordinary naturalist's dredge is of a lighter construction than that of the oyster-fisher, and its meshes should be smaller. For dredging a sandy bottom, the best form of dredge is one like a net used by the Kentish shrimpers. These are twine nets, bag-shaped, and of the length of the boat. The lower side of the mouth of the net is stretched upon a wooden pole, and the other side is held up while the lower is drawn along the bottom. The quantity and variety of animals drawn up by these nets are astonishing. The

dredge used for soles resembles the shrimp-net, but all dredges must be modified to suit the bottom on which they are used.

DREDGING-MACHINE, a machine used for clearing out or deepening the channels of rivers, harbors, &c. Dredging-machines are variously constructed, the simplest being like the oyster-dredge described above, only having a perforated cowhide bag instead of the chain-net, and a stronger 'spoon' or iron mouth to the bag. This is attached to the end of a pole, and worked with tackle by men from a barge in such a manner that the loose matter of the bottom is scooped up into the barge. The bucket dredging-machine is much more efficient. It consists of a long stage or framework overhanging the side of the barge. This frame has a wheel at each end, upon which works a powerful endless chain, to which is attached a series of perforated iron buckets, each with a shovel-shaped steel mouth projecting considerably on one side. The overhanging framework forms an inclined plane, along which the buckets run, descending on one side, and ascending on



Section of a Dredging-machine.

the other. They are so arranged that they descend empty, and on reaching the bottom, the projecting shovel or scoop-mouth digs into the bottom, and partially fills the bucket with the silt; it then turns round on the wheel at the lower end of the incline, and runs up till near the top, when it turns over the upper end, and in doing so its contents are emptied into a second attendant barge. This action is continued by every succeeding bucket of the endless chain. The perforations are for the passage of the water. By varying the inclination of the framework, the working depth may be increased or diminished. Some dredgers are fitted with two complete sets of buckets, one on each side of the vessel. A steam-engine and boiler, suitably placed in the dredger, are provided for giving motion to the machinery, and sometimes also to a screw propeller placed at the stern. Perhaps nowhere has river-dredging been carried such a length as in the case of the Clyde, which, by this process of scooping, has at and below Glasgow been converted from a river navigable only for small vessels into an estuary capable of bearing the largest ships. The dredgers employed for this purpose are moved by steam, the materials scooped out being carried out to sea by lighters. These have a large open tank amidships, while the two ends are decked over, and afford such accommodation for crew or machinery as may be necessary. The sides of the hold are hinged from the top, and open outwards, and thus its contents can be easily emptied into the sea.

DREISSENA, a genus of lamellibranchiate molluscs, generally regarded as belonging to the mussel family (*Mytilidae*), although, whilst the shell very much resembles that of the true mussels, the animal differs in having the mantle closed except at the anal and branchial slits, and a small aperture through which the foot and byssus protrude.—*D. polymorpha* is an interesting mollusc because, having of late been accidentally introduced into British estuaries and canals, it has fully established itself, and is now abundant in many of them, and in the rivers with which they are connected. Originally, it is believed, a native of the rivers which flow into the Caspian Sea and Lake Aral, it has extended to the canals and rivers of Germany, Holland, &c. It is capable of living a long time out of water with its valves closed, and it is supposed that it may have come to Britain on timber imported from the continent.

DRENTHE, a frontier province of the Netherlands, is bounded on the E. by Hanover, on the N. and E. by Groningen, on the W. by Friesland, and on the W. and S. by Overijssel, in lat 52° 37'—53° 23' N., and long. 6° 12'—7° 10' E. Area, 1024 square miles. Pop. (1880) 119,884. The soil is in general poor, only about one-half of the surface being capable of cultivation, the remaining portion covered chiefly with heath and morass. The principal crops are rye and buckwheat, but barley and oats are also raised. The inhabitants are chiefly employed in agriculture, pasturage—the cattle reared in D. being famous—and in digging and exporting peat. Two pauper colonies in the west of the province, the Fredericksoord and Willemssoord, established in 1818, are employed by the state in bringing waste land under cultivation, and in brick-making, weaving and other occupations.

DRESDEN, the capital of the kingdom of Saxony, situated in a charming valley on both sides of the Elbe, in lat. $51^{\circ} 3' 16''$ N., and long. $13^{\circ} 44'$ E. It is 116 miles south-east of Berlin, and 72 miles east-south-east of Leipzig. It is composed of the Altstadt (Old Town), on the left bank of the Elbe; and of the Neustadt (New Town), on the right or northern bank. D. is a pleasant, though not exactly a beautiful town. It contains several open squares both in the Old and New Towns. Pop. (1880) 220,818. On account of its architecture and splendid collections in art, it has been justly called the 'German Florence.' Of the churches, the finest are the *Frankenkirche*, with a tower 335 feet in height; the Roman Catholic Church (1737—1756), with a celebrated organ by Silbermann, and numerous statues and pictures; the *Sophienkirche*; and the *Kreuzkirche*, with an altarpiece by Schönan. The synagogue of the Jews, built in the oriental style by Semper, is also worthy of mention. Among the other important buildings may be mentioned the Royal Palace, a shapeless edifice, begun by Duke George, 1534, and completed by Augustus II.; the Prince's Palace, erected by Augustus II. in 1718; the Zwinger, only the vestibule of a palace in the almost too elaborate old French style of architecture, but containing many valuable antiquarian and scientific collections; the theater, the academy, the Brühl Palace, &c. The Old and New Towns are connected by two bridges, both *chefs-d'œuvre* of architecture.

D. possesses many excellent educational and charitable institutions. The Academy of Art opened in 1764, to which a school of architecture was added in 1819. This celebrated institution and the musical choir render D. of no small importance to the progress of art in the present day.

The most important branches of industry are gold and silver manufactures, machinery, straw-plait, paper-hangings, excellent painters' canvases, colors, artificial flowers, chocolate, porcelain, &c. An impulse was given to the corn-trade by the opening of the Corn Exchange in 1850.—The environs of D. are delightful.

The most important of the D. collections are: 1. The Royal Public Library in the Japan Palace, amounting to nearly 350,000 volumes. It contains many curiosities, and is particularly complete in the departments of literary history and classical antiquity, as well as in the histories of France and Germany. 2. The Cabinet of Coins, likewise in the Japan Palace. 3. The Museum of Natural History in the Zwinger, particularly complete in the mineralogical department. 4. The Historical Museum, formed in 1833. 5. The collection of mathematical and physical instruments, likewise in the Zwinger. 6. The renowned Picture-gallery, containing upwards of 1500 paintings, mainly by Italian and Flemish masters. Among the former, those especially worthy of notice are the pictures of Raphael ('The Sistine Madonna'); of Correggio ('La Notte,' and the 'Madonna of St. Sebastian'); of Titian ('The Tribute-money,' and 'The Venus'); of Andrea del Sarto ('Abraham's Sacrifice'); of Francia; of Paul Veronese; of Giulio Romano ('The Virgin with the Pitcher'); of Leonardo da Vinci ('Francesco Sforza'); of Garofalo, Bellino, Pietro Perugino, Annibale Caracci, Guido Reni, Carlo Dolci, Cignani, &c. Of the Flemish school, the collection boasts 41 pictures by Rubens, 21 by Vandyck, many by Rembrandt, admirable specimens of Snyders, Johann Breughel, Ruyssdael, Wouvermann, Gerard Dow, Teniers, &c. Of works of the German school, the gem of the collection is Hans Holbein's Madonna. Of the French school, several pictures by Nicolas Poussin, and some admirable landscapes by Claude Lorraine, are the most remarkable. 7. The Cabinet of Engravings in the Zwinger is arranged in twelve classes, marking distinct periods in the history of art. 8. The collection of Antiques in the Japan Palace, including several admirable sculptures. 9. The 'Green Vault' in the Royal Palace, a valuable collection of precious stones, pearls, and articles wrought in gold, silver, and ivory. 10. The collection of Porcelain in the Japan Palace.

D. is known in history as far back as the year 1206. It is officially mentioned as a town in 1216. Henry the Illustrious selected it for his capital in 1270. From the close of the 15th c., its prosperity gradually increased. Several successive sovereigns contributed to its embellishment, particularly Augustus I. and Augustus II. It suffered severely, however, during the Seven Years' War; and again in 1813, when Napoleon selected it as the central point of his operations. During the revolution of 1849, also, immense damage was inflicted upon the town, but it is again improving. D. was occupied by the Prussians in 1866 during the Austro-Prussian war. Since that year the city has been enlarged and made more delightful. New streets have been opened; old irregular buildings have given way to handsome and imposing edifices. The foundation stone of the magnificent new Court Theater was laid in 1871.

DRESDEN, BATTLE OF. In August 1813, when the war between Napoleon and the allies, after a short truce, broke out afresh, the armies of the latter gathered from all sides towards Dresden, which they regarded as the key of the French position. It was

held by St. Cyr with a force of about 30,000 men, the main body of the French under Napoleon being in Silesia, where the emperor expected the contest to be waged. On the 23d, the grand army of the allies appeared before Dresden. The town would in all probability have been quickly stormed, had not Schwarzenberg and the Austrians insisted on waiting the arrival of the left wing under Klenau. This delay saved the French, for at half-past nine, on the morning of the 26th, Napoleon with his Guards entered the town. At four o'clock in the afternoon, Schwarzenberg, the commander-in-chief of the allies, gave orders for the attack. At various points, the assault was irresistible, but the opportune arrival of the 'Young Guard' enabled Napoleon to hazard a sally which was as unexpected as it was successful. The allies fell back everywhere; but not dispirited, renewed the fight next day. Towards noon, Moreau was mortally wounded by a cannon-ball at Alexander's side on the height of Räcknitz, and Napoleon obtained a decided advantage over the left wing of the allied army, which Murat, by a skilful manœuvre, contrived to out-flank, taking 10,000 prisoners, among whom was General Metsko. Several other successes in other parts of the field determined the allied armies, especially after hearing that Vandamme was advancing toward Pirne, to retreat, which they did during the night of the 27th August. Dresden, however, was not yet delivered from the miseries of war. When Napoleon finally quitted the city on the 7th October, nearly 30,000 men still remained behind. As all access was cut off by the Russians the city suffered severely from famine. A capitulation was at length brought about (11th November 1813) between St. Cyr and Klenau, according to which the garrison were to withdraw unmolested from the 12th to the 16th November, on condition that they laid down their arms. The capitulation was nevertheless rejected by Prince Schwarzenberg, the garrison declared prisoners of war, and treated as such. The battle of Dresden, as Alison observes, was the *last* pitched battle, on a scale commensurate with his former victories, that Napoleon ever gained.

DRESS, the collective name for the artificial coverings worn in greater or less quantity by all but the most savage of the human race, and always combining the two objects of warmth and ornament. It seems, indeed, from what we read of savage nations, that it is rather in the desire for ornament that the wearing of dress begins, than with a view to protection from cold (see **FASHION**, under which head some notice will be given of the more singular caprices to which the forms of dress have been subjected; see also **CRINOLINE**, **BLOOMERISM**). The earliest coverings would consist of such articles as the skins of animals, and the leaves and inner bark of plants, which, as civilization advances, are mostly supplanted by various textures of wool, flax, silk, and other vegetable and animal substances. Some account of these textures is given under the appropriate heads, and the regulation of dress with a view to health is treated under **HEALTH**. As will be shown more fully under **FASHION**, the tendency in modes of dress—notwithstanding occasional aberrations—is towards simplicity and appropriateness.

DRESSINGS, in Architecture, is a term loosely used to signify mouldings and all the simpler kinds of sculptured decorations.

DREUX, an ancient town of France, in the department of Eure-et-Loir, is situated on the river Blaise, 22 miles north-north-west of Chartres, and 45 miles west of Paris. It is tolerably well built, and lies at the foot of a hill crowned with the dilapidated ruins of an ancient castle, formerly the possession of the Comtes de Dreux. From among the ruins rises a beautiful chapel, in the form of a Greek temple, surmounted by a cupola, erected by Louis Philippe. It contains the tombs of two of the children of Louis Philippe, and of others of his relations. The town-hall and the parish church, both handsome specimens of Gothic, are the only other buildings worthy of note. D. has extensive manufactures of coarse cloth, serge, &c., with a trade in sheep and cattle, also various tan-yards, iron-foundries and dye-houses. Pop. (1876) 7087. In 1562, one of the bloodiest battles recorded in the religious wars of France took place at D., in which the Catholics, under the Constable Montmorency, defeated the Huguenots, and took their leader the Prince of Condé prisoner.

DRI'FFIELD, GREAT, the chief town in the Wolds, in East Riding, Yorkshire, at the south base of these hills, near one of the sources of the Hull, 28 miles east-by-north of York, and 20 miles north-north-west of Hull. It lies in a fertile district, and consists chiefly of one long and broad street. It has a chemical work, flour, and bone-mills, and a considerable corn and cattle trade. Pop. (1881) 5937. Near D. many ancient tumuli have yielded human and horse skeletons, accoutrements, flint spear-heads, urns, and a variety of ornaments.

DRIFT, in Navigation, is a technical name for the deviation which a ship's course receives by the action of a contrary wind.

DRIFT, a name given to the boulder-clay, a deposit of the Pleistocene epoch. More fully, it is called the Northern Drift, Glacial Drift, or Diluvial Drift, in allusion to its supposed origin. For an account of the formation, see **BOULDER-CLAY**.

DRIFT-WOOD is wood carried by tides and currents to a distance from its native locality. Specimens thus transported have been observed in the marine strata of the Chalk, London Clay, and other formations.

SAND-DRIFT is sand driven and accumulated by the wind. Deposits thus formed are occasionally found among the stratified rocks, but compared with other strata they are few, though from their anomalous character, an acquaintance with their phenomena is of importance to the geologist. Moving sands are at the present day, in many places, altering the surface of the land. In the interior of great dry continents, as Africa, India, and Australia, extensive districts are covered with moving sands. The continuous blowing of a steady wind in one direction often covers a rich tract with this arid material. But the influence of the wind on loose sand is most evident along low sandy coasts, where hills, called 'dunes,' are formed entirely of it; they sometimes attain a considerable height, as much, for instance, as 200 or 300 feet.

Dunes are advancing on the French coasts of the Bay of Biscay at the rate of about 60 feet per annum, covering houses and farms in their progress. Similar accumulations are forming on the coasts



Section of Culbin's Sand hill, in Nairnshire.

of Nairn, Cornwall, Wexford, and other parts of the British Isles. The Culbin Sands, in Nairnshire, cover a large district which at a period not very distant was rich arable land. The prevailing wind is from the west, hence the hills are slowly moving in an easterly direction, at the rate of a mile in somewhat less than a hundred years. A singular stratification exists in these hills. The prevailing west-wind lifts, or rather rolls the particles of sand up the gentle incline of the western aspect of the hill, until they reach the summit, where they fall, forming a steep declivity to the east, equal to the angle of repose for sand. A shower consolidates the surface of the new bed, or a land-breeze carrying fine dust separates it by a very thin layer of finer material from the one that follows, and thus, as the hill moves eastward, a regular series of strata is formed at a very high angle, as is shown by the diagram. The progress of the hill is represented by the dotted outline. Little can be done to arrest the progress of these devastating sand-drifts. It has been recommended to plant *Carex arenaria* and similar sand-loving plants, which have long creeping roots: they certainly check to a considerable extent the influence of the wind.

DRILL (*Cynocephalus leucophæus*), a species of Baboon (q. v.), a native of Guinea, similar to the mandrill, but rather smaller and less ferocious.

DRILL is a general name for the exercises through which soldiers and sailors are passed, to qualify them for their duties. It is subject to numerous varieties, according to the number and organization of the men drilled at one time, and the kind of weapon to which the exercises relate. The infantry, the cavalry, and the artillery all have different kinds of drill. The militia and the volunteers differ from the regulars, if not in the kind of drill, at least in the circumstances under which it is carried on; the squad-drill, company-drill, and battalion-drill, vary both in the numbers concerned and in the routine of exercises. And so likewise in the navy, the drilling of seamen varies in kind, according to the duties likely to be required.

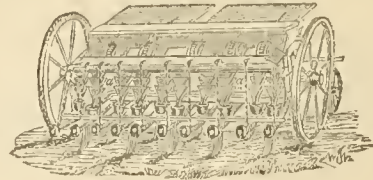
It is generally considered that four months' drill is required to fit an infantry recruit for service. The progress depends greatly on the intelligence of the men. It is on this ground that the Rifle Volunteers, enrolled in such large numbers in 1860, have been so advantageously placed; composed almost entirely of young men, whose intelligence has been developed by a moderately good education, the corps have advanced to a degree of proficiency which has attracted the marked attention of military officers.

Manuals of Drill have been prepared for all the various branches of the two services. Drill-halls, in which drill can be carried on comfortably in any kind of weather, are now common.

DRILL, a fine linen fabric of a satiny finish, used for summer dresses for gentlemen. Drills are worked with five shafts, except fancy patterns, which are wrought with eight shafts.

DRILLING, DRILL. Drilling is the name applied to the mode of sowing in regular rows, as distinguished from broadcast sowing, and the drill is the name of the implement employed in this process; the term *drill* is also frequently applied to a row of drilled crop, as a drill of potatoes, corn, or turnips. In all coun-

tries in which maize and Indian corn are grown, the principle of drilling has been long known and acted upon. In gardening it has been practised everywhere from time immemorial; but its extension to field-culture is comparatively of recent date. Jethro Tull invented a drilling-machine in the early part of last century, and did much to show its merits in the culture of grain and root crops. Since his time, the use of this implement, in the case of both white and green crops, has in many districts become general. The crops which are now most generally drilled are clover, flax, cereals, beans, peas, potatoes, turnips, beet-root, cole-seed, and carrots. Of these, clover and flax are sown in drills at about



Garrett's Corn-drill.

3 or 4 inches apart; cereals from 6 to 12 inches; and beans, potatoes, and turnips at from 25 to 30 inches apart; the general rule, however, with most green crops, being that the space between the rows should admit of the passage of a light plough or hoe, drawn by a horse, without danger to the plants. A great variety of drills are now in use. The system of lifting the grain in small cups and conveying it to the coulters has been long in use. Garrett of Saxmundham, Suffolk, a cut of whose corn-drill is given, and Hornsby of Grantham, are favorite makers of corn and turnip drills. Latterly, R. Reid & Co. of Aberdeen have acquired fame with their Patent Disc Corn-drill, which is popular in Scotland and some parts of England. One powerful recommendation of drilling is, that by means of it a considerable saving of seed is effected in the sowing of white crops; but the great advantage is, that in the case of green crops, it enables the farmer more readily to clean the land, both by the hand and by the horse-hoe. About one-half the seed suffices when deposited by the drill-machine, compared with what the hand-sowing requires, and the seed is more regularly spread and better covered. The braird comes up more uniformly, and the straw is stronger and stiffer. Drill-sowing is slow work, but it is so efficient that it is gaining on the broad-cast. To keep the soil stirred and pulverized, which can only be properly done where the crops have been drilled, favors the retention and absorption of moisture.

In England, turnips are sometimes drilled by a machine on the flat; while in Scotland, they are always sown on ridges or drills formed by the double-moulded plough. The double-board or drill plough is to be found now on almost every farm, and its introduction has saved much labor. Turnip-sowing machines which take two drills at the time have been common for years, and potato-planters taking two rows at the stripe are being introduced, but have not been established yet. One of these was tried, with interest and success, at the Royal English Show, held at Hull in 1873.

DRILLS are tools used for boring or drilling holes in metal, bone, ivory, hard woods, &c. They are usually made of a square steel bar, flattened out at the cutting end; this part is brought to an angular point like a spear-head, and the cutting edges forming the angle are beveled in opposite directions. Those which have a projecting pin in the center, and chisel-shaped cutting edges on each side of the pin, are called 'center bits.' There are various contrivances by which the drill is made to revolve. For drilling iron, steel, and large brass work, the lathe is commonly used, the drill being fitted into a square-hole chuck, and the work pressed against it while revolving by the screw and center of the puppet. The *brace or drill-stock* is commonly used by carpenters for center bits, and occasionally for metal work. This is a curved handle, which is made to revolve by the hand, while one end is pressed against the chest. Small drills for metal work are mounted with a *ferule* or pulley, or are fitted into a stock with such a pulley on it; a piece of cane or spring-steel is mounted with a string like an archer's bow, but loose enough to wind round the ferule. By drawing the bow lengthwise, the drill is made to revolve, and is at the same time pressed against the work by means of a *breast-plate*, which is held against the chest of the workman; this breast-plate has indentations upon it, which serve as sockets, into which the end of the drill-stock or drill works.

DRIMYS. See **WINTER'S BARK**.

DRINKING USAGES. Some of these are of great antiquity, and all are interesting in connection with the history of manners. Besides sacrifices of animals and articles of food, the Hebrews made drink-offerings a solemn religious service. To mark the spot where he communed with God, Jacob set up a pillar of stone, and

'poured a drink-offering thereon.'—Gen. xxxv. 14. We learn that such sacrifices were not made alone to the true God; for women are said to have poured out 'drink-offerings unto other gods.'—Jer. vii. 18. Such a statement is amply verified by pagan writers. Among the Greeks and Romans, the pouring out of a libation to the gods was a common religious observance. A libation was made on the occasion of solemn prayers, and also before meals. These libations were usually of undiluted wine, but they were also sometimes of milk diluted with water, or water flavored with honey. There are many references to these libations by Sophocles, Æschylus, Pliny, and other writers. The libation at meals consisted of pouring a small quantity of liquor from the cup on the ground—so much waste being a kind of propitiation, or an act somewhat equivalent to the asking of a blessing. See SACRIFICE.

From these and similar usages in remote times sprung the ceremonial observance of drinking healths, or the uttering of a pious, heroic, or friendly sentiment before quaffing liquor on festive occasions. It has been stated that the practice of pledging, or saying 'I pledge you,' originated in England in the 10th c., it being then necessary for one to watch over the safety of his companion when the cup was at his lips. But the custom of drinking healths, as just mentioned, is of far higher antiquity, and was derived immediately from the boisterous convivialities of a Scandinavian and Teutonic ancestry (see VALHALLA), if not with equal likelihood from the usages of the early Britons, who were of Celtic origin. A story is told of a feast given by Hengist (5th c.) at his stronghold of Thong-caster, in Lincolnshire, to the British king Vortigern, and of the bewitchment of the royal guest by the charms of Rowena, the young and beautiful daughter of his entertainer. Rowena's address, as she gracefully knelt and presented the wine-cup to the king, *Licver kyning, wass heal*, or 'Dear king, your health,' is often quoted as the origin of our still existing expressions, wassail and wassail-cup; though wassail means pledging or health-drinking independently of the saying of Rowena, and certainly was not then uttered for the first time. Wassail is derived from the old Anglo-Saxon *Was heil*, 'Be in health;' and *Wes heil* and *Drinc heil* were the usual ancient phrases in quaffing among the English, and synonymous with 'Here is to you,' and 'I'll pledge you,' of later times. The explanation of wassail by an old writer, Robert de Brunne, may be appropriately quoted:

'This is ther custom and her gest
When thei are at the ale or fest,
Ik man that levis gware him think
Salle say *Wosseille*, and to him drink.
He that biddis alle say, *Wassaille*,
The tother alle say again, *Drinkaille*.
That says *Wosseille* drinks of the cup,
Kissand his felaw he gives it up.'

The learned Selden, in a note on the *Polyolbion*, says: 'I see a custom in some parts among us; I mean the yearly Was-haile in the country on the vigil of the new year, which I conjecture was a usual ceremony among the Saxons before Hengist, as a note of health-wishing (and so perhaps you might make it Wish-heil) which was exprest among other nations in that form of drinking to the health of their mistresses and friends. "Bene vos, bene nos, bene te, bene me, bene nostram etiam Stephanum," in Plautus, and infinite other testimonies of that nature in him, Martial, Ovid, Horace, and such more agreeing nearly with the fashion now used; we calling it a health, as they did also in direct terms.' For further particulars concerning wassail and wassail-bowl, we may refer to Brand's *Popular Antiquities*, edited by Ellis. It is enough here to quote from that authority the following passages. 'Milner on an ancient cup (*Archæologia*, xi. 420), informs us that "the introduction of Christianity amongst our ancestors did not at all contribute to the abolition of the practice of wassailing. On the contrary, it began to assume a kind of religious aspect, and the wassail-bowl itself, which in the great monasteries was placed on the abbot's table, at the upper end of the refectory or eating-hall, to be circulated amongst the community at discretion, received the honorable appellation of 'Poculum charitatis.' This, in our universities, is called the grace-cup."

The poculum charitatis is well translated by the toast-master of most of the public companies of the city of London by the words, a 'loving cup.' After dinner, the master and wardens "drink to their visitors, in a loving cup, and bid them all heartily welcome." The cup [a silver flagon containing warm spiced wine] then circulates round the table, the person who pledges standing up whilst his neighbor drinks to him.'

While the drinking of healths is thus of old date, the application of the word 'toast' is modern, having had its origin in the practice of putting a piece of toasted bread in a jug of ale, hence called 'a toast and tankard.' The custom of so using the word is said to have had its rise at Bath, in the reign of Charles II. It happened that on a public day a celebrated beauty of those times was in the cross [or large public] bath, and one of the crowd of her admirers took a glass of the water in which the fair one stood, and drank her health to the company. There was in the place a gay fellow half-tipsy, who offered to jump in,

and declared, though he liked not the liquor, he would have the toast. He was opposed in his resolution; yet this whim gave foundation to the present honor which is done to the lady we mention in our liquors, who has ever since been called a toast.—*Tatler*. Begun in the form of toasting beauties at private parties, toasts were in time given on all sorts of subjects at public festivities, accompanied with rounds of cheers and hurrahs, these noisy demonstrations being now called 'the honors.' The fatigue of announcing these exciting sentiments is so great, that all well-ordered large assemblies a toast-master is employed. Standing behind the chairman, this official, besides proclaiming the toasts, acts as a fagelman to regulate the clapping of hands and the 'hip, hip, hurrahs' of the company. 'Toasts, certainly, in this guise look more like a medium for taking an indefinite quantity of wine, than that spontaneous effusion of the heart in honor of some cherished individual, which they originally were. On certain occasions, these signals are hushed, and the convivial glass is taken "in solemn silence." The effect is certainly rather startling. A convivial glass to the memory of one departed has surely something in it of practical absurdity.'—Mrs. Stone's *Chronicles of Fashion* (1845). The absurdity of the whole toasting system has incurred the reprehension of temperance societies, without any perceptible abatement; but the old custom of drinking healths at private parties is now given up in good society, along with the excesses which were formerly practised.

Space is not afforded in the present work to do more than glance at the diversity of drinking usages in connection with domestic events and social intercourse. There were, as is well known, at one time drinkings on the occasions of births, baptisms, marriages, and even deaths; these last, which included the gloomy festivities of the *Lykewake*, or wake over the corpse of the deceased being a relic of a very ancient custom, as was that, at least in Scotland, of drinking the *dredgy* (dirge) after the funeral solemnities were completed. In what manner these, as well as many other drinking usages, originated, it cannot be doubted that they were long maintained from the force of custom, along with that demand for artificial stimulus provoked by the naturally phlegmatic character of a northern people.

For the long nights of a cheerless climate, there seems to have been sought the solacement of those intoxicating agents, in which it would have been fatal to indulge—where they were not needed—under the sunny skies of the south. We believe this is really the philosophy of the subject, if there be any philosophy in it; and it cannot fail to be observed that just in proportion to an increase in the number of comfortable homes, the cultivation of mental resources, and the spread of a taste for harmless recreations, the more odious of the old convivialities disappear. Latterly, many amusing traditions respecting the drinking habits of a past age in Scotland, where they longest flourished without alteration, have been given in the *Memoirs of Lord Cockburn*, the *Autobiography of the Rev. Dr. Alexander Carlyle*, and the *Reminiscences of Scottish Life and Character*, by the Very Rev. Dean Ramsay (1860).

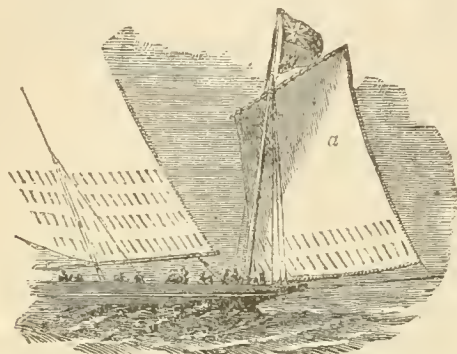
As regards miscellaneous drinking observances at one time common, we can refer but to a few of the more prominent. Perhaps the most offensive of all was that customary among tradesmen of imposing fines to be consumed in liquor. Apprentices, on being introduced to a workshop, paid so much entry-money to be spent in drink, and similar exactions were made from journeymen on entering a new employment. This was called paying their *footing*. When Benjamin Franklin, on his getting employment in a printing-office in London, refused to comply with this mischievous custom, he experienced, as he tells us, a variety of petty annoyances. Among shipwrights, the penalty of non-payment was flogging with a hand-saw from time to time, and other maltreatment. We refer to Dunlop's *Drinking Usages of Great Britain* (1839) for many curious details of this kind. Happily, the abolition of these usages has kept pace with the increasing intelligence of the working-classes, and of such outrages little is now heard. Prisoners, on being lodged in jail, as related in the novels of Smollett and others, were obliged to pay *garnish* for drink to the brotherhood of which they had become members. This pitiless exaction is now totally gone, through the efficacy of modern prison-discipline.

The giving of *vails* (Lat. *vale*, farewell) to servants on quitting a gentleman's house, which became so intolerable in the 18th c., as at length to be given up by universal consent, meant, doubtless, a gift to be spent in drink to the health of the donor, and was analogous to the custom of giving a *trink-geld* in Germany and a *pour boire* in France, to servants, drivers of carriages, and others. There were, at one time, numerous drinking usages connected with departures. We need only notice the *bonallie* (Fr. *bon aller*), or, as it is sometimes called, a *foy* (Fr. *voie*), a festive drinking at the away-going of servants or of persons in a still higher degree, once common in the Lowlands of Scotland; also the *stirrup-cup*, or, as it is called in the Highlands, *deoch an dorris*, or drink on getting on horseback, and being ready to set off.—For the moral and physical evils connected with drinking usages, and the means taken to redress them, we refer to the article TEMPERANCE.

DRIP, the projecting edge of a moulding, so channelled as that the rain will drip from it instead of trickling down the wall.—*Parker*.

DRI'PSTONE (Fr. *larmier*). The dripstone is a projecting moulding or tablet placed over the head of a Gothic doorway or window, for the purpose of throwing off the water, whence it is also known as a water-table or weather-moulding. Though such was, no doubt, its primitive use, the dripstone latterly became a mere ornamental appendage, which served to enrich and define the outline of the arch. It does not generally extend lower than the springing of the arch, though this rule is by no means without exceptions. When the tracery extends to a lower level, the external dripstone usually accompanies it, and *Parker* mentions that, at the north doorway of Otham Church, Kent, it descends the whole length of the jamb. The dripstone is not so constant a feature in continental as in English Gothic.

DRIVER, on shipboard, is the name of a large sail, occasionally set upon the mizzen-mast with a yard or gaff. A boom, called



a, the Driver.

the *driver-boom*, extends the lower part of the sail a good way over the stern, like a cutter's mainsail.

DRIVING, FURIOUS. This, which was often an offence at common law, is made a statutory offence by 24 and 25 Vict. c. 100, s. 35, so that if any person shall suffer any bodily harm, by reason of the wanton and furious driving or racing, or by the wilful misconduct of any coachman, or other person having the charge of any carriage or vehicle in any place, the offender shall be guilty of a misdemeanor, punishable by two years' imprisonment. Special penalties were often put in general and local Road Acts; and 2 and 3 Will. IV. c. 120, by which the laws relating to stage carriages and horses let for hire were consolidated, enacts that any driver, conductor, or guard, guilty of furious driving, shall forfeit £5 (s. 48). The owners are liable for the penalty where the driver or guard is not known, or cannot be found. As to cabs, see **HACKNEY-COACHMEN**. Within the metropolis they are regulated by 1 and 2 Will. IV. c. 22, and other statutes, including 33 and 33 Vict. c. 115.

DRO'GHEDA (Ir. 'bridge of the ford'), a well-built parliamentary and municipal burgh and seaport, in a county by itself of nine sq. m., on the borders of Meath and Louth, on both sides, but chiefly N. of the Boyne, 4 miles from its mouth, and 31 miles N. of Dublin. The Dublin and Belfast Railway crosses the Boyne here by a viaduct 95 feet high. There are linen and cotton manufactures, tanning and brewing works, and an iron-foundry. It has a considerable trade chiefly with Liverpool, 140 miles E.S.E., principally in corn, meal, flour, cattle, provisions, linen, hides, and butter. Great quantities of ale are sent to the colonies.

Vessels of 500 tons reach the quay, and barges of 50 tons ply 19 miles up the Boyne to Navan. Pop. (1881) 13,510, of whom 12,381 are Roman Catholics, 855 Episcopalians, 152 Presbyterians; population in 1881, 12,297. D. sends one member to parliament. The parts of D. on the opposite sides of the river formed two opposing corporations till 1412, when a sermon by a monk induced them to get a charter of union from Henry I. From the 14th to the 17th century, D. was the chief military station in Leinster. Many parliaments were held in D., and it had the right to coin money. In 1649, Cromwell stormed D. and put 2000 of the garrison to the sword. Poyning's laws were enacted here. D. surrendered to William III. the day after the battle of the Boyne, which was fought in 1690 at Oldbridge, 4 miles west of D. One of the four ancient gates of D. still remains, and the ruins of many monastic institutions. A handsome hall was recently presented to the town. Two newspapers are published here. The harbor receipts in 1877 were £5000. The constituency numbered 765 in 1879-80.

DROGUE AMÈRE (Fr., bitter drug), a celebrated stomachic bitter; of which the basis is creat root, and the other ingredients

mastic, frankincense, myrrh, and aloes, all steeped for about a month in brandy, which is then strained and bottled.

DRO'HOBICZ, a town of Austria in the province of Galicia, is situated on the Tyszmanika, a tributary of the Dniester, in lat. 49° 25' N., and long. 23° 30' E. The town is in general ill built, but it contains several interesting edifices, including a Basilian monastery, a castle, a high school, and two very handsome churches. D. has extensive salt-works, which produce about 3700 tons of salt yearly. There are also in the vicinity iron-mines and pitch-wells. D. has likewise a good trade in wine, linen, cotton, leather, and grocery. It has, besides, corn and cattle markets. Pop. (1880) 15,714, seven-eighths of whom are Jews, who carry on most of the commerce of this town.

DROIT D'AUBAINE (Lat. *alibi nati*). By the old custom of France, the king was entitled, on the death of a foreigner who had taken up his fixed residence there, to claim his movable estate, notwithstanding any testamentary settlement which he might have left. But when a foreigner went to France as a traveler, merchant, or foreign minister, without any intention of fixing his residence there, the *droit d'aubaine* was excluded. The Swiss, Savoyards, Scotch, and Portuguese were exempted. This antiquated piece of injustice was abolished in 1819.

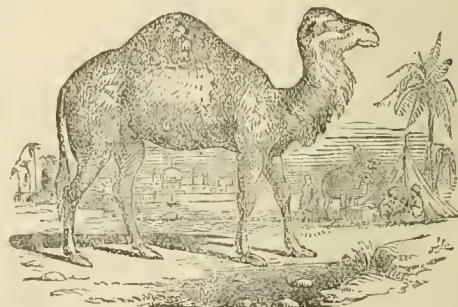
DROITS OF THE ADMIRALTY. See **ADMIRALTY DROITS**.

DROITWICH, a parliamentary and municipal borough in Worcestershire, containing four parishes and three churches, seven miles north-north-east of Worcester, in the narrow valley of the small river Salwarp, on the Bristol and Birmingham and West Midland Railway, and on a canal connected with the Severn, which admits vessels of 60 tons. It has direct communication, also, by means of other canals, with Birmingham and London and the intermediate district. Its chief trade is salt, for which it has been famous from remote times, and which is esteemed the best in Europe.

In the middle of the town, rising from a depth of 200 feet, through beds of new red-sandstone and gypsum, are the celebrated wyes, or brine-springs, yielding over 115,000 tons of salt a year, nearly the half of which is exported to foreign countries. Pop. (1881) of the municipal borough, 3761; of the parliamentary, 9858. D. sends one member to parliament. It was the Roman *Salinae*. The remains of a Roman villa were found here, with tessellated pavements, &c.

DROME, a department of France, on the east bank of the Rhone, to the south of the department of Isere. Area, 2500 sq. m. Pop. (1881) 311,782. In the west of the department, running from north to south along the Rhone, stretches a sandy plain of from five to eight miles in breadth, but towards the east the surface is hilly; a spur of the Alps traversing the eastern boundary, and sending offshoots of about 3500 feet in average height westward across almost the entire area of Drome. These heights, whose sides are covered with forests of pine, oak, and beech, afford excellent pasturage in summer and autumn. The general direction of the rivers of D. is westward, toward the Rhone, and the most notable of them are the Drome, from which the department takes its name, and the Isere. Vines and mulberry, chestnut, walnut, and olive trees are extensively grown. About 8,600,000 gallons of wine are produced annually. Many of the vineyards are famous, but perhaps the most celebrated is that of L'Hermitage, near Tain, on the banks of the Rhone, which yields red and white wines hardly surpassed by any in the world. D. has several iron-mines, also copper, lead, and to some extent coal. The manufactures consist chiefly of woollen cloth, silk, hosiery, serge, and cotton yarn. The department is traversed by the Lyon and Avignon Railway. It is divided into the four arrondissements of Valence, Montélimart, Die, Nyons, with the town of Valence for capital.

DRO'MEDARY, a name sometimes given, probably at first



Dromedary.

through mistake, to the Arabian or one-humped camel (*Camelus dromedarius*), but properly belonging to a variety of that species,

distinguished by slenderness of limbs and symmetry of form, and by extraordinary fleetness. It has been well described as 'bearing much the same relation to the ordinary camel as a race-horse or hunter does to a cart-horse.' The word dromedary is derived from the obsolete Greek *dremo*, to run. The pace of the D. is a trot, which it can maintain without intermission for a prodigious length of time; often at the rate of nine miles an hour for many hours together; whilst a journey of upwards of 600 miles is performed at a somewhat slower rate in five days. Even its more rapid pace can be maintained for twenty-four hours at a stretch, without sign of weariness and without stopping to bait; and if then it is allowed a little refreshment, of a ball of paste made of barley and powdered dates and a little water or camel's milk, it will resume its journey, and go on with undiminished speed for twenty-four hours more. The jolting to the rider is terrible.

The gallop is a pace unsuitable to the D., and at which it very soon fails. Dromedaries are sometimes trained to run races. White dromedaries are particularly prized in some parts of the East. See CAMEL.

DROMO'RE (*Druim Mor*, Great Ridge), an Episcopal city in the north-west of the county of Down, on the Lagan, 14 miles south-west of Belfast. It has linen manufactures. Pop. (1881) 2491. In the peat-bogs here were found the remains of an elk, the space between the extremities of whose horns measured 10 feet 3 inches. North of D. is a mound or rath, 60 feet high, with three concentric intrenchments, and great outworks towards the Lagan. The see of D. was founded by St. Colman in the 6th c., but is now united with those of Down and Connor. Jeremy Taylor, when bishop here, built the present church.

DRONE. See BEE.

DRO'NTHEIM. See THRONDHJEM.

DROORAJAPAT'AM, or **DOOGOORAUZEPATA'AM**, a town on the Coromandel coast of Hindustan, possesses remarkable facilities for navigation, both maritime and inland. It stands on an inlet, which connects Blackwood Harbor with Pulicat Lake, the former being the only safe haven on the west side of the Bay of Bengal, and the latter being artificially continued as far as Madras. The place is 60 miles to the north of Madras, and 34 to the south of Nellore, in lat. 13° 59' N., and long. 80° 13' E.

DRO'PSY (Gr. *hydrops*, from *hydor*, water), a class of diseases always of serious import, though not often, perhaps, directly fatal. D. is rather a symptom than a disease; it consists of the effusion of watery fluid from the blood into the skin and subjacent textures, or into the cavities of the body. When the effusion is chiefly in the superficial parts, the dropsy is called *Anasarca* (*ana*, upon; *sarx*, the flesh); when it is in the abdomen, it is termed *Ascites*; when in the chest, *Hydrothorax*. Dropsy most commonly depends on disease of the heart (q. v.) or kidneys (q. v.); in cases of ascites, the liver and spleen are often at fault. The treatment of dropsy is chiefly by diuretics, (q. v.), and other evacuent remedies, which remove the fluid from the textures by unloading the blood of its excess of serum. It is, however, a matter of some difficulty to find the proper remedy in each individual case. In all cases of dropsy, the internal organs should be, if possible, submitted to a strict medical examination, and the treatment regulated accordingly.

DRO'PWORT. See SPIRÆA and WATER DROPWORT.

DROSERA'CEÆ, a natural order of exogenous plants, consisting entirely of herbaceous plants, which generally inhabit marshy places, and are often covered with glands. The leaves are frequently all radical, and they and the flower-stalks are rolled up in bud like the fronds of ferns. There are five sepals, five petals, five, ten, fifteen, or twenty stamens; the fruit a one-celled capsule, with numerous seeds. About 100 species are known, distributed over most parts of the world, many of them plants of very delicate appearance; and many of them, as the species of *Drosera* or *SUNDEW*, natives of Britain, are remarkable for their glandular hairs, which secrete a viscid fluid, and by means of it often fatally detain flies which alight on them. *Rosidula dentata* is placed in houses in South Africa on this account. Venus's Fly Trap belongs to this order. See DIONÆA. Acrid and stimulant properties prevail in the Droseraceæ.

DROSTE-HÜLSHOFF, **ANNETTE ELIZABETH**, a distinguished lyric poetess of Germany, born 12th January 1798, on the estate of Hülschoff, near Münster. Of a delicate constitution, and living in complete seclusion from the world, she nevertheless received an excellent scientific education. In the year 1825 she was introduced into a wider circle of distinguished men and women at Cologne and Bonn, but in a short time retired again to her maternal estate of Rischhaus, near Münster, where she lived almost exclusively for science, nature, and poetry. She died at a place near Lake Constance, 24th May 1848. While occupying a distinguished place among the literary women of the time, she retained all the characteristic timidity of her sex, avoiding those eccentricities into

which many women fall who think they have a mission to regenerate society. Her *Gedichte* (Poems) appeared at Stuttgart in 1844, and of her posthumous works *Das geistliche Jahr nebst einem Anhang religiöser Gedichte* at Stuttgart in 1852. The poems are not only perfect as regards form, but unite a womanly gentleness and poetical creative power in a degree seldom seen in the writings of women.

DROUET, JEAN BAPTISTE, COMTE D'ERLON, French marshal, was born 29th July 1765, at Rheims, entered a regiment of volunteers in 1792, and took part during the years 1793—1796 in the campaigns of the Moselle, Meuse, and Sambre. His important services quickly obtained him promotion. His conduct in the peninsular war was highly distinguished, and elicited the warmest eulogiums from Massena. After the fall of Napoleon, the Bourbons tried to secure his services, and gave him the command of the 16th division, but he was shortly after arrested on the charge of conspiring against the royal family. Managing to escape, he remained in concealment in Lille until the return of Napoleon from Elba, when, putting himself at the head of the troops, he seized the citadel and held it for the emperor, who made him a peer of France. At the battle of Waterloo he commanded the first *corps d'armée*. After the capitulation of Paris, he fled to Bavaria, where he resided until the July revolution, when he returned to France, and received in 1832 the command of the army of Vendée. During 1834—1835, he held the important office of governor-general of Algeria, and in 1843 was elevated to the rank of marshal. D. died 25th January 1844.

DROUYN DE LHUYS, EDOUARD, an eminent French diplomatist and politician, was born at Paris, November 19, 1805, and studied at the college of Louis-le-Grand and the Ecole de Droit. He was at first attached to the embassy at Madrid, whither he proceeded in 1830. In 1840 he was placed at the head of the commercial department under the Minister of Foreign Affairs, and shortly after was elected *député* for Melun; but taking a part hostile to the government, of which he was a subordinate member, he was deprived of his situation by M. Guizot. This gave him fuller scope for the advocacy of his political opinions. He now became an active member of the *Reforme* party, and after the famous banquet of the 12th arrondissement had been interdicted, he signed, along with the other chiefs of the opposition, the accusation drawn up against Mr. Guizot and his colleagues. Elected representative of the people to the Constituent and Legislative Assemblies, by the department of Seine-et-Marne, he was made first a member and then president of the Committee of Foreign Affairs. Here he acted generally with the moderate party. In the first cabinet formed by Louis Napoleon after his election to the presidency (December 1848), he became Minister of Foreign Affairs, and directed the French policy in all the difficult European complications of the year. In 1849 he went to London for a short time as ambassador, and after the *coup d'état* became one of the vice-presidents of the Imperial Senate, and again Minister of Foreign Affairs. Being disappointed at the issue of the Vienna Conference in 1855, he resigned his office. In 1863 he was recalled to his old post, resigning again in 1866. In 1871, he fled to Jersey. He died March 1, 1881.

DROWNING. See ASPHYXIA.

DROWNING, as a mode of capital punishment, has only lately ceased in Europe, and is probably still in use in some other quarters of the world. Tacitus, writing about the end of the 1st c., tells us that the Germans hanged their greater criminals, but that meaner and more infamous offenders were plunged under hurdles into bogs and fens. By the law of the ancient Burgundians, a faithless wife was to be smothered in mud. The Anglo-Saxon codes ordered women convicted of theft to be drowned. The punishment was in such common use throughout the middle ages, that grants of capital jurisdiction ran '*cum fossa et furca*,' i. e., 'with pit and gallows.' The pit, ditch, or well, was for drowning women; but the punishment was occasionally inflicted on men. The doom of the parricide was to be put into a sack and cast into the sea. A canon of Prague, afterwards enrolled in the catalogue of saints, was drowned in 1383, for refusing to reveal the secrets of the confessional. In this instance, perhaps, drowning was allowed to the offender as a matter of favor. So in Scotland, in 1556, a man convicted of theft and sacrilege, was sentenced to be drowned, 'by the queen's special grace.' So lately as 1611, a man was drowned at Edinburgh for stealing a lamb. By that time, the punishment of drowning had become obsolete in England. It survived in Scotland until 1685. The last execution by drowning in Switzerland was in 1652, in Austria in 1776, in Iceland in 1777.

DROYLSDEN, a large and rapidly increasing Lancashire township, a district parish of Manchester, and 4 miles east from Manchester, a station on the Lancashire and Yorkshire Railway. It is situated on an elevated plain; is irregularly built, the houses of brick, but many of them very neat. The cotton manufacture

is extensively carried on; there are also print-fields, dye-works, and copperas-works. Pop. (1871) 6768; (1881) 8679.

DRUGGET, a common felt or other coarse woollen fabric, chiefly used for covering carpets, or as a substitute for a carpet. At one time, also, it was largely used as an article of clothing by the humbler classes, and even yet the *drugget petticoat* is far from uncommon, although it is gradually giving place to cotton fabrics, which have the advantage of greater cleanliness, and of being less liable to retain infectious and contagious poisons.

DRUGS, a name applied to all material agents used in the treatment of disease, when in their crude or commercial forms. See **PRESCRIPTION, CHEMISTS AND DRUGGISTS, AND APOTHECARIES.**

DRUIDISM is commonly spoken of as the religious system of the Gauls and Britons, or of the Celtic peoples. Prof. Rhys, however, in his work on *Celtic Britain* (1883), affirms that the real religion of the Celts was an Aryan Polytheism like that of Italians and Greeks; and that Druidism, in so far as found amongst the Celts of Gaul or Britain, was by them derived from pre-Celtic and non-Aryan aborigines (Ivernians, Iberians, Euskarians, Neolithic men?), and was thus non-Aryan in origin. There is no reason, Rhys says, for holding that D. was found amongst the Brythonic or Kymric races proper, though it was in force amongst the originally Goidelic (Gaelic) people of Wales. Caesar thus describes the character and functions of the Druids: 'They attend to divine worship, perform public and private sacrifices, and expound matters of religion. A great number of youths are gathered round them for the sake of education, and they enjoy the highest honor in that nation; for nearly all public and private quarrels come under their jurisdiction; and when any crime has been committed, when a murder has been perpetrated, when a controversy arises about a legacy, or about landmarks, they are the judges too. They fix rewards and punishments; and should any one, whether a private individual or a public man, disobey their decrees, then they exclude him from the sacrifices. This is with them the severest punishment. The persons who are thus laid under interdict are regarded as impious and wicked people; everybody recoils from them, and shuns their society and conversation, lest he should be injured by associating with them. They cannot obtain legal redress when they ask for it, nor are they admitted to any honorable office. All these Druids have one chief, who enjoys the highest authority amongst them. When he dies, he is succeeded by the member of the order who is most prominent amongst the others, if there be any such single individual; if, however, there are several men equally distinguished, the successor is elected by the Druids. Sometimes they even go to war about this supremacy.'

'At a certain time of the year, the Druids assemble on the territory of the Carnutes, which is believed to be the center of all Gaul, in a sacred place. To that spot are gathered from everywhere all persons that have quarrels, and they abide by their judgments and decrees. It is believed that this institution was invented in Britannia, and thence transplanted into Gaul. Even now-a-days, those who wish to become more intimately acquainted with the institution, generally go to Britannia for instruction's sake.

'The Druids take no part in warfare; nor do they pay taxes like the rest of the people; they are exempt from military service, and from all public burdens. Attracted by such rewards, many come to be instructed by their own choice, while others are sent by their parents. They are reported to learn in the school a great number of verses, so that some remain there twenty years. They think it an unhallowed thing to commit their lore to writing, though in the other public and private affairs of life they frequently make use of the Greek alphabet. . . . Beyond all things, they are desirous to inspire a belief that men's souls do not perish, but transmigrate after death from one individual to another; and they hold that people are thereby most strongly urged to bravery, as the fear of death is thus destroyed. Besides, they hold a great many discourses about the stars and their motion, about the size of the world and of various countries, about the nature of things, about the power and might of the immortal gods; and they instruct the youths in these subjects.'

It is easy to comprehend that this powerful priesthood did all they could to uphold the national cause against the Roman conquerors, and urged the people to rebellion; so much so, that the Emperor Claudius found it necessary to interdict formally the practising of Druidical rites, which seem, however, to have continued down to the extinction of paganism. Besides being priests and teachers of religion, the Druids appear also to have been adepts in the magic arts, and were versed in the mysterious powers of animals and plants. The oak-tree was especially sacred among the Druids. In oak-groves they frequently performed their rites, and they even derived their name from this custom. See the article **CELTS**. They also had a special reverence for the mistletoe, when growing on an oak. According to Pliny, a Druid, clothed in white, mounted the tree, and with a knife of gold, cut

the mistletoe, which was received by another, standing on the ground, in his white robe. The same author gives a curious account of the 'serpent's egg,' worn as a distinguishing badge by the Druids. It was formed, he says, by the poisonous spittle of a great many serpents twined together. Gathered at moonlight, and afterwards worn in the bosom, it was a mighty talisman. All these particulars refer properly to the Druids of Gaul, but Caesar's testimony leaves no doubt that the Druidism of Britain was essentially the same.

In all the countries anciently inhabited by Celts, there are found rude structures of stone, one of the most common forms of which is the so-called *dolmen* (see that article). The older archæologists assumed that these were Druidical altars, but there is no proof that such was their destination or origin: similar structures are found in Scandinavia and many parts of Germany, and to assume in all these countries the presence of Celts, seems too hazardous. The same doubts prevail as to the larger monuments of this kind—the supposed Druidical temples of Amesbury, of Carnac in Brittany, and of Stonehenge (see that article).

DRUM (*druim*), a Celtic word meaning the back, and applied to a ridge of hills, enters into the composition of many names of places, especially in Ireland, as Drumcondra, Drumglass, Drumsheugh.

DRUM (Ger. *trommel*; Fr. *tambour*—a modification of *tabour*; *timbrel* and *tambourine* are other forms of the word *tabour* or *tambour*), a hollow cylinder of wood or metal, having skin (parchment) stretched across one or both ends, upon which the drummer beats with an instrument of wood or metal called a *drumstick*. The drum is used as an instrument of music along with other instruments in bands, and particularly for military purposes. The military drum serves for giving various signals as well as for music. There are three kinds of drum—the *side* drum, the *big* or *base* drum, and the *kettle* drum. Since 1858, the British infantry are supplied with brass side drums, three pounds lighter than those formerly in use, and tuned with screws instead of straps and ropes. The cavalry drum is a copper or brass hemisphere, thus resembling a *kettle*, with a parchment lid. The big drum has both ends covered with parchment. The ancient Romans used small hand-drums—some resembling tambourines, others kettle-drums—in their religious dances; and the Parthians are said to have used them in war to give signals. They are believed to have been first brought into Western Europe by the Crusaders.

DRUM, a name given to a fashionable and crowded evening-party about the middle of the 18th c., at which card-playing appears to have been the chief attraction. The names *Drum*, *Rout*, and *Hurricane*, by which these gay assemblies were known, sufficiently indicate their noisy, promiscuous, and irrational character. Lady Mary Wortley Montagu, writing from Louvère to her daughter in 1753, hints that ladies gave these entertainments to make money at cards to support their extravagance; and adds: 'I find I should be as solitary in London as I am here, it being impossible to live in a *drum*, which, I think, so far from a cure of uneasiness, that it is, in my opinion, adding one more to the heap.' See **ROUT**.

DRUM, SACRED, an object of religious veneration and instrument of magical incantation among the Laplanders in former times. It was hollowed out of a piece of the trunk of a pine or birch, in which certain peculiarities were required, and was covered with skin on the upper side only, the wood being partly left on the under side to serve as a handle.

Figures were painted in red on the skin; the drumstick was a reindeer's horn; and to the drum were appended a large copper ring and some smaller rings. The drum was considered a necessary part of the furniture of every family. The motions of the rings, when the drum was beaten, which might be done only by the head of the family, were supposed to afford indications concerning the results of disease and other future events. The beating of the drum was accompanied with songs, and the person by whom it was beaten often fell into a trance, during which revelations were supposed to be made to him. The sacred drum seems to have been somehow connected with the worship of the sun.

DRUM-MAJOR, as a component member of a regiment, was not much known in the English army till the time of Charles I. There was in earlier times an officer in the royal household called the *drum-major general*, without whose license no one except royal troops might use a drum; but this office fell into disuse. The drum-major, when regularly established, received orders from the major of the battalion concerning the necessary beats or signals, and communicated them to the drummers. The management of the big drum, and the teaching and control of the drummers generally, still devolve upon the drum-major. The 'beats' at present adopted by the British infantry were composed by Drum-major Potter of the Coldstream Guards.

DRUMMER is a component member of every British regiment. His position is slightly superior to that of the private soldier, but

still he is reckoned as one of the rank and file. Besides his ordinary duties (see **BEAT OF DRUM**), the drummer performs the *drumming out*, when a soldier is discharged with ignominy. See **DISCHARGE**. To the drummers is also intrusted the repulsive duty of flogging, when the sentence is passed upon soldiers. A *Drum-head Court-martial* (not now much adopted) has no particular connection with the drummers, but is a hasty council or court-martial held in the field around the big drum.

DRUMMOND, CAPTAIN THOMAS, R.E., was born at Edinburgh in 1797, and during his professional training at Woolwich and Chatham displayed high mathematical and mechanical abilities, with much aptitude for the application of scientific principles to practical affairs. In 1820, he was engaged by Colonel Colby to assist in the trigonometrical survey of the United Kingdom. The inaccessibility of lime having been brought under his notice at a lecture on chemistry, the idea occurred to him that it might be advantageously used on the survey to render distant object visible: he accordingly made experiments, which, with their results, and the first application of the Drummond Light (q. v.) in Ireland, are described by him in the *Philosophical Transactions* for 1826.

A heliostat or reflecting mirror of his invention, described in the same paper, has been employed with success in the survey. Experiments which he made with the view of adapting his 'Light' to light-houses, are detailed in the *Philosophical Transactions* for 1830. When exhibited at Purfleet, it was powerful enough to cast shadows at Blackwell, distant ten miles. Practical difficulties, not yet overcome, prevented the fulfilment of his hopes in this direction; his attention having been diverted to political life, for which he soon proved himself to be eminently fit. As the head of a commission appointed by Lord Grey's government to superintend the fixing of the boundaries of the boroughs under the provisions of the Reform Bill, he performed most ably that laborious and important work. He next acted as private secretary to Lord Althorp, chancellor of the exchequer; and, finally, in 1835, went to Dublin with Lord Mulgrave, as under-secretary for Ireland. Here the knowledge of Irish character and feelings which he had acquired in the survey was of great advantage to him, and by his impartiality, sound judgment, conciliatory disposition, indefatigable energy, and hearty devotion to the work before him, he at once gained the confidence and affection of the people. It was in a letter written by him to the magistrates of Tipperary on the 22d of May 1838 that the memorable words occurred:—'Property has its duties as well as its rights;' an aphorism which instantly flew over Ireland, and continues everywhere to exercise a wholesome influence. But it was perhaps as the head of a commission appointed in 1836 to report on a railway system for Ireland, that D. rendered that country his greatest service by the admirable Report which he had the main labor of producing. So far as the routes recommended have been followed, the expectations of the commissioners have been fulfilled or exceeded; and it is the opinion of good judges, that it would have been well for Ireland had the carefully digested scheme been more fully adopted. By these multiplied labors, however, D.'s strength was overtasked, and he sank on the 15th of April 1840, amidst the grief of the Irish people, and of his intimates in public life, who had hoped to see him rise to some of the highest offices in the state. A statue by Hogan was erected to his memory by public subscription, in the Royal Exchange at Dublin; and a memoir of his professional life (abridged in Knight's *English Cyclopædia of Biography*, ii. 647) was published in 1841 by Captain Larcom, R.E., in the 4th volume of *Papers on Subjects Connected with the Duties of the Corps of Royal Engineers*.

DRUMMOND, WILLIAM, OF HAWTHORNDEN, a poet of considerable celebrity, was descended from a very ancient and noble Scottish family, and was born 13th December 1585. He was educated at the High School of Edinburgh, and afterwards at the University of that city, where he took his degree of M.A., July 27, 1605. On leaving college, he was sent to the continent in order to study law, for which he exhibited great aptitude. He returned in 1609, and his father dying in the following year, he retired to the paternal estate at Hawthornden, which, according to the learned Ruddiman, 'was a sweet and solitary seat, and very fit and proper for the muses;' and there, with an interval of eight years of foreign travel, spent his life in his favorite literary pursuits. He died 4th December 1649; his death, it is said being hastened by his excessive grief for the fate of Charles I. His principal works are the following: *Tears on the Death of Mœliades*—Prince Henry, son of James I.—(Edin. 1613); *Poems: Amorous, Funerall, Divine, Pastorall, in Sonnets, Songs, Sertains, Madrigals* (1616); *Fourth Feasting* (1617); *Polemo Mithras* (Oxford, 1691).

After relinquishing poetry, he wrote a sectional History of Scotland, known as the *History of the Five Jameses*. A standard edition of his poems was edited for the Maitland Club by Dr. Irving and Lord Dundrennan in 1832. Smaller editions appeared in 1833 and 1836, and an exhaustive Life, with an account of his

writings, by Professor Masson, in 1873. D. enjoyed the friendship of many of his literary contemporaries, including Drayton and 'rare' Ben Jonson, the latter of whom visited him at Hawthornden in 1619. D.'s *Notes of Ben Jonson's Conversations with William Drummond of Hawthornden*, is a characteristic record of the literary spirit of the time.

D.'s verse abounds in the conceits, antitheses, and hyperboles of the period, and gives indication of a mind indulging itself in melancholy. His sonnets are the best specimens of his muse, although even in them one looks in vain for sustained harmony or great originality of thought.

DRUMMOND ISLAND, within the limits of Canada, is in Lake Huron, being the most westerly of the Manitoulin chain. It measures 20 miles by 10, and lies about 30 miles to the east of Mackinaw, an island in the strait of the same name, which pours Lake Michigan into Lake Huron.

DRUMMOND LIGHT, or LIME-BALL LIGHT. The heat given out during the combustion of a mixture of hydrogen and oxygen gases, or of coal gas and oxygen, is very intense; and when the mixture is directed on an infusible substance such as lime, a most brilliant light is evolved. Captain Drummond, R.E., originally proposed the employment of this light in the trigonometrical survey of Great Britain, and constructed apparatus for its production. See **DRUMMOND, THOMAS**. The most convenient form of the apparatus is represented in the figure, where the mixed gases escaping by the jet *a*, being set fire to and made to impinge upon the cylinder of lime *b*, raise the surface of the latter nearest the jet to a white heat, accompanied by a dazzling light.

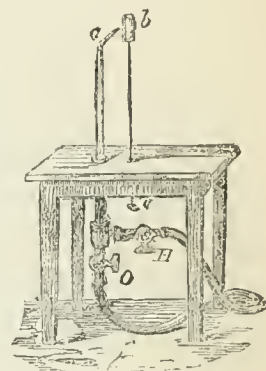
As minute portions of lime become detached and are volatilized from the spot on the lime on which the jet of burning gases strikes, it is necessary to expose a new surface of lime to the gases, and for this purpose the screw *C* may be turned by the hand or by clockwork. The hydrogen and oxygen ought to be confined in separate gas-holders or bags, and to be brought by different tubes, *H* and *O*, provided with separate stop-cocks, to within a short distance of the exit jet. The common tube through which the mingled gases pass to the jet is about six inches long by two-thirds of an inch in diameter; and in Mr. Hemming's construction the tube is very closely packed, full of very fine brass wire, which is afterwards wedged in by a stout wire being driven down the center. The object of the fine wires is to prevent the return of the flame, which might lead to a disastrous explosion.

When the rays from this light are concentrated by a parabolic reflector, it can be seen at immense distances. Thus, on the 31st December, 1845, at half-past 3 P.M. (daylight), the light was exhibited on the top of Slieve Donard, in county Down, and was seen from the top of Snowdon, a distance of 108 miles; and in other instances the D. L. has been seen at distances up to 112 miles. The employment of coal-gas instead of hydrogen has greatly increased the applications of the D. L., and it is now often used in magic-lanterns and other apparatus where great brilliancy and penetration of light are required. It has been used lately on the continent with great effect in illuminations. Great caution should at all times be exercised in the preparation, storing, and employment of the gases, as many dangerous explosions have occurred. Little heat is evolved from the D. L., nor does it vitiate the surrounding air, or consume its oxygen.

DRUNKENNESS. See **INTOXICATION**, and also **TEMPERANCE**.

DRUPE, in Botany, a succulent fruit containing a single seed or kernel, usually enclosed in a hard 'stone,' the *endocarp*. The succulent part is the *mesocarp*. Examples are familiar in the fruits generally known as stone-fruits, the peach, plum, cherry, &c. In the almond, the mesocarp is not succulent, yet the fruit otherwise possessing all the characters of a D., receives that name. It may be regarded as intermediate between a D. and a nut. The fruits of the genus *Rubus* (Raspberry, Bramble) are composed of many small aggregated drupes, upon a common receptacle. The date is a D. in which the hard 'stone' is represented by a membrane.

DRURY, DRU, a goldsmith, silversmith, and cutler, in London, where he was born, 4th February 1725; was devoted to the study of entomology and the collection of exotic insects. His *Illustrations of Exotic Entomology* (2 vols., Lond. 1773–1782), a work unrivaled at the time of its publication for the accuracy and beauty



Drummond Light Apparatus.

of its figures, is still in high repute as a book of reference. D. was also assiduous in his endeavors to acquire information concerning the habits of insects. He died 15th January 1804.

DRUSES, a remarkable people who inhabit a district in the north of Syria, comprising the whole of the southern range of Mount Lebanon and the western slope of Anti-Lebanon. In this district they hold exclusive possession of about 40 towns and villages, and divide the possession of about 200 more with the Maronites (q. v.), while 80 villages in other parts of Anti-Lebanon are peopled by them. The inhabitants of the Lebanon afford a remarkable illustration of the amalgamation of races. After the second captivity of Israel, Esarhaddon re-peopled the wasted strongholds of Samaria with certain fierce tribes, some of whom, called in the Scriptures Cutlites, and known in subsequent times to the Greeks as Carduchi, and familiar to us as Kurds, settled in Lebanon. From them the present D. are supposed to have originally sprung. More than a thousand years later, a fresh colonization took place.

The Mardi, a warlike tribe who dwelt to the north of the Caspian, originally of Persian extraction, were transplanted thither by Constantine IV., in 686 A.D., to the number of 12,000, to act as a bulwark against Mohammedan invasion. The Arabs also, in sweeping through the mountain-fastnesses, left a permanent impression there. Thus, Cutlites, Mardi, and Arabs, or rather Mohammedans of various races, have combined to form that strange being—the modern Druse. It has also been supposed by some that there runs in his veins not a little of the blood of the Crusaders, but this is doubtful. No immigrations, however, of any importance into the country of the Druses took place after the close of the 10th c.; and this period seems naturally to conclude the first great section of Druse history.

The nationality of these mountaineers having now been consolidated, their peculiar and mysterious religion began gradually to be developed. Hakem Biamr Allah, or Bemrillah, calif of Egypt, and a Nero in cruelty, was the author of this system. He affirmed that he was the representative of God, and, having enlisted his confessor, Darazi, in his cause, he prepared to propound his doctrine. In the 470th year of the Hegira (1029 A.D.), the divine nature of Hakem, or rather the incarnation of the Spirit of God in him, was publicly announced at Cairo. This revelation, however, was unfavorably received by the mob. Hakem's confessor, Darazi, narrowly escaped the fate of a martyr to the impostures of his master. Retiring, however, to the fastnesses of the Lebanon, he there began to inculcate the principles of the new faith; and although he never acquired any mastery over the sympathies of the mountaineers, he at least left his name to them; for there can be little doubt that the name Druses is derived from that of Darazi. Hamzé, a Persian mystic, and successively the disciple and vizier of Hakem, introduced into the newly promulgated religion all the elements of attraction and strength which it possesses; and him the D. venerate as the actual founder of their faith.

The D. form one of the very few sects among whom proselytism is discouraged. They are remarkable conservatists. For 800 years they have maintained a distinct religious and political independence and nationality. Into their faith the doctrines of the Pentateuch, the Christian gospel, the Koran, and the Sufi allegories, are wonderfully interwoven. They reject, however, the seven points of Islamism, substituting for them the following seven:—1. Veracity (to each other only); 2. Mutual protection and resistance; 3. Renunciation of all other religions; 4. Profession of the unity of Hakem as God; 5. Contentment with his works; 6. Submission to his will; 7. Separation from those in error, and from demons. They believe in one God in whom there are no parts, to whom they ascribe no attributes, before whom the tongue ceases to utter, the eyes to behold, but who has revealed himself ten times upon the earth under the form and name of mortal men.

In Hakem, so Hamzé taught, had God revealed himself for the tenth and last time. They also believe that the number of existing souls never varies, and that all the souls in life now, have lived, vested in some human form, from the beginning of the world, and will so continue to exist till the end of it; that when a man dies, his soul puts on a fresh humanity, which occupies a rank in moral dignity corresponding to the purity or impurity of the past life. But although they believe, in this sense, in the transmigration of souls, they also believe that after the lapse of ages, when the soul will have been purified from every stain, there will come a period of rest. As a religious body, the D. are divided into two classes: the Akals, or those initiated into the Druse mysteries; and the Djahils, the uninitiated. The former do not adorn themselves with gold, or wear silk, embroidered, or fanciful garments; they forbear using wine, spirits, tobacco, and other luxuries, never swear, utter obscene language, or lie. The latter are free from all religious duties. But, however rigid the profession of the Akal or initiated Druse, he is taught that his practice

may be conducted in some cases on the principal of expediency. To be truthful, he is taught, is desirable; but when concealment is necessary, then equivocation, or even falsehood, may be practised.

Previous to 1840, Druse and Maronite lived on terms of intimacy and friendship. At that period, however, dissension sprang up between the two tribes, and proved to be the introduction to years of intermittent warfare. The strife reached its climax in 1860. From May to October of that year, accounts of the fearful barbarities practised by the D. upon the Maronites followed each other with appalling frequency, until the indignation of Europe was roused against them. A conference of the five Powers which had guaranteed the independence of Turkey met at Paris, and it was resolved that a French army should proceed to Syria to chastise the D., and that, at the same time, a European Commission should, on the spot, make inquiry as to the facts. The troops reached Syria in August 1860. They could not, however, get at the D., who retired into the Desert of the Haouran. In the meanwhile, it was ascertained beyond all doubt that the Turks, and the low fanatical mob of Damascus (who have frequently been confounded with the D., because they fomented their passions), were mainly chargeable with the crimes that had been committed; and that the retaliation of the Maronites was equally vindictive and horrible. It is stated that the Maronite leaders—in most cases bishops—on being asked to furnish sworn lists of such of the D. as, from the unusual atrocity of their crimes, were worthy of death, sent in a list demanding 4946 heads; refusing, however, to bring forward any particular charges. Punishment was inflicted on those who were really to blame. While the French troops remained in Syria, the Turks were compelled to punish the chief Mohammedan criminals, a considerable number of whom, including Achmet Pasha, the governor of Damascus, were shot.

In June 1861, the troops returned to France, and the commissioners drew up a new constitution for the Lebanon, finally revised and signed on 6th September 1864. Under it, the Lebanon is to be ruled by a Christian governor, appointed by the Porte; and to be divided into seven districts, under chiefs of the prevalent religion in each. The result was the appointment, as governor, of Daoud Pasha, an Armenian Christian, and of 7 chiefs (4 Maronite, 1 Druse, 1 Orthodox Greek, and 1 Separatist Greek). The constitution did not satisfy the Maronites, whose revolt, under Joseph Karam, kept the Lebanon in a very unsettled state till 1867. During this period, the governor had to restrain the D. from attacking the Maronite villages in the absence of their defenders. The D. are about 80,000 in number; they are a brave, handsome, and industrious people, and can almost all read and write. They had no superior educational establishment until Daoud Pasha founded and endowed one at Abey. Polygamy is unknown among them. They have, with incredible toil, carried the soil of the valleys up and along the hillsides, which are laid out in terraces, planted with mulberry, olive, and vine. Their chief trade is the manufacture of silk. Corn is also raised, though in very small quantity. Deir-el-Kammer is the principal town. See *Druses of the Lebanon*, by the Earl of Carnarvon; Guy's *La Nation Druse*.

DRUSUS, the name of a distinguished family of the gens Livia, which contributed a large proportion of eminent men to the Roman commonwealth. The most conspicuous of the Drusi were: 1. M. LIVIUS DRUSUS, tribune of the people in 122 B.C., who made it the business of his public life to thwart the democratic policy of his colleague, C. Gracchus, and uphold the cause of the senate and nobles, which he did with much skill and ultimate success. 2. His son, who bore the same name as himself, and whose dangerous and daring political intrigues, conducted partly for the benefit of the aristocratic party whose sympathies he inherited, and not less for his own aggrandizement, kept Rome in perpetual turmoil and disorder from 100 B.C. till his death in 91 B.C. Though identified by birth and sympathy with the patricians, Drusus, to win the people, renewed some of the most liberal measures of the Gracchi, and carried agrarian and frumentarian law. During the latter years of his life, he contrived to gather into his own hands the threads of the various political movements which resulted in the Social War; but his almost incredible pride and arrogance had made him so many enemies, that his death, in the flower of his age, was regretted as little by his friends as by his foes. 3. The most illustrious of the Drusi was Nero Claudius Drusus, commonly called Drusus Senior, the stepson of the Emperor Augustus, and younger brother of the Emperor Tiberius. He was born in 38 B.C., and as he grew up, developed splendid personal qualities as well as the highest capacity for civil and military affairs. He began his public career in 19 B.C., and signalized himself when only 23 years old by his defeat of the Rheti and other Alpine tribes which infested the north of Italy.

In 13 B.C. he was sent into Gaul, then in revolt, and, after crushing the rebels there, pushed across the Rhine in pursuit of their German allies. In this campaign he subdued the Siambri

and Frisii, and forced his way to the German Ocean, being the first Roman general who had done so. From this time he made the business of his life to establish the Roman supremacy in Germany, partly by conquest, and partly by the execution of great military works. Among these latter may be mentioned the canal joining the Rhine with the Yssel, the two bridges over the Rhine itself, and the embankments of the Vahalis, the Waal. In 11 B.C., he conquered the Usipetes, the Cherusei, and the Suevi; in the following year, the Chatti, the Nervii, and was prosecuting the work of subjugation in 9 B.C., when a fall from his horse cut short his brilliant career in his 30th year. For his exploits in Germany, Drusus was rewarded with the title of Germanicus, but care must be taken not to confound him with the celebrated Germanicus, his own son. See GERMANICUS.

DRY PROCESS, in Photography. Reference to the article **COLLODIONIZED PAPER PROCESS** will show that the collodionized glass-plate, on being withdrawn from the bath, previous to, and during exposure in the camera, has mechanically adhering to its surface a quantity of solution of free nitrate of silver, and it is partly upon the presence of this salt that the extreme sensitiveness of wet collodion plates depends. This, however, is not the sole cause of sensibility to actinic rays; carefully conducted experiments fairly lead to the assumption, that the molecular arrangement of the ultimate particles of iodide of silver, and of the pyroxyline, forming, as it were, the network of the film while wet, materially affect this necessary condition; and it is the object of what is termed a *dry process* to preserve this molecular arrangement as far as possible unaltered, notwithstanding the disturbing influence which would necessarily be exerted by the desiccation of the film. This desirable end for traveling photographers is accomplished with more or less certainty by the employment of solutions of various substances, which are poured over the film after the adhering nitrate of silver has been removed by copious washing with water. The heterogeneous character of the substances so used goes far to prove that their action is principally *mechanical*, they being selected from the animal, vegetable, and mineral kingdoms. Among the first may be mentioned honey, gelatine, glycerine, milk, and albumen; among the second, syrups, gum, wine, beer, balsams, and resins added to the collodion, and linseed tea; and among the third, chloride of calcium, nitrate of zinc, and nitrate of magnesia. The plate, on its removal from the sensitizing bath, being well washed with water, any one of these substances is dissolved in water in suitable proportion, and applied to the surface of the plate by pouring on and off several times. It is then set up to drain and dry on folds of bibulous paper in a dark closet or box. The plate is then ready for use. The pictures obtained on plates so prepared do not suffer by comparison with those taken by the wet collodion process; the only drawback to their use being a slight diminution in the degree of sensibility to light.

DRY ROT, a kind of decay, very often rapid, to which timber is subject, without the presence of much moisture. It has proved ruinous to many valuable edifices, and has been the cause of many serious accidents. The ends of joists are often affected by it, so that upon being burdened with even a slight additional load, they are ready to break off by the wall; and the process of destruction has often gone far without a suspicion being entertained of anything wrong. Dry rot is occasioned by *Fungi*, the *mycelium* of which diffuses itself through the substance of the timber, destroying its texture, and reducing it to a fragile or even friable mass. *Merulius lacrymans*, *M. vastator*, and *Polyporus destructor* (see **AMADOU**), are species very commonly productive of this mischief; the first being the most common and formidable dry-rot fungus in Britain, and the last having the same pre-eminence in Germany. Its German name is *Hauschwamm*. Other fungi, however, produce the same effects where none of these are present; but besides the species which are well ascertained, there are some forms of mycelium not unfrequently occurring as dry rot, of which it is uncertain to what fungus they ought to be referred, as they have not been observed to develop themselves in any perfect form, whilst also it is not known what different modifications of appearance the mycelium of the same fungus may exhibit in different circumstances. Very destructive ravages have been ascribed to different species of *Sporotrichum*, particularly in the naval yards of Britain; but the genus is altogether a doubtful one, and not improbably consists of mere forms of undeveloped mycelium. Several species of fungi are often present together in timber affected with dry rot. Some of them penetrate deeply into the substance of the timber, others spread more superficially, but attract moisture from the atmosphere, which hastens decay. This is the case with *Merulius lacrymans*, which first appears in small white points; a filamentous substance radiating from these gradually forms broad patches, sometimes many feet in diameter; from these long creeping shoots often proceed, and a network of filaments penetrates into every crevice. The species of *Polyporus* more generally fill the whole mass of the timber with delicate

filaments, which destroy the cohesion of its fibres. *Dadalea quercina* appears in the form of leathery laminæ, often in the strongest oak, and the delicate threads of mycelium penetrate every duct and cavity, reducing the whole to a fungous mass. Beautiful orange tufts sometimes appear, supposed to be the mycelium of species of *Coprinus*.

Of the causes of dry rot, stagnation of air, as behind a wainscot or under a floor, is certainly one of the chief, and a knowledge of it suggests means of prevention which may often be easily and most advantageously employed. Another principal cause is insufficient drying of the timber itself; and much of the prevalence of dry rot is not improbably due to the practice of felling oak in spring for the sake of the bark, when the wood is full of sap. Any circumstance which may tend to render the sap acidulous, greatly increases the liability to dry rot. The production of fungi takes place with unusual rapidity when by fermentation or otherwise an acidulous condition of organic substances is produced. A fermentation and chemical change in the albuminous constituents of the wood, is not improbably the immediate cause of dry rot, providing a soil suitable for the vegetation of fungi.

For the prevention of dry rot, various processes have recently begun to be employed, the object of which is to fill the pores of the wood with some chemical substance. Sir William Burnett used chloride of zinc; Mr. Bethel used creasote; and Mr. Payne, lime, with silicate of potash. The process most generally approved, and apparently most successful, is that of Kyan, called *Kyanising* (q. v.), in which a solution of corrosive sublimate is introduced into the pores and cells of the timber by means of an air-pump. The salts of mercury have been found to be more unfavorable to the development of fungi than any other chemical substances.—But without the use of any such means, we have abundant evidence that well-seasoned timber, in favorable circumstances may remain unassailed by fungi for many centuries. England contains structures of which the timber is known to be nearly 1000 years old; wood in a state of perfect preservation was brought by Lord Elgin from behind the frieze of the Parthenon, where it must have been placed more than 2000 years ago, and the British Museum contains a block of charred wood found by Mr. Layard in his excavations at Nineveh.

DRY STOVE, in Gardening, a hothouse in which the air is kept less moist than in the bark stove. In structure and in management, except that the temperature is kept higher, it agrees more nearly with the green-house. The dry stove is particularly adapted to succulent plants. As free an admission of air is allowed in the dry stove as is consistent with the maintenance of the temperature.

DRYADS, an inferior order of deities in the mythology of Greece. Their name is derived from the Greek word for an oak-tree (*drus*). They were looked upon as the guardians of the larger kinds of forest trees, along with which they came into being, and with which they died.

DRYDEN, JOHN, was born at Aldwinckle, in Northamptonshire, on the 9th August 1631. His father, Erasmus Dryden, was the third son of Sir Erasmus Dryden, created a baronet in 1619. D. received the rudiments of his education at Tichmarsh, and was afterwards admitted a king's scholar at Westminster School, under Dr. Busby. Here, in 1649, he wrote an *Elegy on the Death of Lord Hastings*, and some commendatory verses on the *Divine Epigrams* of his friend John Hoddgeson; both of which performances were published in 1650. In May 1650, he was elected to a scholarship in Trinity College Cambridge; he took the degree of Bachelor of Arts in 1653—1654; and was made Master of Arts in 1657. His father dying in 1654, put him in possession of an estate worth £60 per annum, of which sum his mother had life-interest in a third. After leaving the university, he proceeded to London, under the patronage of Sir Gilbert Pickering, who was faithful to the Protector, and seems to have aroused for the time the same feeling in his protégé, whose first poem of importance was entitled *Heroic Stanzas on the Death of Cromwell*. On the return of Charles II., D., with equal splendor of diction, and perhaps with equal sincerity, congratulated the Restoration.

The publication of a poem, entitled *Astræa Redux*, led to a breach between the poet and the family of Sir Gilbert Pickering, and he now became author by profession. He turned his attention to the stage, planned *The Duke of Guise*, and wrote his first acted play, *The Wild Gallant*. In December 1663, he married a daughter of the first Earl of Berkshire, with whom he received a portion; and in 1670 he was appointed poet laureate and historiographer, with a salary of £200 a year. He afterwards entered into an engagement with the theaters to supply them with three plays each year, for which he was to receive annually from £300 to £400; but as he did not fulfil his share of the contract, it is not probable that the theaters fulfilled theirs. In 1671, the Duke of Buckingham produced his attack on the English heroic drama, of which D. was the head. This satirical piece was entitled *The Rehearsal*, and when it was brought on the stage, the town was

amused. Although personally satirized, D. endured his castigation in silence, and, waiting his opportunity, immortally revenged himself on the witty and profligate duke in the *Absalom and Achitophel*. This magnificent satire arose out of the political commotions of the times, and is an elaborate defence of the king against the Whig party. Charles II. is *David*; Monmouth, *Absalom*; Cromwell, *Saul*; Buckingham, *Zimri*; and Shaftesbury, *Achitophel*. Its success was amazing; it ran through five editions within the year. This great poem appeared in 1681; and enraged at its success, D.'s enemies hovered around him like a cloud of venomous gnats. In the same year he published *The Medal*. Elkanah Settle, one of the most virulent of his foes, replied with some effect; and D., thoroughly roused, issued next year the *Mac Flecknoe*, and the second part of *Absalom and Achitophel*. These satires were as overwhelming as the Italian battles of the first Napoleon; D.'s enemies were crushed for ever, and he remained during his lifetime the undisputed king and lawgiver of English literature.

After the death of Charles II., D. became a convert to the Roman Catholic faith. This event was announced to the world by the publication of *The Hind and Panther*, in 1687. For this change of faith, he has been much abused. Macaulay calls him 'an illustrious renegade.' Mr. Bell, one of his biographers, strenuously defends his conscientiousness. At the Revolution, he was deprived of his laureateship, and somewhat straitened in circumstances, he fell back upon his old occupation of writing for the stage. His translation of *Virgil* was begun in 1694, and completed by the close of 1696. A month after the publication of *Virgil*, appeared the *Ode on Alexander's Feast*. In 1698, he commenced his *Fables*, and completed them in a year and a half. His last work was a masque, with prologue and epilogue. He died on the 1st May 1700, and was buried in Westminster Abbey, where a monument was erected to his memory by John, Duke of Buckingham.

Although the great bulk of D.'s works are composed of plays, and although these are, for the most part, devoid of character, feeble in sentiment, false to all external nature, and exaggerated in expression, he remains one of the prime glories of English literature. His *Satires* and his *Fables* are masterpieces. In these he is almost always masculine and natural, and his versification flows on broad, deep, and majestic. Nor is it only as a poet that he excels; his prefaces and *Essay on Dramatic Poesy* prove him to be a master of 'that other harmony of prose.' His works in 18 vols. were edited by Scott.

DRYING-MACHINES. The ordinary process of drying clothes and fabrics by exposure in the open air, has been found too tedious for the bleacher, dryer, and large laundry establishments; and hot air chambers have been extensively used; but a great improvement has been lately made by using the principle of centrifugal force to throw off the greater part of the moisture. The drying-machine commonly used consists of two drums or cylinders open at the top, the inner one, into which the goods are packed, is perforated at its sides, and made to revolve with great velocity either by steam, water, or hand-power. The action of the drying-machine is precisely the same in principle as that witnessed when the housemaid is *trundling* a mop, or of the dog when he shakes himself on coming out of the water. The use of the outer cylinder is merely to catch the drops of water thrown out, and prevent the inconveniences that would result from its distribution through the apartment. A pipe connected with this outer drum carries the water away. The drying is not, however quite completed by such machines; a very slight degree of moisture, just perceptible to the touch if the goods are pressed against the cheek, still remains. This is expelled by open-air or hot-chamber drying. These drying-machines are commonly called 'extractors' by dyers. A simpler and cheaper drying-machine has been lately introduced for domestic use. It consists of two rollers mounted parallel, and one above the other, with an adjustment to vary the distances between them. One end of the article to be dried is inserted between the rollers, which are then brought as close as possible together, and one roller is turned by a handle, the other being free to revolve, turns also as the clothes pass between them—the moisture in this case being extracted by pressure, as in the common process of 'wringing.'

DRYING OILS. See **OILS**.

DRY'NESS, a technical term in painting, used to indicate a style in which the drawing is hard, angular, and formal, and the color deficient in harmony and mellowness, though not necessarily in power or richness. The earlier works, both of the Italian and Flemish schools, all more or less partake of this defect, and it is the most prominent characteristic of those of their imitators to whom the name pre-Raphaelites has been given.

DRYOBALANOPS. See **CAMPHOR**.

DRY'OPHIS, a genus of serpents of the family *Colebriidae*, allied to *Dendrophis*, and, like those of that genus, of very elongated

form, and living mostly among the branches of trees, but distinguished by a projecting muzzle—a curious prolongation of the upper jaw, which in some is slender, in some leaf-like. They are natives of the East Indies, Madagascar, and tropical America.

DRY'-POINT, a sharp etching-needle, used to incise fine lines in copper, without the plate being covered with etching-ground, or the lines bit in by acid. See **ENGRAVING**. The work produced by the dry-point is not only very delicate, but it wears less in printing than lines produced by the action of acid.

DU'AL, in Grammar, is the form given in some languages to a noun or a verb, when only two things are spoken of. Thus, in Greek, *pater* is father; *patere*, two fathers; *pateres*, fathers. To have a dual number in addition to a plural, is often spoken of as a refinement of language. It argues, however, a higher degree of abstraction to be able to conceive every subject as one, or more than one, than to require three classes—one, a pair, and more. Accordingly, it is only in some of the more ancient languages that we find traces of a dual number, and it becomes lost as the power grows of analyzing concrete impressions. Sanscrit, ancient Greek, Arabic, and Hebrew have the dual number, the last only in nouns. Modern Greek has lost the dual. The only trace of it in Latin is in the two words *duo*, and *ambo*, both. It is wanting in the Germanic languages, with the exception of the ancient Gothic, which had a dual form of the verb. In Anglo-Saxon, there was a separate form of pronoun for 'we two' (*wit*) and 'ye two' (*git*).

DU'ALISM is the name given to a philosophical theory, according to which some two principles, of different nature, original, and incapable of being derived the one from the other, lie at the bottom of everything; as, for example, the ideal and the real, or the material and the thinking substance. In a narrower and theological sense, dualism means the assumption of two original beings, a good and an evil, as in the doctrine of Zoroaster, or of two distinct principles in man, a bodily and a spiritual. The opposite of dualism is Monism.

DU BARRY, MARIA JEANNE GOMARD 'DE VAUBERNIER, COMTESSE, favorite of Louis XV., was born August 19, 1746, at Vaucouleurs. Her mother was a dressmaker, and her father, or rather her reputed father, was an exciseman named Vaubernier. After the death of her father, she stayed for some time at a convent, but left it when fifteen years of age; went to Paris, and assuming the name of Mademoiselle Lange, succeeded in obtaining employment in the establishment of a fashionable milliner; but in a short time renounced all honest occupation, and forming a connection with a disreputable house, met there the Comte Jean Du Barry, one of the most noted *roués* of his day, who made her his mistress. This person afterwards introduced her to Lebel, valet-de-chamber of Louis XV., who presented her to his royal master, then nearly 60 years of age. She was at this time remarkably handsome, to some extent witty, and had a frankness, or it might be, a vulgarity of manner that amused the doting monarch. Desirous that *la petite Lange* should obtain a title, and be introduced to court, Louis prevailed upon Comte Guillaume Du Barry, brother of the comte already mentioned, to marry, and thereby confer his title upon the favorite. Accordingly, in 1769, she was presented to court as the Comtesse Du Barry. After this period, many of the most powerful courtiers abused themselves before her. D'Aiguillon became her confidant, and in concert with her, ruled the doting king; the Chancellor Maupeou claimed a remote relationship with her, and by her influence succeeded in dismissing and exiling the parliament in 1771; the Abbé Terray, comptroller general of finance, was *suave* to her, though insolent to all the rest of France. At no period, perhaps, was the court of France more openly and outrageously immoral than during the supremacy of this strumpet.

On the death of Louis, however, in 1774, Du B. was dismissed from court, and sent to live in a convent near Meaux. She was afterwards removed to her residence of Luciennes, and while living there was allowed a pension by Louis XVI. Some time after the outbreak of the Revolution, she went to London to dispose of her jewels. On her return, Robespierre caused her to be arrested, July 1793. In November, she was tried before the Revolutionary Tribunal, and accused of 'having wasted the treasures of the state, of conspiracy against the republic, and of having, in London, worn mourning for the late king.' She was condemned to death, and was sent to the guillotine 7th December 1793. Of all the women who mounted the scaffold during the Revolution, Du B. exhibited the least courage. She implored the 'good people' to deliver her, and Monsieur the executioner to prolong her miserable life for one moment only. The single good thing that history records of her, is her patronage of various artists and men of letters, but there is little reason to believe that it originated in anything higher than her dread of epigram and caricature. She had neither taste nor knowledge, and cared only for sensual gratifications and excitement. It is estimated that she cost France 35,000,000 francs. The *Mémoires* published under her name (6 vols., Par. 1829—1830) are not reliable. The only work, it seems, which can

be consulted with confidence is Lacretelle's *Histoire de France pendant le 18^{me} Siècle*.

DUBITZA, a fortified town of European Turkey, is situated on the northern frontier of Bosnia, on the right bank of the Unna, and at a point about ten miles from its confluence with the Save, of which it is a tributary. During the 16th and 17th centuries, it was a bone of contention between Austria and the Porte, and was repeatedly lost and regained by the latter. It is chiefly notable, however, for its heroic but unavailing resistance to the Austrians in 1788. D. was subsequently restored to the Turks, but with the rest of Bosnia passed under Austrian administration in 1878. Pop. 6000.—On the opposite bank of the Unna, in Croatia, stands Austrian Dubitza, a market town of 3200 inhabitants.

DUBLIN, a maritime county in the east of Leinster Province, Ireland, and containing the metropolis of that country; bounded, N., by Meath; E., by the Irish Sea; S., by Wicklow; and W., by Kildare and Meath. It is the smallest but two of the Irish counties, being 32 miles long, and 18 (average 12) broad; area, 354 square miles, of which $\frac{5}{11}$ ths are arable, and $\frac{4}{11}$ th in wood. The coast, from its indentations with creeks and bays, is 70 miles long, and off it lie several isles. Dublin Bay, one of the finest in the kingdom, is 6 miles broad, 6 deep, with a sweep of 16 miles. It has two precipitous hills, about 500 feet high at its north and south ends; but the head of the bay is low and sandy. The coast is defended by 26 martello towers. The surface is mostly a level rich plain, with slight undulations, but rising in the south in a hill-range, the highest point of which is Kippure, 2473 feet.

North of this range, the only prominent eminences are Lambay Isle, or Ireland's Eye, and Howth Head, 503 feet. The only river of note is the Liffey, which runs through Dublin city into Dublin Bay. The Royal and Grand Canals run west through the county, and unite the Liffey and the Shannon. The chief rocks are carboniferous limestone, granite, and some metamorphic rocks and greenstone. There are copper and lead mines near Scalp. Fullers-earth and potters-clay occur. Iron and manganese are found on Howth peninsula. Granite and limestone are much used in building. There are many mineral springs, including ten saline purgative ones, within the city of Dublin, and some tepid ones of 75° F. The climate is mild. The soil is generally a shallow calcareous gravelly clay. In the north and west are grazing and meadow farms, and around Dublin city, villas, kitchen-gardens, dairies, and nurseries. D. is the best cultivated county in Ireland. In 1881, 88,724 acres, not very much under half the county, were in crop. The chief crops are oats (in 1881, 14,202 acres), wheat (5606 acres), potatoes (9829 acres). There are important fisheries along the coast of turbot, brill, sole, plaice, cod, ling, haddock, whiting, and oysters. The manufactures (chiefly of cottons, stockings, and embroidered muslins) are mostly confined to the city and the vicinity of the metropolis, and are of more value than in any other Irish county. Balbriggan is famed for its hosiery. The chief exports are from Dublin city. D. is divided into 9 baronies, and contains 76 civil parishes, and 10 parts of parishes. The chief towns are Dublin, the capital of Ireland, and Kingstown. Pop. (1881), exclusive of Dublin city, 168,666; including the city, 418,152. At the end of 1880, the county had 60,315 pupils on the rolls of its National schools. The county sends six members to parliament—two for D. county, two for Dublin city, and two for Dublin University. The manners, appearance, dress, and cabins of the lower orders in D. county differ less from those of the interior of Ireland than would be expected. There are numerous antiquities in different parts of the county.

DUBLIN (Irish, *Dubh-linn*, 'black pool'; the *Eblana* of Ptolemy), the capital of Ireland, stands on the river Liffey, where it disembogues into Dublin Bay, in lat. 53° 20' 38" N., and long. 6° 17' 30" W. It covers an area of 1300 acres, but its parliamentary boundary comprises an area of about 5000 acres, and its municipal boundary nearly 4000 acres. Much of D. is built on land reclaimed from the sea, a work which still continues; and the ground is generally flat, with a very few undulations, scarce deserving the name of hill. The river, running from west to east, divides the city into two almost equal portions. The aristocratic parts are the south-east and north-east, containing many beautiful squares, with splendid streets and terraces. The center, and the north-west quarter are the great emporiums of trade, and the residence of the middle classes, many of whom, however, have their private houses in the suburbs. The south-west division, part of which is called the 'Liberties,' once the seat of the silk trade, is the most filthy and degraded portion of the city. The streets in this quarter are narrow, crooked, and irregular, while in the fashionable portions they possess a totally opposite character. The city is surrounded by a 'Circular Road' of nearly 9 miles in length, forming a favorite drive and promenade.

In the newer parts of D., the streets run at right angles to one another, and are remarkable for their breadth and the uniformity of their architecture, which however, is so varied as to avoid monotony. The most imposing one is Sackville Street, which is 120

feet broad, and nearly 700 yards long; at its north end stands the Rotunda, with Rutland Square—in its center, the beautiful Ionic portico of the General Post-office, and Nelson's Monument (upwards of 130 feet high)—while on the south, it is terminated by Carlisle Bridge, and a wedge-like block of noble houses formed by the converging sides of Westmoreland and D'Olier Streets. A peculiar feature of D. is its squares, which are very numerous, spacious, and well kept. Stephen's Green, the largest, occupies an area of nearly 20 acres, and is about a mile in circuit. Somewhat smaller, but more elegant and aristocratic, is Merrion Square (13 acres). The large park and squares of Trinity College occupy more than 40 acres.

The public buildings of D. are famed for their number and grandeur, and appear to more advantage since the dwelling-houses are built of brick. In the first class may be mentioned the Bank of Ireland (formerly the House of Parliament), Trinity College, the Custom-house, and the Four Courts, which from the chasteness of their design, and the massiveness of their proportions, have a very imposing effect. The castle has no pretensions to architectural beauty. There are monuments of William III., in College Green (once a green, but now a paved street); of Nelson, the Duke of Wellington, Goldsmith, Burke, Grattan, and many others in various public sites. The benevolent and charitable institutions of D. are very numerous, and are liberally supported.

Within the limits of the Circular Road, the Liffey is crossed by nine bridges (two of iron), and throughout the whole extent of the city the banks of the river are faced with granite walls and parapets. On each side of these 'quays' there is a spacious roadway, with tall houses and excellent shops. The quay proper extends eastward from Carlisle Bridge. Near the Custom-house, there are several large docks for the accommodation of vessels from distant ports with excisable cargoes, and in communication with the Royal and Grand Canals; the former connecting Dublin with the North Shannon and the west of Ireland, the latter with the south portion of the same river and the south. A very spacious dock, the 'Spencer Dock,' was opened in 1873; and the harbor has been much improved in late years by the completion of two large breakwaters, the north and south walls. There is a bar at the mouth of the harbor, but even there the least depth at low tide is about 11 feet.

The chief manufacture of D. is poplin, which is much celebrated. This, with some glass-works, cotton and linen factories, foundries, distilleries, breweries, and those workshops which are necessary to supply domestic wants, are the main branches of industry. In this regard, D. has been much more of a capital, and less of a manufacturing and export city than London; but a considerable change in the industrial character of the city has been going on for several years.

The direct foreign trade, though increasing, is very limited, Glasgow, Liverpool, and Bristol intercepting the greater portion of it. Much of the inland traffic is carried on by the canals above mentioned, and by the railways (now extending to all parts of Ireland), and consists principally of articles of dairy and farm produce from the central counties. The principal banks are the Bank of Ireland, the Royal, the National, Provincial, Hibernian, and Munster, with some private establishments.

The great educational institution of D. is Trinity College and University. See DUBLIN, UNIVERSITY OF. There is also a Catholic University, the medical school of which has been very successful. In regard to schools, D. is not well supplied. The education of the upper and middle classes is left chiefly to private enterprise. For the humbler classes, much has been done by the National Board (whose model schools are attended by large numbers of children), by the Church Education Society, the Christian Brothers, and Catholic brotherhoods and sisterhoods, and other agencies. There are many literary and scientific societies, dealing with subjects of general knowledge, or with matters of local or national interest. There are two botanic gardens—one at Glasnevin, belonging to the Royal Dublin Society, and one near Donnybrook, connected with the university. The hospitals, asylums, orphanages, and other charitable institutions are numerous, and liberally maintained.

The municipal affairs are under the control of a town-council, which consists of a lord mayor, 15 aldermen, and 45 councillors. The city police has charge of the surrounding country as far as eight miles from the castle. The city sends two members to parliament. The population of the municipal borough in 1871 was 246,326, of whom 195,180 were Roman Catholics, 39,897 Episcopalians, 4517 Presbyterians, and the rest of other denominations; of parl. bor., 267,717. Pop. of city (1881) 249,602; with suburbs of Rathmines, Glasnevin, New Kilmainham, &c., 338,579; of parl. bor., 273,282.

The environs of D. are especially beautiful. Rathmines, a southern suburb, has become a large township, and is the favorite residence of the wealthier part of the mercantile community. Glasnevin, on the north, deserves special notice as the favorite residence of the poet Tickell, of Addison, Steele, Parnell, Swift,

Sheridan, and many other celebrated men. In the cemetery at Glasnevin lie the remains of Curran, O'Connell, and Tom Steele. The Phoenix Park is a magnificent area of nearly 2000 acres, in some parts level, in others with broken ground, having a large amount of timber and brushwood, which shelter immense herds of deer. It affords ample scope for military reviews, and is most extensively used by the inhabitants of D. of all classes for recreation. D., as a whole, with its magnificent bay—which has often been compared to the Bay of Naples—splendid park, massive public buildings, wide streets, spacious and well-kept squares, clean and elegant quays, and beautiful environs, is one of the most handsome and delightful capitals of Europe.

There are numerous places of worship, Catholic and Protestant, monasteries, convents, friaries, and a Jewish synagogue. The most remarkable among the Protestant churches are St. Patrick's Cathedral, restored by the munificence of a single individual, and Christ Church, which has also undergone restoration; and among the Catholic, St. Mary's, St. Saviour's, St. Augustine's, St. Kevin's.

The number of vessels entered inwards in the port of Dublin was, in 1878, 9280, with a tonnage of 2,376,747 tons; cleared outwards, 8545, with a tonnage of 2,323,015. The customs revenue in 1874 was £1,064,580; in 1878, only £847,748.

DUBLIN, UNIVERSITY OF. The first university of Dublin was established in connection with St. Patrick's Cathedral in 1320; but for want of proper endowments, it never prospered, and dragged out a miserable existence till, probably, the dissolution of the cathedral by Henry VIII.

Foundation.—The existing university was founded in 1591—1592, and stands in the position of being a college with university powers. Trinity College, indeed, was intended merely as the nucleus of a university, but as no colleges have since been added, it remains in undisputed possession of all university privileges. Queen Elizabeth provided the charter, the corporation of Dublin bestowed the ground and ruins of the suppressed monastery of All-Hallows, and the Irish gentry supplied by subscription the funds necessary for the erection of the buildings. The income of the college was very limited and very precarious, till James I. endowed it with certain estates in the province of Ulster, and a yearly pension of £388, 15s., English money, from the public purse.

Constitution.—By Queen Elizabeth's charter, the corporation was to consist of a provost, three fellows, and three scholars, in the name of more, with the power of purchasing, taking, and possessing any manors, tenements, &c., from the sovereign, or from any other person. On a vacancy in the provostship, the fellows were entitled to elect a fit successor, and the election of fellows and scholars lay with the provost and fellows. The provost and fellows had full powers to enact statutes, confer degrees, and prescribe the necessary exercises for graduation, and to do all the work of tuition. Defects soon began to show themselves in this constitution, but they were remedied by the new statutes of Archbishop Laud, which were definitely published in 1637, and which are in the main still in force. By these the election of provost was given to the crown.

Parliamentary Representation.—In 1613, James I. conferred on the university the right of sending two members to the Irish parliament. One of these was taken away at the Union in 1800, but was again restored by the Reform Bill of 1832. The electors were formerly the provost, fellows, and scholars; but, in 1832, the privilege was extended to masters of arts, and those of higher degree.

Board.—The provost and senior fellows form the board of management of the college. They meet every Saturday, and transact all the financial and other business.

Council.—By letters-patent of 1874, a Council was established to co-operate with the Board in the regulation of the studies of the university, and in the appointment and regulation of the tenure of office and duties of professors. This Council consists of 17 members—namely, the provost of Trinity College, 4 members elected by the senior fellows, 4 elected by the junior fellows, 4 by the professors, and 4 by the Senate of the university.

Officers.—The government and working of the university are intrusted to the following officers: the chancellor, vice-chancellor, provost, two proctors (one chosen from the senior, and one from the junior fellows), a senior lecturer (who regulates the public examinations), two deans, and a censor, a librarian, registrars, an auditor, professors, and examiners.

Senate.—The chancellor (or, in his absence, the vice-chancellor or pro vice-chancellor), all masters of arts, and doctors of the three faculties, whose names are on the college books, form the senate of the university. The senate elects the chancellor, and confers degrees.

Caput.—The caput of the senate consists of the chancellor, vice-chancellor, provost, (or vice-provost), and senior master *non-regent*, who is chosen by the senate. Every *grace* (for the bestowal

of a degree) must first receive the sanction of the provost and senior fellows, be afterwards approved of by the caput (each member of which has a *negative* vote), and finally be confirmed by the senate in public congregation.

Provost.—The provost, who is appointed by the crown, may be a layman, of any religious denomination. He enjoys an income of about £3000 a year.

Fellows (Senior).—The fellows are all chosen, in the first instance, by examination; but the seniors are promoted from the juniors, in order of seniority. They have no stated duties, except those connected with the general management of the college affairs. The average income of a senior fellow, from all sources, is about £1380 per annum.

Fellows (Junior).—The junior fellows are elected by examination. They form the great teaching staff of the college, and do all the duties of lecturing and examining the undergraduates. Most of them are tutors, and their income, which may average £600 a year, is derived partly from a salary given by the college, and partly from their duties as tutors, lecturers, and examiners. Fellowships were formerly tenable only by members of the Episcopal Church, but by the recent act all such religious restrictions were abolished. The number of the junior fellows has been altered from time to time, but by a queen's letter issued some years ago it was fixed at twenty-three—the then number of twenty-seven being gradually reducible. The law of celibacy, imposed in the reign of Charles I., was repealed in 1840.

Professors.—There is a very complete staff of professors, who represent almost all subjects of human knowledge. Besides a full complement of lecturers in divinity, natural philosophy, mathematics, law, and medicine, there are professors of ancient, oriental, and modern languages (Irish, Arabic, and Sanscrit being among the number), moral philosophy, oratory and English literature, modern history, political economy, natural history, botany, geology, mineralogy, civil engineering, &c.

Scholars.—The scholars, 70 in number, are elected from among the undergraduates. They are members of the corporation, and have the university franchise. Scholarships (which are tenable for five years) are gained by public competition—some being assigned for classics, and others for science; the provost and senior fellows, assisted by some of the junior fellows or professors, if desired, are the examiners. The various emoluments of a scholar, arising from salary, remission of fees, rooms, commons, &c., amount to about £50 per annum. There are also minor scholarships for the encouragement of the study of divinity and of the Irish language; while others are connected with the royal and endowed schools. Forty exhibitions of £25 per annum each, tenable for two years, have been recently founded, 12 of which are given in each year to students immediately after entrance, and 8 to those who have concluded their second year.

Students.—There are four grades of students, 1. Noblemen, sons of noblemen, and baronets, who have certain special privileges; the first two being allowed the degree of B.A. *per specialem gratiam*. 2. Fellow-commoners, who dine at the fellows' table. 3. Pensioners, who form the great body of the students. 4. Sizar, who have rooms and commons free. The sizars are limited to 30; they are elected by competitive examination, and hold their sizarships (worth about £37 per annum) for four years. Each rank has a dress peculiar to itself.

Entrance.—Students are admitted to the college after an examination in a prescribed course of classics, arithmetic and algebra, English history and composition, and modern geography. The honor of *first place* at entrance examination is keenly contested; and there are, besides, prizes awarded for excellence in special branches of the entrance course, and also for Hebrew.

Tutors.—Each student must at entrance place himself under one of the 18 junior fellows who are tutors. These stand to their pupils *in loco parentis*, and have charge of their tuition, though each tutor does not necessarily teach his own pupils.

System.—To proceed to the degree of A.B., a student must keep terms for four years, two terms at least being necessary in each year. Terms may be kept either by residence, and attendance on lectures, or by simply appearing on a stated day in the public hall, and passing a creditable examination in a prescribed course. Lectures are delivered on the different subjects of each term examination by the tutors, the honor examiners, and the university professors; and prizes of the value of £4 and £2 are awarded at the Michaelmas examination to the *first* and the *second* honor men respectively. In the other terms (Hilary and Trinity), parchment certificates reward the diligent. At the end of the fourth year, gold and silver medals are awarded to the senior and junior moderators. Students of the first year are called junior freshmen; those of the second, senior freshmen; of the third, junior sophisters; and of the fourth, senior sophisters. All students must pursue the following course: *first year*, Latin, Greek, mathematics; *second year*, Latin, Greek, mathematics, logic, and metaphysics; *third year*, Latin, Greek, physics, logic, and metaphysics; *fourth year*, Latin, Greek, physics (both

mathematical and experimental), astronomy, and ethics. For those who aspire to honors, the course is much more extensive than that for mere *passe*.

Degrees.—Term examinations having been duly passed, the student is promoted to the degree of A. B., which is conferred by the senate in full congregation. The *comitia* for granting degrees are held on Shrove Tuesday and the last Wednesday in Trinity and Michaelmas terms. Those students who, at the final ordeal of the fourth year, stand highest in an examination over an extra course in (1) mathematics and mathematical physics; (2) classics; (3) mental and moral philosophy; (4) experimental science; (5) natural science; (6) history and political science; (7) modern literature, are called (according to merit) senior or junior moderators. These form the first class of graduates, the second being called respondents. The third consists of 'unclassified candidates.' The higher degrees are procurable after the lapse of a fixed number of years, and on the performance of certain exercises, and the payment of fees.

Fees.—For entrance and first half-year the fees are—Noblemen, £60; fellow-commoner, £30; pensioner, £15; sizar, £5, 1s. 3d. Other half-years, £33, 12s., £16, 16s., and £8, 8s.—the sizars being exempt. This does not include rooms and commons. For degrees, the fees for pensioners are—A.B., £8, 17s. 6d.; A.M., £9, 16s. 6d.; LL.B., £11, 15s.; LL.D., £22; B.D., £13, 15s.; D.D., £26; M.B., £11, 15s.; M.D., £22.

Divinity, Medical, and Engineering Schools.—Connected with Trinity College there are schools for medicine and engineering. The Divinity School of the Church of Ireland is also in connection with the university. Graduates in medicine and in engineering must previously graduate in arts. The divinity testimonium is obtained after two years' attendance on lectures, with an examination at the end of each term.

Church Patronage.—The university formerly held a large and valuable patronage, but this has been abolished by the recent Church Act.

Studentships.—In 1859, 14 studentships were founded, worth £100 a year each, tenable for seven years, to encourage graduates in the pursuit of some special branch of study which they may afterwards be called on to teach, should they become fellows and lecturers. Two are given every year, and (like every other prize or distinction in the university, not connected with the divinity school) are open to persons of all religious denominations. They are awarded to those candidates at the Degree examination who take the highest places in science and classics respectively.

General Remarks.—The university of Dublin is well equipped for carrying education to a high degree of perfection. The teaching staff is numerous, and in the actual work of tuition, the tutorial and professorial elements are more largely combined than in any other British university. Many distinguished men have, in past generations, gone forth from her halls. The names of Ussher and Berkeley; of Elrington, Lloyd, Magee, Sir W. Hamilton, Romney Robinson, Macculagh, Archer Butler, Lord Cairns; and of Burke, Sheridan, Curran, Swift, and Goldsmith, with a host of others celebrated in politics, in law, in science, and in literature, are sufficient to indicate the success which has attended her sons.

DUBNITZA, a town in the principality of Bulgaria, 25 miles S. W. of Sophia. It has extensive iron-works, and a population (1881) of 7497.

DUBNO, a town in Russia, in the government of Volhynia. Its trade is chiefly in corn, flax, tobacco, fish, and cattle. A large fair is also held here at Whitsuntide. Pop. (1880) 7212.

DUBOIS, GUILLAUME, Cardinal, was born 6th September 1656, at Brives-la-Gaillarde, in Auvergne, where his father was an apothecary. At the age of twelve, he came to Paris, and entered the college of Saint Michael, as a domestic of the principal. Here he made such good use of his opportunities for acquiring knowledge, that he was afterwards selected as tutor to the son of a merchant named Mauroy, and gradually rose till he became tutor to the young Duc de Chartres. Although of an ugly exterior, he contrived, by his mixture of wit and hypocrisy, to win the esteem of the boy's mother, while he possessed the most unlimited confidence of his pupil, partly through their common love of letters, and partly because he took upon himself the odious office of pander to his vices. His public career commenced after the marriage of his pupil, in 1692, with Mademoiselle Blois, a natural but legitimized daughter of Louis XIV. He then received from that monarch, for his services in bringing about the match, a gift of the abbey of St. Just, in Picardy. He was next attached to the French embassy at the court of London, where he formed some important political connections. On his return, he became private secretary to his old pupil; and when the latter (now Duke of Orleans) became regent in 1715, D. became virtually the most powerful man in France. The great act of his life was the famous treaty signed at La Haye, 14th January 1717, and known as the *triple alliance*, between England, Holland, and France. The importance of this act lies in the circumstance that it effectually changed the foreign

policy of France, in spite of the French princes, in spite of the traditions of Louis XIV., in spite of the dislike of the English king for the Regent, and finally in spite of Cardinal Alberoni himself, the Spanish minister. In reward for his brilliant dexterity, D. received the office of Minister of Foreign Affairs, and in 1720, on the solicitation of George I. of England, was appointed to the vacant archbishopric of Cambray. In 1721, he obtained the cardinal's hat, and in the following year became prime-minister of France, when his authority seemed unbounded. He died 10th August 1723, a victim to hard work and the wildest debauchery.

DUBOVKA, a town of European Russia, in the government of Saratov, is situated on the eastern slope of the Sarpa Hills, on the right bank of the Volga, in lat. about 49° N., and long. 44° 45' E. It is a *dépôt* for goods brought from the northern provinces, which it forwards to Katshalinskala, a town about forty miles distant from D., and situated on the Don. The produce is thence conveyed by the Don to the southern provinces. D. has some trade in wood, oil, iron, and manufactured articles. Pop. (1880) 12,737.

DUBUQUE a city and port of Iowa, U. S., on the right bank of the Mississippi, 450 miles above St. Louis, built on a bluff 200 feet high, contains a city hall, market-house, U. S. custom-house, Episcopal seminary, surveyor-general's office, 14 Protestant and 3 Catholic churches and cathedral, 8 newspapers, of which 2 are German. Settled in 1788, by Julian Dubuque, a French trader, it became the center of a large trade, and is the chief *dépôt* of the great lead region of Illinois, Wisconsin, and Iowa, Pop. (1860) 13,012; (1870) 18,434; (1880) 22,254.

DUCANGE. See DUFRESNE.

DU'CAT, one of the most extensively used names for a coin, mostly of gold. Ducats were first coined in the 12th c. in Sicily, and took their names from the legend found on those early Sicilian pieces: *Sit tibi, Christe, datus, quem tu regis, iste Ducatus* (*ducat* means duchy). Such coins were extensively issued after the 12th c. in Italy, especially at Venice. Venice ducats were called *Zecchini*, from *Zecca* where the mint was situated. The ducat was adopted in 1559 by the imperial diet of Germany into the currency of the empire, and was afterwards coined in the several German states, and over the whole of the north of the European continent, Russia included. They generally bore the likenesses of the sovereign princes. The ducat varied in weight and fineness; by far the most common, which was current in Austria, Russia, Hamburg, &c., weighed 54 troy grains, sterling value about 9s. 4d. The modern Italian ducat was of much less value. The gold ducat of Venice was valued at 6s. In the (late) kingdom of the Two Sicilies, the ducat (*ducat* del regno) was a silver coin and money of account, forming the unit of the currency, being divided into 100 grani, in the island of Sicily into 100 bajocchi. There are few silver ducats, however, in existence. The ducat = 3s. 4d. sterling. There are various kinds of the Spanish *Ducado*, generally translated dollar. The *ducado de plata* or silver ducat, hard = 4s. 2d. The ducat is now to a great extent merely a money of exchange.

DUCA'TO, CAPE (anciently, *Leuca'tés*), a headland at the southern extremity of a promontory of Santa Maura, one of the Ionian Islands; in lat. 38° 34' N. and long. 20° 32' E. Cape D. was in ancient times dreaded by mariners, and the modern Greek sailor still fears the strong currents and the fierce gales which he has to encounter there. A point on the western side of the *Leucadian* promontory is called *Sappho's Leap*, as it was supposed that here the poetess precipitated herself into the sea. It is a white broken cliff, rising perpendicularly from the water to the height of about 2000 feet. On its summit stood a temple dedicated to Apollo, the substructure of which still exists.

DUCHESNE, ANDRE (in Latin, Andreas Chesnius, or Duchenius, or Quercetanus), the father of French history, was born at Ile-Bouchard, in the old province of Touraine, in May 1584, and studied at Loudun and Paris. History and geography were his favorite studies from his youth, and under Richelieu's ministry he was appointed royal geographer and historiographer. He died 30th May 1640, by a sad accident, having been crushed against a wall by a carriage in a narrow street. His collection of the *Historia Francorum Scriptores Constanti ab ipsius gentis origine ad Philippum IV. tempora* (5 vols., Paris, 1636—1649), is particularly important.

It was continued from the third volume by his son, FRANÇOIS DUCHESNE (born 1616, died, after having likewise been appointed historiographer, in 1693), and contains much that may be sought for in vain in Bouquet's collection. Of his other numerous writings, we may mention, as deserving of special notice, the *Historia Normannorum Scriptores Antiqui* (Paris, 1619); *Histoire Généalogique de la Maison de Montmorency et de Laval* (Paris, 1624), and *Histoire Généalogique de la Maison de Vergi* (Paris, 1625). The last two throw much light upon the history of France. D.'s industry was extraordinary; he is said to have left more than a hundred folios in manuscript.

DUCHOBORTZI, a Russian religious sect, of the origin of which nothing is very certainly known, and which, although conjecturally referred by Count Krasinski to the Patarenes (see **CATHARI**), cannot be traced beyond the middle of the 18th c., when it was found to exist in different parts of Russia; and its members became exposed to penalties by their refusal to serve in the army. The D. hold the doctrine of the Trinity, and are chiefly distinguished by their holding that human souls existed before the creation of the world, and fell in that former existence, from which the fall of Adam and a continual tendency to fall have proceeded; and by their ascribing hidden mysterious meanings to all parts of the Bible for the knowledge of which they depend on inward light. They are extreme mystics. They reject the use of pictures common in the Russian Greek Church. They neither observe baptism nor the Lord's Supper. In their religious meetings they salute each other with bows and kisses: they pray, sing psalms, and exhort or expound the Scriptures. They are, however, generally very illiterate and ignorant. On the accession of the Emperor Alexander I., they received the most complete toleration, and were allowed to settle by themselves on the bank of the Molochna in the south of Russia. Here, however, an impostor named Kapustin prevailed on them to receive him as a prophet, taught them the transmigration of souls, and made them believe that he himself was animated by the soul of Jesus Christ; and it would appear that, in consequence of disputes arising among them concerning him, great numbers were buried alive, and otherwise put to death by the rest, on which the settlements on the Molochna were broken up in 1841, and great part of the people transferred to the provinces beyond the Caucasus.

DUCK, a kind of plain linen of a coarse heavy make, highly glazed, used for smock-frocks by the English agricultural laborers, and for working-dresses by those employed at smelting furnaces and iron forges.

DUCK. See **ANAS**. The broader bill, laminated and not toothed, distinguishes the Linnæan genus *Anas* from *Mergus* (including Smews, Mergansers, and the Goosander. In recent ornithological systems, however, it is divided into numerous genera, but three chief groups are usually recognized, corresponding to swans, geese, and ducks of popular nomenclature. See **GOOSE** and **SWAN**.

The group to which the name duck is sometimes extended, both by scientific writers and in popular language, is characterized by greater breadth of bill than either the swans or geese. Their food is chiefly animal, whilst that of both swans and geese is in great part vegetable. Their legs are shorter and placed further backward than those of geese, so that they move with greater difficulty and with a more waddling gait on land, and their necks are shorter than those of geese, and much shorter than those of swans, although in this character there is a considerable difference between different species. There is a very marked difference in plumage between the males and females, which is not the case in any corresponding degree in swans and geese. They exhibit also a peculiar anatomical character in a large dilation of their trachea (windpipe) on each side at its bifurcation. This great group of Ducks is subdivided into two sections; one section characterized by a webbed or broadly margined hind-toe, the other by a hind toe destitute of membrane. These characters are connected with important differences in other respects, and particularly in habits; the ducks of the first section being chiefly oceanic, living more exclusively on animal food, and diving readily and frequently in pursuit of it; whilst those of the second section are more generally inhabitants of lakes and other inland waters, showing a preference for shallow waters. Those of the first section also have the feet placed further backward than those of the second; those of the second have generally longer wings than those of the first, and a longer neck by which they are adapted for seeking their food by dabbling in muddy shallows, they less frequently dive, and when alarmed generally seek safety by taking wing. Many of both sections are migratory, and spend the summer in arctic and sub-arctic regions. Not a few of them are common to the northern parts of both the eastern and western continents. Their plumage is remarkably thick, soft, and compact. The tongue, which, unlike that of most birds, is large and fleshy, assists in the selection of food. To the first or oceanic section of ducks belong Scoters, Garrots, Eiders, Pochards, Scaups, Harlelds, &c.; to the second section belong Sheldrakes, Shovellers, Musk Ducks, Summer Duck, Pintails, Gadwalls, Teals, Wigeons, Bluewings, &c.—See these articles.

The **COMMON DUCK**, or **DOMESTIC DUCK** (*Anas boschas*), known also in its wild state as the **WILD DUCK** or **MALLARD**, belongs to a genus, or sub-genus, of the second section, characterized by a flattish broad bill, longer than the head, not contracted, nor much dilated, towards the tip, and not much elevated at the base, destitute of a tubercle at the base, the denticulations of the upper mandible (ends of the laminae) scarcely projecting beyond the margin, and a short and rather pointed tail of sixteen feathers.

Even as thus characterized, it includes **TEALS** (q. v.), which are by some ornithologists constituted into a separate genus.

The male (drake) of the common duck has the four middle tail-feathers recurved. The deep emerald green of the head and upper part of the neck, the white collar which separates the green from the dark chestnut of the lower part of the neck, and the deep blue iridescent *speculum* of the wing—formed by the outer portion of the outer web of the secondaries—are also marked characteristics of this beautiful bird; the plumage of which exhibits greater brightness of colors—during the breeding season at least—in the wild than in the domestic variety. At the close of the breeding season, the male of the wild-duck assumes for a time a plumage more sober, and resembling that of the female; but before winter, the splendid plumage proper to his sex is again acquired. The mallard or wild-duck is a widely distributed bird, being found in the northern parts of Europe, Asia, and America, and extending southward as far as Florida—where it is abundant—and the West Indies, although in the Old World it is not known as belonging to regions of similar climate. It was formerly much more abundant than it now is in Britain, the drainage of marshes having apparently tended more than any other cause to the diminution of its numbers. Multitudes of mallards, however, still visit the fen counties of England in winter; and great numbers are taken in decoys, along with other *Anatida*, and sent to the London market. See **WILDFOWL**. Many wild-ducks, however, still breed in Britain, sometimes near the lakes or rivers which they frequent, sometimes in more elevated moorish districts, from which the parents often take opportunity of bringing their very young brood to the lower waters, by swimming down the streams on some occasion of their being swollen by rain, and it is interesting to see the little creatures hurried on, without injury, by the current, and passing along narrow rapids and over waterfalls of considerable height, much as pieces of cork might do, and with as little apparent injury. The nest is composed of grass, intermixed and lined with down, and the eggs are usually nine to twelve in number.

This species, in a wild state, always pairs, but in domestication it becomes polygamous, and the care of the young is left entirely to the female. It has been long common in the poultry-yard, being valued for its eggs and its flesh; and there are breeds, as the Aylesbury duck, &c., remarkable for their great size and delicacy of flesh. In situations where they have ready access to a lake, pond, or stream, ducks are easily managed, and very useful poultry. In other circumstances, they cannot be kept with advantage.

The species most nearly allied to the common duck is said to be the **JAVANESE DUCK** (*A. Javanensis*). The **BLACK DUCK** or **DUSKY DUCK** (*A. obscura*) of North America is also very nearly allied to it, and is generally distributed from Labrador to Texas. The **Summer Duck** or **Wood Duck** of North America, and the **Mandarin Duck** or **Chinese Duck**, belong to a nearly allied genus or sub-genus (*Dendrocygna*), with shorter bill and pendant occipital crest. See **SUMMER DUCK**. The **TREE DUCK**, or **WHISTLING DUCK**, of the warmer parts of America, also belongs to a distinct but nearly allied genus or sub-genus (*Dendrocygna*).

DU'CK-BILL (*Ornithorhynchus*, or *Platypus*), a genus of *Mammalia* of the order *Monotremata* (q. v.). Only one species is fully ascertained, *O. Paradoxus*, or *P. anatinus*. It inhabits the rivers of Australia, Papua, and Tasmania. In the Australian colonies it is generally called **WATER MOLE**. The first descriptions of this singular quadruped were received with incredulity, and even when a stuffed specimen was brought to England, it was suspected to have been ingeniously fabricated. The whole length, including bill and tail, is usually from 20 to 23 inches. The body is rather long and compressed, thickly covered with very glossy hair, among the roots of which there is a layer or soft short waterproof felt or wadding. The head is small and round, with small bright eyes, and no external ears, although the internal ears are perfectly developed, and the hearing acute; and instead of the muzzle, mouth, and teeth of an ordinary quadruped, the creature is furnished with a bill like that of a duck, but broader in proportion, near the extremity of the upper mandible of which the orifices of the nostrils are placed. The bill is covered with a leathery membrane. There are no true teeth, but the bill has small transverse laminae, like the bill of a duck; and at its base, on each side of each jaw, are two horny protuberances without roots or bulbs. The tongue is beset with villousities, does not extend to the extremity of the bill, and bears at its base what has been described as another tongue of a thicker form, and with two little fleshy points in front. The legs are short; the forefeet have each five toes, with strong burrowing claws, and a connecting membrane for swimming, which extends even beyond the claws, but is capable of being folded back, so as not to impede their use in burrowing. The hind-feet are smaller than the fore-feet; they have each five toes armed with claws, and webbed, but the web does not extend beyond the base of the claws. The

hind-feet of the male are armed with sharp spurs, like those of a cock, which are merely rudimentary in the female. These spurs were at one time erroneously supposed to be venomous. The tail is strong, broad, and flattened, about half as long as the body, covered with longer and coarser hairs, and nearly naked on its under surface. The D., besides the characteristics of the *Monotremata*, exhibits other anatomical peculiarities which resemble those of birds, and some—principally osteological—which even resemble those of saurian reptiles. It lives chiefly in the water, and seeks its food by means of its bill in the mud, like ducks. Its



Duck Bill or Water Mole (*Ornithorhynchus paradoxus*).

food consists chiefly of aquatic insects, molluscs, &c.; but it is said also to feed on small fish, and even on vegetable food; and in confinement, it can be fed on worms, minced meat, or egg, and bread and milk.

It makes serpentine burrows of great length—twenty or even fifty feet—in river banks, entering near the water's edge, and enlarged at the termination into a receptacle or nest, which is furnished with dry weeds for the accommodation both of parents and young. The young are produced in a very imperfect state: the D. is indeed strictly ovoviviparous; the fœtus receives no nutriment from the parent before birth, except what it derives from the ovum, which, however, is hatched within the body of the parent; but the young are suckled, and the mouth is adapted to this by the comparative shortness of the bill and greater length of the tongue at this period of life. The D. is lively and active, and so readily alarmed by the appearance of danger as not to be easily shot, diving before aim can be taken. It is usually to be seen with only its head above the surface of the water. It prefers the twilight to the glare of the day. Its voice resembles the growl of a small puppy. It carefully dresses and pecks its fur. When asleep, it rolls itself up into a ball.

DUCK-CREEK, a water-course of Central Australia, is the largest of the channels which drain into the Darling (q. v.).

DUCKING-STOOL, an apparatus at one time in use in Britain for the punishment of scolding wives. The ducking-stool grew out of the cucking-stool, which was not, as many have supposed, a mere difference of name for the same thing. The cucking-stool of itself did not admit of the ducking of its occupants. It was a simple chair in which the offender was placed, usually

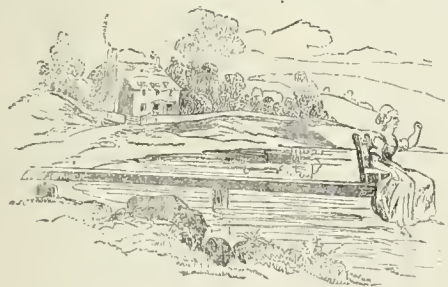


Fig. 1.

Ducking-stool until lately in existence at Broadwater, near Worthing.

before her or his (for the cucking-stool was not so specially for women as the ducking-stool) own door, to be pelted and insulted by the mob. In conjunction with another instrument of degradation, however—the tumbrel—the cucking-stool was occasionally used for ducking; but the ducking-stool *par excellence* was specially made for purposes of immersion. There were various examples of the ducking-stool. Sometimes it consisted of a rough strong chair attached to one end of a beam, which worked on a pivot on a post bedded into the ground at the edge of the dam, or the river, as the case might be. 'The woman was placed in the chair with her arms drawn backwards; a bar was placed across her back and in front of her elbows; another bar held her upright, and there were cords to tie her securely in. The executors of the punishment then took hold of a chain at the opposite end, and gave her a ducking on the 'see-saw' principle. Fig. 1 is an illus-

tration of this kind of ducking-stool, which was in use at Broadwater, near Worthing.

In fig. 2 there is an example of a tumbrel and ducking-stool combined, which was in use for actual ducking at Leominster as recently as 1899. The beam to which the chair was attached was 23½ feet in length, the ducking being administered in the manner previously described. A representation of a ducking-chair, preserved in the Scarborough Museum, is also given in fig. 2. Other ducking-stools consisted of an upright and transverse beam, either movable or fixed, from which the chair was sus-

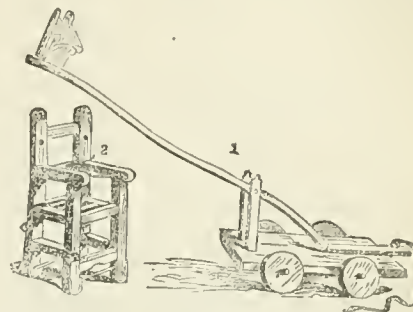


Fig. 2.

1. Tumbrel preserved at Leominster; 2. Ducking-chair in the museum at Scarborough.

ended by a rope or chain. The practice of ducking commenced in the latter part of the 15 c., and prevailed generally throughout the kingdom until the first part of the 18th c., and in isolated cases, as we have seen, even into the 19th century.

For the facts of this article, as well as for the cuts, we are indebted to a paper by Mr. Llewellynn Jewitt in the *Reliquary*. See also Chambers's *Books of Days*.

DUCKWEED (*Lemma*), a genus of plants, referred by many botanists to the natural order *Araceæ*, but regarded by others as the type of a small natural order, *Lemnaceæ*, which consists chiefly of floating plants, were flat green fronds, with roots hanging loosely in the water, and unisexual flowers—destitute of calyx and corolla—bursting through a membranous spathe in their margin. The *Lemnaceæ* are distributed throughout all parts of the world. Several species of D. are British, and cover the surface of stagnant ponds with green vegetation. Their flowers and fruit are rarely to be seen, but they spread rapidly by new fronds budding from their margins.

DUCTILITY is that property of bodies by which they are capable of being drawn out in length, while diminishing in breadth, without fracture or separation of their parts. Ductility is peculiarly noticeable in the case of metals. It is possessed also by gums, glues, resins, and some other bodies, which when softened by water or heat, may be drawn into threads. Clays, when moistened, become ductile. Metals are ductile, generally speaking, at any temperature, but their ductility is much influenced by temperature; some—brass, for example—are more ductile at ordinary temperatures than when hot. Metals are ductile nearly in the order of their Malleability (q. v.), the order of their ductility being as follows, beginning with the highest: gold, silver, platinum, iron, copper, zinc, tin, lead, nickel, palladium, cadmium. Some, however, as iron, are more ductile than malleable. The ductility of gold and glass is surprising; see article DIVISIBILITY for an account of the fineness to which gold-gilt, silver wire and glass tubes have been drawn. The ductility of glass at red heat seems to have no limit; at high temperatures, this brittle substance may be drawn into threads finer than any hair, and of the highest flexibility, indeed, according to some, increases in proportion to the fineness to which its threads are drawn, and it is conceived to be possible that we may yet convert glass into clothes for wearing apparel.

DU DEFFAND, MARIE DE VICHY CHAMROND, MARQUISE, a celebrated Frenchwoman, was born of a noble family of Burgundy in 1697, and educated at the convent of La Madeleine de Trenelle, in Paris. Here she manifested that boldness of opinion and vivacity of intellect which obtained for her so many distinguished admirers in after-years. Her parents, alarmed at her scepticism, sent the eloquent Massillon to converse with her, who was, however, more struck with the wit and beauty of the young lady, than she was with the force of his arguments. In 1718, she married the Marquis Du Deffand. The union was unhappy, and a separation took place, whereupon the Marquise threw herself into all the excesses of gallantry which characterized French society in the 18th c., and had the name of being, for a time, the mistress of the Regent. Subsequently, a reconciliation took place between her and her husband, but it lasted only a short period. She then set up an establishment of her own, and gathered round

her all the wits, philosophers, and men of fashion in her day. Among her friends and correspondents may be mentioned D'Alembert, Voltaire, President Hénault, Montesquieu, Marmontel, and Walpole. Her evening-parties at her residence in the Rue St. Dominique were famous. They formed a rendezvous for all the notabilities of Paris, and were much relished by distinguished foreigners visiting the city. In 1753, she became blind, and in the following year chose as companion and reader a young lady, Mademoiselle de l'Espinasse, of whom, however, she became very jealous, on account of the attentions paid to her by the friends of the marquise. In 1764, the two ladies separated, Mademoiselle de l'Espinasse carrying with her a large number of enthusiastic partisans, who deserted the saloon in the Rue St. Dominique, at the head of whom was D'Alembert. The Marquise Du D. died 24th September 1780. Her correspondence with D'Alembert, President Hénault, Montesquieu, and the Duchesse du Maine was published in 1809; and in the following year appeared at London her correspondence with Horace Walpole (written between 1766 and 1780), to which were added her letters to Voltaire.

DUDEVANT, AMANTINE LUCILE AURORE, MADAME, a French authoress, who has attained an extraordinary celebrity under the name of GEORGE SAND. She was born at Paris in 1804, and descended by the father's side from the famous Marshal de Saxe. Her maiden name was Dupin. After having received a strict conventual education (1817—1820), she married M. Dudevant in 1822; but in the course of a few years, finding the lack of congeniality of sentiment intolerable, she arranged a separation with her husband in 1831, and repaired to Paris, where at first she was hard pushed to secure a livelihood. Her first literary efforts made their appearance in the *Figaro*.

In conjunction with her friend and companion for the time, Jules Sandeau, from whose name she formed her *nom de plume*, she wrote a romance, entitled *Rose et Blanche* (1832), which only occasionally rises above mediocrity, and gave no hint of the splendid ability first fully developed in *Indiana*, published in the same year. This romance, in which a glowing heart, deeply wounded by the pressure of social relations, gives vent to its feelings, excited considerable interest. This was increased to the utmost by the succeeding romances—*Valentine* (1832), *Lélia* (1833), *Jacques* (1834), *André* (1835), *Leone Lenzi* (1835), and *Simon* (1836). During the next two years, she published a great variety of works, in which she showed herself to be deeply influenced by the age in which she was living. In addition to her purely imaginative productions, Madame D. found time to contribute miscellaneous essays and political articles to the journal entitled *Le Monde*, so long as it was edited by Lamennais. She was much occupied at this time with philosophical and theological speculations, and their influence may be traced in the *Spiridion* (1839), and the extraordinary piece of prose poetry, entitled *Les Sept Cordes de la Lyre* (1840). She cherished, moreover, republican ideas of the wildest nature, which appeared conspicuously in the *Compagnon du Tour de France* (1840), and in *Pauline*. Her brilliant literary success having now placed her in comfortable circumstances, she obtained a legal divorce from her husband, and thus secured possession of a portion of the property which she had brought to him as her dowry. She now occupied herself with the education of her two children, and spent her time, sometimes in Paris, sometimes at her estate in Berri, where she had passed her childhood, or in journeys into Switzerland and Italy. A dispute with the editors of the *Revue des Deux Mondes*, which, from 1833 to 1841, had regularly published her works in chapters before they appeared in a separate form, induced her to start the *Revue Indépendante*, in conjunction with P. Leroux and Viardot. For this new review, she wrote *Horace*, *Consuelo*, and *La Comtesse de Rudolstadt* (1842—1843), three romances deeply imbued with democratic feelings and sentiments, which are apparent likewise in *Jeanne* (1844), and which in the *Mémier d'Angibault* (1845), becomes altogether socialistic. It would be impossible to enumerate the works which flowed from her rapid pen between this period and the revolution of 1848. It is sufficient to say that her socialistic sympathies predominate in all of them; but if the logic is not convincing, the vigor and purity of her imagination are undeniable. This is always the case with Madame Dudevant. Even those who disapprove of her exaggerated and one-sided ideas and views of life, must admire the perfect form, the captivating style, the plastic finish, and the great affluence of thought and sentiment displayed in all her productions. Her finest romances are *Valentine*, *André*, and, in particular parts, *Consuelo*, which is her best known work. Of her smaller pieces, *La Mare au Diable*, is a master-piece of its kind, and indeed, considered from an æsthetic point of view, is the most complete production of her pen.

After the revolution of February, Madame D. for a short time wasted her talents on the barren politics of the day. She subsequently devoted herself to writing plays, which were received less favorably than her novels, though the *Marquis de Villemer*, and one or two more, were very successful. In 1854 she published

Histoire de Ma Vie; in 1871 *Journal d'un Voyageur pendant la Guerre*; and in 1873, *Impressions et Souvenirs*. Madame D. died on June 8, 1876.

DUDLEY, a parliamentary borough in a detached part of Worcestershire, in the south of Staffordshire, 26 miles north-east of Worcester, and 8½ miles west-north-west of Birmingham. It is a well-built town, and a chief seat of the iron trade. On the north-east of the town are the beautiful ruins of an old castle, founded in 760 by Dodo, a Saxon prince. It was demolished in the time of the civil wars of Charles I., was rebuilt, but was afterwards burned down in 1750. In the vicinity are iron and coal mines, and limestone quarries. The limestone is Silurian and full of organic remains; it is wrought out of caverns, and brought to the kilns through a tunnel one mile and three-quarters long, which is carried through the basalt of the Castle Hill. Saline springs occur near. The chief manufactures are fire-irons, grates, nails, vises, chain-cables, other iron utensils, and glass. Pop. (1881) of mun. bor., 46,233; parl. bor., 87,407. D. sends one member to parliament. The living is a vicarage in the gift of the Earl of Dudley, and valued at £1000 per annum.

DUDLEY LIMESTONE, a highly fossiliferous Silurian limestone belonging to the Wenlock Series (q. v.), which forms some of the most picturesque eminences around the town of Dudley. The masses of corals, shells, and trilobites which abound in this rock, form, when weathered, extremely beautiful cabinet specimens.

DUDLEY LOCUST, the popular name for a trilobite (*Calymene Blumenbachii*, q. v.), which is very abundant in the Dudley limestone.

DU'EL (Fr. *duel*, Lat. *duellum* or *dvellum*, which, as Cicero remarks, [*Orat.* 45], was the old form of *bellum*, war), a combat between two persons, at a time and place indicated in the challenge, cartel, or defiance borne by one party to the other. A duel generally takes place in the presence of witnesses, called seconds, who regulate the mode of fighting, place the weapons in the hands of the combatants, and enforce compliance with the rules which they have laid down.

No trace of the duel, as an institution, is to be found in the history of the classical nations of antiquity, the Latin word from which ours is derived having been used to signify a war between two nations. So long as men continued to be barbarians, their personal quarrels were no doubt decided in the ancient, as national quarrels still are in the modern world, by an appeal to physical force. But though war has been in all times the practical solution of strife, it was not till the middle ages that it came to be regarded as a means, in any sense judicial, of settling disputes. Hitherto, it had determined who was able to prevail, justice being set aside, but it was a new view that it would determine who ought to prevail on the principles of justice.

The rationale of the *judicial combat* or *wager of battle* was probably twofold. On the one hand, and generally amongst the people, it depended on a belief that God would interfere directly and miraculously in the conflict to protect the innocent, and to punish the guilty, and that thus the weakest combatant who had God on his side would prove more than a match for the strongest, when destitute of His aid. But there was a view of the matter which was not so directly superstitious, and which rested rather on a confusion between the principle of the original constitution and the principle of the transmission of rights. All human rights originate in the powers and faculties which God has given to man, and it was supposed that as the right originated in power, its continued existence in the individual could be ascertained by ascertaining whether the power still existed in him. The error consisted, as we have said, in confounding the principle of the constitution with the principle of the transmission of rights. If a field which was claimed by two competitors had as yet been appropriated to nobody, or had been abandoned, and was, as lawyers say, *res nullius*, the fact of which of the two claimants ought to become the possessor might be ascertained by judicial combat. But if it was already the property of one of them on a title which was to be held sacred, and the question was which of the two had this sacred title, that fact could never be determined by ascertaining which would have been in a condition to constitute it for the first time, had it been non-existent. The principle of the private duel, in so far as it had any principle at all, and was not merely a piece of barbarous and irrational foppery, was precisely the same as that of the judicial combat. But the latter had been applied to a class of cases which admitted of legal investigation and decision, and it was consequently abandoned in the days of Queen Elizabeth; whereas the former was supposed to be a means of redressing wrongs which hardly can come within the cognizance of a human tribunal, and the consequence was that it continued in green observance in this country until recently, and is still in vigor in many continental countries.

Like the other peculiarities of medieval life, the duel probably originated with the Germanic nations. It is said to have been in-

produced into legal proceedings in lieu of an oath by Gundeald, king of the Burgundians, in 501. Louis le Débonnaire was the first of the French kings who permitted litigants to appeal to arms. The practice was prohibited by Henry II., in consequence of a noted duel which took place in his presence between his friend, Francis de la Chastaignerie, and Guy Chabot de Jarnac, in which the latter was slain. The royal edict, however, was totally ineffectual, and the practice of private duelling has generally prevailed more extensively in France than in any other country. Francis I. patronized it by declaring that a lie could be born without satisfaction only by a base-born churl, and still more by the example which he set in challenging his own great rival Charles V.

In 1599, the parliament of Paris declared all persons who were either principals or seconds in duels to be rebels to the king. But its efforts were unavailing; and it is said that during the first 18 years of Henry IV., no fewer than 4000 gentlemen perished in this foolish manner. In 1609, Henry added to the existing penalties, introducing even punishment by death in extreme cases. But these regulations were forced upon him by popular feeling; he had himself no aversion to the practice, and when he gave permission to Crequi to fight Don Philip of Savoy, he added: 'If I were not the king, I would be your second.' The consequence of this feeling was, that he readily granted pardons to those who had violated the laws which he had been forced to enact, and these laws not unnaturally produced an effect the very reverse of their ostensible object. Duelling acquired the charm of what the French call 'forbidden fruit,' and thus became a fashionable and favorite vice. In the reign of Louis XIII., the custom was so prevalent, that Lord Herbert, the English ambassador, wrote home to his court that there was scarcely a Frenchman worth looking on who had not killed his man. It would not seem, however, that it was from negligence in enforcing the royal edicts that duelling then reached to so alarming a height; for it was during this reign that two noblemen, the greatest duellists of the day, the Count de Bouteville and the Marquis de Beuron, were tried and beheaded for persisting to fight. In the commencement of the reign of Louis XIV., duels with four or five a side began to be fought; and two very sanguinary affairs of this description having taken place, in which several persons of the highest rank were slain, the king determined to put an end to the practice. He published an edict in 1679, forbidding it under the highest penalties, which, unlike most of his predecessors, he had the firmness to inflict; and this measure, together with a solemn agreement which was entered into amongst the nobility themselves, led at that time to its almost total abolition.

The duel does not seem to have existed in England in Anglo-Saxon times, and was probably introduced at the Conquest. In its judicial form, it was not entirely obsolete in the reign of Queen Elizabeth; and Sir Henry Spelman gives an account of a trial by battle, which terminated, however, without actual combat, in the year 1571. See *BATTEL TRIAL BY*. Private duelling was common, however, both in Elizabeth's reign and in that of her successor, by whom a severe statute against it was enacted in Scotland (1600 c. 12). During the Civil Wars, men's minds were too much occupied with questions of grave importance to leave time for questions of etiquette, and the duel consequently declined; but it became exceedingly prevalent during the dissolute reign of Charles II. Some attempts were made to suppress it in the reign of William III., both in England and Scotland, and, in 1712, the subject was recommended to the attention of parliament in the Queen's speech, but the bill which was brought in by the government was thrown out, and the practice continued to prevail.

When the custom of wearing the sword was abandoned, the number of duels diminished, though it was then that their irrational character may be said to have attained its maximum. The pistol was substituted for the sword, and the doctrine of chance—which was reduced to an absurdity by the medical duel of a couple of pills, one composed of bread and the other of poison—was inaugurated. Since this period, the practice has fallen into disrepute, by the gradual operation of public opinion, and in this country it may probably be now regarded as finally abolished. By the law of this country, the act of killing in a duel has always been regarded as murder, however fair the duel may have been; but whilst the practice was countenanced by public opinion, it was generally found impossible to induce a jury to convict. That a verdict of acquittal could not be looked for with the same security in the present day, is probably a pretty good guarantee for the practice not again making its appearance even in exceptional instances. In France it still prevails to a certain extent.

The duels of the students at the German universities, of which so much has been said and written in this country, are nothing more than fencing-matches with sharp weapons. They are foolish, but not deadly affairs, as the seconds, who are also armed, always interfere to prevent serious bloodshed.

In 1844, several new Articles of War were issued by the Com-

mander of the Forces, with a view to the abatement of duelling in the army.

1. Every officer who shall send a challenge, or who shall accept a challenge to fight a duel with another officer, or who, being privy to an intention to fight a duel, shall not take active measures to prevent such duel, or who shall upbraid another for refusing or not giving a challenge, or who shall reject or advise the rejection of a reasonable proposition made for the honorable adjustment of a difference, shall be liable, if convicted before a general court-martial, to be cashiered, or suffer such other punishment as the court may award.

2. In the event of an officer being brought to a court-martial for having acted as a second in a duel, if it appears that such officer exerted himself strenuously to bring about an honorable adjustment of the difference, but failed through the unwillingness of the adverse parties, then such officer is to suffer such punishment as the court shall award.

3. Approbation is expressed of the conduct of those who, having had the misfortune to give offence to, or injure or insult others, shall frankly explain, apologize, or offer redress for the same, or who, having received offence, shall cordially accept frank explanations or apologies for the same; or, if such apologies are refused to be made or accepted, shall submit the matter to the commanding officer; and, lastly, all officers and soldiers are acquitted of disgrace or disadvantage, who, being willing to make or accept such redress, refuse to accept challenges, as they will only have acted as is suitable to the character of honorable men, and have done their duty as good soldiers who subject themselves to discipline.

Partly in consequence of these regulations, but still more as a result of the increasing reason and humanity of English society, the practice of duelling has become almost as entirely obsolete in the British army as it has in the country generally. See *ORDEAL*.

DUE'T, in Music, a composition for two voices or instruments.

DUFF, ALEXANDER, D.D., LL.D., who so thoroughly identified himself with the cause of Indian missions, was born 25th April 1806, at a farm near Pitlochry, in Perthshire. He studied at the university of St. Andrews with great success. In 1829 he resolved to go out to India as a missionary from the church of Scotland; and in October of that year, having been previously ordained, he set sail from Portsmouth for India. On the passage out, he was wrecked on a barren island to the north of the Cape of Good Hope, and at length reached his destination after a disastrous voyage of eight months. At the Disruption in 1843, the missionaries in India being obliged to declare with which party they would connect themselves, D. resolved to cast his lot with the Free Church, and for twenty years carried on with great energy the missionary work at Calcutta under the auspices of that body. In the year 1837, he received the degree of D.D. in acknowledgment of his distinguished services. D. visited his native land twice after 1829, before returning altogether in 1863. He was moderator of the General Assembly of the Free Church in 1851 and 1873, and was professor of Evangelistic Theology in the Free Church Colleges. He took an important part in various philanthropic societies and schemes. Dr. D. was gifted with great fervor and extraordinary fluency as a speaker, and he wrote voluminously. Amongst his writings are *New Era of the English Language and Literature* (1837), *Missions the Chief End of the Christian Church* (1839), *India and Indian Missions* (1839), *The Indian Rebellion, its Causes and Results* (1858). He died 12th February 1878. There is a life of D. by Dr. George Smith (2 vols., 1879).

DUFOR, GUILLAUME HENRI, a Swiss general, was born at Constance in 1787, of a Genevese family. While Switzerland formed part of France, he studied at the Polytechnic School of Paris for two years; and on leaving it he received an appointment as an officer of engineers in the French army. At the fall of Napoleon, he entered the Swiss service, and rapidly rose to the rank of colonel. When the government survey of Switzerland was undertaken, he was appointed Director—at the same time acting as the Principal of the Swiss Military School at Thun. In 1840, he published *A Treatise on the Artillery of Ancient and Medieval Times*; and in 1842, *A Manual of Military Tactics*. In 1847, he was raised to the rank of general, and intrusted with the command of the army employed against Sonderbund. He defeated their forces at Freiburg (13th November) and at Lucerne (24th November); and by his promptitude and skilful manœuvres secured a triumph for the liberal party in time to prevent the interference of foreign powers, diplomatically or otherwise. The diet voted him a gift of 40,000 francs, and for a time he was the most popular man in Switzerland. His politics were not, however, those of the Genevese democrats, and in 1848 they deprived him of the public offices he had previously held.

In 1856, he was again admitted to the council of Geneva, and sent on a special mission to Louis Napoleon à propos of the dispute between Switzerland and Prussia about Neuchâtel (see

KERN). In 1864. he was president of the Geneva conference. He died in 1875.

DUFRESNE, CHARLES, SEIGNEUR DU CANGE, hence generally styled merely DUCANGE, a French author, distinguished by his historical and linguistic writings, belonged to an ancient family of Picardy, and was born at Amiens, 18th December 1610. After having received the rudiments of a scientific education at the Jesuits' College in his native town, he studied law at Orleans, and in 1631 became parliamentary advocate at Paris, where he continued to reside till his death, 23d October 1688. There was scarcely any branch of science with which he was unacquainted, but his favorite studies were classical philology and history. Among his historical works may be mentioned the *Histoire de l'Empire de Constantinople sous les Empereurs François* (Paris, 1657). He also edited, along with other scholars, the *Corpus Historiæ Byzantinæ* (Paris, 1680), and Joinville's *Histoire de Saint Louis, Roi de France*. His two principal works, however, are the *Glossarium ad Scriptores Mediæ et Infimæ Latinitatis* (3 vols. fol., Paris, 1678; much enlarged by the Benedictines of St. Maur, 6 vols. fol., Paris, 1733—1736, to which four supplementary volumes were afterwards added by Carpentier, a Benedictine), and the *Glossarium ad Scriptores Mediæ et Infimæ Græcitatatis* (Paris, 1688). Both works display great learning, good judgment, and admirable industry, and are extremely valuable contributions to the study of the history and antiquities of the middle ages. A new edition of the Latin Glossary, incorporating all the previous supplements, together with additions of his own, was published by G. A. Henischel (7 vols. 4to, Paris, 1842—1853); and a supplementary volume (*Latino-Germanicum*) has since been added by Diefenbach (Frankf. 1857). D. left a large quantity of valuable manuscripts, which have been collected in the University of Paris.

DUGDALE, SIR WILLIAM, a celebrated antiquary and historian, was born in 1605 at Shustoke, near Coleshill, Warwickshire. He was educated for some time at the free school of Coventry, but left it at the age of 15, and continued his studies under the care of his father, who, having a decided predilection for the branches of civil law and history, seems to have encouraged similar tastes in his son. His antiquarian pursuits led to his being created (1638) a pursuivant-at-arms extraordinary by the name of Blanche Lyon; and shortly afterwards, he was made Rouge Croix pursuivant-in-ordinary.

During the civil war, D. adhered to the royal cause, and lived for several years in Oxford, employed in researches for his great works. On the restoration, D. was made Norroy King of Arms, and in 1677 Garter King of Arms; at the same time, the king, much against the wishes of D., whose estate was but a poor one, conferred upon him the honor of knighthood. He died at his estate of Blythe Hall, February 10, 1686. His chief works are *Monasticon Anglicanum* (Lond. 1655—1661—1673), (which, though for the most part written by another antiquary, named Dods-worth, was concluded, arranged, indexed, and corrected by D.); a new and greatly enlarged edition of the *Monasticon* by Bandinel, Caley, and Ellis, was published in 1817—1830, and re-issued in 1846; *The Antiquities of Warwickshire* (1656; second edition revised and continued, 1730); *The Baronage of England* (1675—1676); *Origines Juridicales, or Historical Memoirs of the English Laws, &c.* (1666; 3d edit. 1680); *Short View of the Late Troubles in England* (Oxford, 1681); *The Ancient Usage in Bearing Arms* (1682; new edition, 1811). D. bequeathed upwards of 27 folio MS. volumes, written in his own hand, to the university of Oxford. They are now in the Bodleian Library, the Herald's College, and the Ashmolean Museum.

DUGO'NG (*Halicore*), a genus of mammalia, of the family *Manatidæ* (q. v.), and the order *Sirenia*, distinguished by molar teeth with flat summits, and composed of two cones laterally united, the incisors of the upper jaw elongated almost into tusks; the tail forked or crescent-shaped; and the swimming paws destitute of any vestiges of nails. One species alone has been thoroughly ascertained and accurately described. The D. (*H. Indicus*, or *H. Dugong*) of the Indian Archipelago is said to attain a length of 20 feet when full grown, although it is more frequently seen of only 8 to 12 feet long. In general form, it much resembles the manatee. The skull is remarkable for the sudden bending downwards of the upper jaw almost at a right angle. The upper lip is large, thick, and fleshy, covering the prominent incisors, and forming a kind of snout, 'something like the trunk of the elephant cut short across.' The eyes are very small, and are furnished with a third eyelid or *nictitating membrane*. The skin is smooth and thick, but yields no oil. The anatomy of the D. has been very carefully examined. It exhibits a very remarkable peculiarity, in the ventricles of the heart being completely detached from one another. Its osteology has been found to exhibit interesting points of correspondence with that of the *Pachydermata*, as in the numerous ribs, &c.; its dentition resembles in some particulars that of the elephant; its digestive apparatus is adapted to vegetable food, differing very much from that of the

whales, dolphins, and other ordinary cetaceans. It feeds on the algae which grow on submarine rocks in shallow seas. Its lips are of much use in gathering together its food. It often comes to the surface to breathe, and is said to utter a peculiar cry. It



Dugong (*Halicore Indicus*).

is gregarious. The female produces one young one at a birth, and shows an affection for it which is proverbial among the Malays.

When the young one is taken, the mother is easily secured. The D. is generally pursued in boats, and killed by spearing. The flesh is highly esteemed even by Europeans, and is described as resembling young beef. That of full-grown animals is, however, comparatively coarse, on which account, and the greater facility of capture, the younger ones are more frequently killed. According to Rüppell, it was with the skin of the D. of the Red Sea that the Jews were directed to veil the tabernacle.

DUGUAY TROUIN, RENE, one of the most celebrated naval officers of France, was born 10th June 1673, at St. Malo, left the school at Caen, where he was to have studied theology, with the reputation of a good-for-nothing fellow, and betook himself to the sea. His career, which was very brilliant, may be divided into two parts, the first extending from 1689 to 1697, and the second from 1697 to the close of his life. During the former, he cruised about as a sort of privateer, inflicting immense damage on the enemies of France. The English merchantmen suffered severely from his attacks. In the Channel, on the coasts of Ireland and Holland, and in the Spanish Main, everywhere fortune followed Duguay. Louis XIV., as a reward for his daring exploits, admitted him into the state navy, and gave him the command of a frigate. The second part of his career was as brilliant as the first. In 1707, he engaged a part of the English fleet at the entrance of the Channel, burned one ship, captured three others, and about 60 transports; but the most glorious of his triumphs was the attack and capture of Rio Janeiro in 1711, after hostilities had lasted for eleven days. The city was ransomed for 610,000 cruzades. The South American expedition of D. T., which cost Portugal in all about 30,000,000 francs, put the seal to the celebrity of the French commander. He was successively named *chef d'escadre*, member of the council of the Indies, lieutenant-general, and naval commandant at Brest. In 1731, Louis XV. sent D. T. into the Levant, to chastise the barbarians inhabiting the neighboring coasts, and to obtain reparation for the damages done to French commerce. In this also D. T. was successful. He died 27th September 1736. His *Mémoires* were published by Beauchamps (4 vols., Paris, 1740).

DUI'DA, a mountain of Venezuela, in South America, stands in lat. 3° 80' N., and long. 66° 10' W. It is of conspicuous form, being perpendicular on two sides, and bare at the summit. Rising, moreover, to the height of 8500 feet, it forms a safe landmark for the voyager on the Orinoco.

DUISBURG, a town of Rhenish Prussia, about 15 miles north of Düsseldorf, is situated in a fertile district, between the Ruhr and the Rhine, with both of which it is connected by a canal. It is surrounded partly by walls, flanked with towers, which are now somewhat decayed, and partly by a rampart and ditches. D. contains a gymnasium founded in 1599, a monastery of Minorites, and five churches, two of which—that of St. John the Baptist, dating from 1187, and St. Salvador's, are worthy of notice. Its manufactures are numerous and important; including tobacco, soda, sulphuric acid and other chemicals, iron castings, soap, starch, and sugar; there is also a large trade in wine and colonial produce.

In the neighborhood are iron-works and coal mines. Pop. (1880) 41,242. D. is an ancient town. In the 13th c., it was a member of the Hanseatic League, and afterwards a free town of the German empire, but at the close of the war in 1815 it was handed over to Prussia.

DUKE (Fr. *duc*, Lat. *dux* from *ducere*, to lead), a term applied originally to any military leader. Gibbon informs us that the title came first into use when Constantine separated the civil and the

military commands in the provinces, which had been exercised in common by such men as Agricola. From that time forth, the military governors of provinces were either counts or dukes. But these titles originally stood to each other in an opposite relation to that which they afterwards assumed. 'It should be recollected,' says Gibbon (iii. 57, cap. xvii.), 'that the second of these appellations—that of duke—is only a corruption of the Latin word, which was indiscriminately applied to any military chief. All provincial generals were therefore dukes, but no more than ten among them were dignified with the rank of counts, or companions a title of honor, or rather of favor, which had been recently invented in the court of Constantine.' See COUNT. 'A gold belt,' continues Gibbon, 'was the ensign which distinguished the office of the counts and dukes; and, besides their pay, they received a liberal allowance, sufficient to maintain 190 servants and 158 horses. They were strictly prohibited from interfering in any matter which related to the administration of justice or the revenue; and the command which they exercised over the troops of their department, was independent of the authority of the magistrates.' When the Goths, and Franks, and other barbarians successfully invaded the provinces of the empire, they preserved the titles of count and duke, if they had not already borrowed them from the Romans. But amongst races who owed their supremacy to the sword, no dignity could prevail over that of the commander of an army; and the dukes, as military chiefs, acquired a marked pre-eminence over the counts, whose lofty functions under the empire had been partly of a civil, and partly of a military nature. The only exception under the first Merovingians was in the case of the Count of the Palace. See COUNT. In the hierarchy observed by the Franks and other Teutonic races, the ordinary count became the lieutenant of the duke, and the government of the latter extended to several provinces; whereas that of the former was confined to one province, or even to a single locality. The power of the dukes grew so rapidly, in consequence of the dissensions of the Merovingians, that, towards the end of the 6th c. (582), they arrogated to themselves the right to dispose of the crown. Amongst the causes which tended to raise the power of the dukes, was the immense wealth which had been acquired by the great provincial families. The chiefs who had attached themselves to the fortunes of Clovis had been richly endowed with conquered lands. After the close of the 7th c., they overshadowed the crown, and the title of prince and chief (*chef*) began to be attributed to them.

It has been said that the *ducs-maires* of the palace sometimes assumed the title of Archduke (q. v.). Under the second dynasty, the title of duke retained all its dignity and importance, and it was to the successive invasions of local upon central power, that feudality owed its origin. The concession, tacit or express, of hereditary power and independent jurisdiction, first to the central province known as the Isle of France, and then to Aquitaine, extended itself, under the Carolingians, to Burgundy, Normandy, and Gascony; and on the accession of Hugo Capet, to all the other subaltern tenures. Once become unlimited masters of their respective legations, the dukes did not long delay to proclaim their title to be as good as that of the king. They assumed the crown and the sceptre, promulgated laws for their subjects, struck money with their own image, and made war in their own name against the crown, with whom they balanced and several times divided the supreme authority. The confederation of the feudal lords had assumed such dimensions, that about the period of the Norman invasion of England nothing remained directly under the crown except a few towns, of which Rheims and Laon were the chief. The rest of the kingdom was divided amongst the dukes and the counts, under an obligation, which they almost always evaded, of service and fidelity to the crown. But the Capetians had been enlightened by the fall of two dynasties, and were careful to delegate to no other hands the duchy of the Isle of France, which had so often been a stepping-stone to the throne. When it became extinct in 887, it was not re-established, and that event was the signal for the restoration of a national character to France. The duchy of Gascony was joined to Aquitaine in 1052; and both provinces, along with Normandy, were finally re-united to the crown, in 1204, by confiscation. This latter duchy was sometimes given to princes of the blood, but without any separation of its fiscal arrangements from those of the kingdom. A part of Aquitaine was given up to England in 1259, and again ceded to France in 1453. The ducal sovereignty of Burgundy was extinguished in 1477, that of Brittany in 1514, of Narbonne in 1529, and of Toulouse in 1561.

The duchies which were subsequently granted to members of the royal family—that of Bourbon, erected in 1327; of Orleans, in 1344; of Auvergne, Berri, Touraine, Valois, and Alençon, at subsequent periods—enjoyed none of the privileges of independent sovereignty which had belonged to the ancient duchies. The subordination of these fiefs was absolute, and the princes who governed them, though placed on the steps of the throne, were only the first subjects of the realm. The tendency to diminish the actual power which anciently had attached to the ducal title, was

still more apparent in the case of those dukedoms which were conferred on the representatives of illustrious noble families.

The Montmorencies were created dukes in 1551, but they enjoyed no other privileges than those of titled nobles, and their position had no analogy whatever to that of the old provincial dukes. The duke-peers, as they were called, were simply the first class of nobles in France, just as dukes are with us in England; but they differed from English dukes, in that, after the extinction of the Comté pairie d'Eu, in 1775, the duke-peers alone sat in parliament. Several prelates enjoyed this rank—as, for example, the Archbishop-duke of Rheims, the Bishop-duke of Laon, and the Bishop-duke of Langres. The Archbishop of Paris took the same rank after the erection of St. Cloud into a ducal peerage in 1674. There were still two other sorts of dukes in France—the dukes who were not hereditary peers, and the dukes for life, or patent dukes, who date only from the reign of Louis XIV. Swept away by the Revolution, the title was restored by Napoleon, who conferred it, with rich endowments, on his marshals. Several ducal peers were created by Louis XVIII. and Charles X.

In Germany, the dukedom passed through phases very similar to those which it exhibited in the earlier history of France. What is special to the position of the nobility of that country, will be stated under Graf (q. v.).

Dukes, in the older European sense, do not appear ever to have existed in England. The title seems not to have been known earlier than the reign of Edward III., and from the first it was a mere honorary distinction. The Black Prince, who was created Duke of Cornwall (see below) in 1335, was the first English duke. In 1350, Henry, the king's cousin, was created Duke of Lancaster; and when he died, and his daughter was married to John of Gaunt, the king's son, the title was transferred to him—his elder brother, Lionel, being made Duke of Clarence. In the succeeding reign—that of Richard II.—the two younger sons of Edward III. were created, the one Duke of York, and the other Duke of Gloucester. The dignity was thus, in the first instance, confined to the royal house. But the families of Holland and Mowbray very soon received the same title; and one of the Beauforts, an illegitimate son of John of Gaunt, was raised to the peerage by the title of Duke of Exeter. In the reign of Henry VI., the title was granted more widely, and there were at one time ten dukes in his court. The Staffords, Beauchamps, and De la Poles, belong to this period. King Henry VIII. created only two dukes—the one was his illegitimate son, whom he made Duke of Richmond; and the other Charles Brandon, who married his sister, the French queen, and was made Duke of Suffolk. Queen Elizabeth found only one duke when she came to the throne—Thomas Howard, Duke of Norfolk—attainder or failure of male issue having extinguished the rest of them. After the attainder and execution of the Duke of Norfolk, there was no duke in England, except the king's sons, till Ludovic Stuart, a relative of the king's, was made Duke of Richmond in 1623.

In 1623, Villiers was made Duke of Buckingham. On the Restoration, Charles II. restored the Seymours to the rank of Dukes of Somerset, and created Monk Duke of Albemarle. But the habit of conferring this dignity on the illegitimate sons of the monarch was still adhered to, as in the case of the Duke of Monmouth, who was the illegitimate son of Charles II.; and the Duke of Berwick, of James II. Of the existing dukes besides the descendants of Charles II., there are only three families which date their dukedoms before the Revolution—viz., the Howards, the Seymours, and the Somersetes. It was William and Anne who, by advancing a very considerable number of the first families of peers to the rank of duke, altogether changed its character. There are now 11 English dukes, 7 Scotch, 5 of Great Britain, 6 of the United Kingdom, and 2 Irish. These numbers do not include dukes of the blood-royal.

The DUCAL CORONET is composed of a circle of gold, with eight strawberry or parsley leaves, of equal height above the rim.

DUKE OF CORNWALL. The duchy of Cornwall was by royal charter of Edward III. conferred on his son Edward the Black Prince. King Henry IV. subsequently included the D. of C. in a patent in favor of his son Henry Prince of Wales. But since that time, the duchy has belonged of right, without any special grant, to the king's heir-apparent from the time of his birth. On the death of the king's eldest son without issue, during the life of his father, the duchy descends to the next brother. In the event of the death of the heir-apparent without issue, and without leaving a younger brother, or in case of the heir-apparent succeeding to the crown, the duchy of Cornwall merges in the crown until the birth of a son calls it again into existence. The uncertainty thus arising in regard to the duchy has produced much confusion in regard to leases held of the duke, and various acts of parliament have been passed, from the 21 James I. to the reign of the present Queen, to regulate this matter. The D. of C. formerly possessed 'royal jurisdiction and crown rights,



Ducal Coronet.

giving liberty to send burgesses to parliament, and appointing the sheriffs, admirals, and other officers."—Carew's *Cornwall*. At the present day, there is a separate chancellor, and attorney and solicitor general for the D. of Cornwall. The revenues of the duchy are considerable, arising partly from the rents, &c., of the different manors, and partly from the dues on tin, which is produced in large quantities from the Cornish mines. There is a special court for the settlement of questions arising among the miners, called the Stannaries Court (q. v.).

DUKE OF EXETER'S DAUGHTER, an instrument of torture resembling a rack, said to have been invented by the Dukes of Exeter and Suffolk during the reign of Henry VI. This curious instrument was for some time preserved in the Tower of London. Blackstone avers that it was never put into use.

DUKE OF YORK'S SCHOOL is the popular designation for the *Royal Military Asylum* at Chelsea. The late Duke of York, in 1801, used his influence to obtain the formation of a soldiers' orphan asylum. Accommodation was obtained at Chelsea; and in 1803, schools were opened for 700 boys and 300 girls, children of deceased soldiers. The institution has been kept up ever since for the boys, of whom 500 are now maintained, but was a failure as to the girls. The boys are wholly supported as well as educated. They are not bound to serve the state after they leave the asylum; but most of them nevertheless enter the army. A soldier's son has not a *right* of admission; a selection is made according as vacancies may occur. When the boys leave the school, those who do not enter the army are apprenticed to trades. The expenses are defrayed by an annual parliamentary grant, included in the Army Estimates.

DU'KINFELD, a township in the N.E. of Cheshire, 42 miles from Chester, and separated from Ashton-under-Line in Lancashire by the Tame. It has large cotton-factories, iron-foundries, fire-brick and tile-works, and collieries. Astley's New Pit in this township, 690 yards in depth, is one of the deepest coal-mines in the world. Pop. (1831) 16,943.

DULCIGNO (Slavonic *Mkronich*, Turkish *Olgun*), a port of Montenegro, 20 miles S.W. of Scutari, and till 1880 a Turkish town. Pop. about 5000, of whom 3500 are said to be Mohammedans.—Old D. fell into the hands of the Turks in 1571. In the 16th and 17th centuries, it was the most famous den of pirates on the Adriatic; but the Turks burned the whole Dulcignote fleet. *New D.* stands a little farther inland. In 1880, with the approval of Turkey, the representatives of the Western Powers arranged that D. and its territories should become Montenegrin, instead of certain inland districts assigned to Montenegro in fulfilment of the Treaty of Berlin. The Albanians (perhaps not quite spontaneously) insisted on the retention of D., and an Albanian League was formed with this view. The despatch, in September 1880, of a fleet representing the Great Powers, did not immediately secure the transfer; it was not till the end of November that, after endless procrastination, the Turks expelled the Albanian troops by force, and the Montenegrins were able to take possession.

DU'LCIMER, a musical instrument resembling a flat box, with sounding-board and bridges, strung with thin wire, and played on by striking the wires with a small piece of wood in each hand.

DU'LCOSE, or **DU'LCINE**, is a substance closely allied to manna-sugar or mannite, and imported from Madagascar. It consists of $C_6H_{10}O_6$, or $C_{12}H_{14}O_{12}$, is insoluble in boiling alcohol, and does not undergo fermentation.

DULSE (*Rhodomenia palmata*), a sea-weed, one of the **CERAMIACEÆ** (q. v.), growing on rocks in the sea, and used as food by the poor on the coasts of Scotland, Ireland, and other northern countries, and of the Grecian Archipelago, occasionally also as a luxury by some of the wealthier classes who have acquired a taste for it. It has a purple, leathery, or somewhat membranous, veinless, sessile frond, irregularly cut, with repeatedly forked segments, which are either entire at the edges, or furnished with lateral leaflets, the spores distributed in cloud-like spots over the whole frond. Its smell somewhat resembles that of violets. It is eaten raw or roasted, and with vinegar. In Iceland, it is sometimes boiled in milk. It is an important plant to the Icelanders, and after being washed and dried, is stored in casks to be eaten with fish. In Kamtchatka, a fermented liquor is made from it. It is extremely common on all parts of the British coasts. Sheep are fond of it.—The name Dulse is also given in the south-west of England to another sea-weed, *Iridea edulis*, also one of the *Ceramiaceæ*, which has an undivided, obovate or wedge-shaped, flat, expanded frond, very succulent, tapering to a short stalk, and of a dull purple color. It is eaten either raw or pinched between hot irons.—**PEPPER DULSE** (*Laurentia pinnatifida*), another of the *Ceramiaceæ*, has a compressed cartilaginous frond, twice or thrice pinnatifid. It has a pungent taste, and is used as a condiment when other sea-weeds are eaten.

DULUTH, a port of Minnesota, U. S., at the S.W. extremity of Lake Superior. It is an important point of connection for

railways and steamer lines, is near valuable mineral districts, and is growing rapidly. Pop. above 5000.

DU'LWICH, a suburb of London, in the north-east of Surrey, 4½ m. S.S.E. of St. Paul's Cathedral, and near Sydenham. Pop. (1871) 4041. It is a fine rural spot, has many genteel residences, and is noted for its college and picture-gallery.

DULWICH COLLEGE, or God's Gift, was founded in 1619 by Edward Alleyne, a tragic actor. It maintains 12 poor brethren, 12 poor sisters, 12 poor scholars, and 16 out-pensioners. The old college buildings occupy 3 sides of a quadrangle, and comprise the chapel, chaplain's house, alms-rooms, and the Lower School, in which 160 boys receive a second-grade education at the nominal fee of £1 per annum. The Upper School, giving a first grade education, was, in 1870, transferred to new buildings, erected at a cost of nearly £100,000. It can accommodate 700 scholars. The picture-gallery, of choice old Italian, Flemish, and other paintings, was left to the college in 1811 by Sir F. Bourgeois, and is much visited. The expenses of this important institution are chiefly defrayed by the revenues of the manor of Dulwich, which consists of about 1400 acres, and produces about £17,000 per annum.

DUMANGAS, a town near the sea-coast, in Panay, one of the Philippines. Pop. 25,000.

DUMAS, ALEXANDRE, a French novelist, was the son of the republican general, Alexandre Davy-Dumas, who was himself the offspring of the Marquis Davy de la Pailletterie and a negress. The crisp hair and thick lips of D. bore testimony to his African origin, a testimony which is confirmed by the savage voluptuousness and barbaric taste of his partial innumerable compositions. D. was born at Villers-Cotterets, 24th July 1803.

His father died when he was quite a child, and he received in consequence a very imperfect education. At the age of twenty, he came to Paris to seek his fortune, and after a short time received an appointment in the household of the Duc d'Orleans. In 1826, he first appeared as an author in a volume of *Nouvelles*; but it was not till 1829, when his historical drama, *Henri III. et sa Cour*, was brought upon the stage, that France fairly mistook him for a genius. This work appeared at the time when *Romanticism* was beginning to triumph over *Classicism* in French poetic literature, and was hailed by the advocates of the former as a crowning victory. The Duc d'Orleans, who was delighted with the production, led the applause, on the first night of its representation, in honor of the author. Next morning D. was made librarian to his Highness. From this period, he became more and more a noted character in Paris, dexterously contriving at once to feast the appetites of the mob, and to continue the companion of princes. In 1846, he accompanied the Duc de Montpensier to Spain, as the historiographer of his marriage. Afterwards, he visited Africa; and on his return to Paris, finding his income inadequate to meet the expenses of his costly mode of life, he opened a theater of his own. The revolution induced him to attempt a political career; but France, in spite of its discreditable admiration of this literary Cagliostro, had sufficient good sense to turn the cold shoulder to him. In 1853, 'financial considerations' compelled him to seek refuge in Belgium. Subsequently, his pecuniary star being once more in the ascendant, D. visited the East. After the conquest of Sicily by Garibaldi in 1860, he followed in the wake of the great Liberator, who does not seem, however, to have been imposed upon by his mountebank worship and bombastic enthusiasm.

It would require pages to enumerate all the productions which have been issued under the name of D.; but for two reasons, this is unnecessary: first, they are for the most part worthless, and second, they are for the most part not *his*. M. Alphonse Karr, in his *Mercantilisme Littéraire* (1845), and M. Eugène de Mircourt, in his *Fabrique de Romans. Maison A. Dumas et Cie* (1845), have exposed the astounding quackery of this writer. It would seem that D. had introduced the *sweating-system* into literature, for he had in his employ a large number of poor authors and literary hacks, whose circumstances or position hindered them from demanding a legitimate emolument for their labor. To these persons D. was in the habit of giving a few brief outlines of a novel or drama, and then paid them for composing the work, which appeared as the production of D.'s miraculous pen. Thus it happened that D. sometimes contrived to issue more volumes in a year than it was possible for a human being to transcribe in the same period. His best known works are *Les Trois Mousquetaires* (8 vols., 1844), *Le Comte de Monte-Cristo* (12 vols., 1841—1845), *La Reine Margot* (6 vols., 1845). His *Mémoires*, commenced in 1852, only confirm the impression of his character which one derives from the perusal of his books.

Altogether, it may be said that the appearance in literature of a writer like D. is a portentous phenomenon; and the avidity with which his immoral fictions are devoured, is the most severe condemnation of modern, and especially French, society that could well be pronounced. He died 5th Dec. 1870.—**DUMAS, ALEXANDRE**, or Dumas the Younger, son of the preceding, who has un-

nappily followed in the footsteps of his father, was born at Paris, 28th July, 1824. His principal work is *La Dame aux Camélias* (2 vols. 1848), a novel on which is founded the notorious opera of *La Traviata*. It is perhaps the most audaciously immoral work in existence. The heroine is a prostitute, who, while following her avocation, contrives (in a manner known only to French novelists) to keep up an unsullied affection for a young gentleman, who is a compound of sentimentalism, imbecility, and lust. Among D.'s other works may be mentioned *Le Roman d'une Femme*, *La Dame aux Perles*, and several dramatic pieces. *Le Divorce*, a polemical treatise, appeared in 1880. He was installed as a member of the French Academy in 1875.

DUMAS, JEAN BAPTISTE ANDRÉ, a distinguished French chemist, was born at Alais, Gard, in 1800. As apprentice to an apothecary in Geneva, he engaged in some scientific investigations that attracted the attention of Decandolle and Prévost. In 1823, he came to Paris, was first a lecturer in the Polytechnic School, and then professor of chemistry in the *Athénéeum*. He was afterwards removed to the Sorbonne, and made a member of the Institute. His researches in organic chemistry, on atomic weights, sulphuric ether, and the law of 'substitutions,' attracted attention over all Europe. D. is not merely an expert chemist, but an able and bold thinker, and eloquent expounder, who has the art of making science attractive, and of captivating his hearers. During the July monarchy, he was a member of the Council of Education. After the revolution of February, he was chosen a member of the Legislative Assembly; and from 1849 to 1851, he held the portfolio of Agriculture and Commerce. After the *coup d'état*, he was made a member of the Senate and of the Superior Council of Public Instruction (see an excellent sketch of his life in *Nature*, 1880). Numerous contributions from his pen are contained in the scientific journals, and in the *Mémoires de l'Académie*. His chief works are *Traité de Chimie appliquée aux Arts*; *Leçons sur la Philosophie Chimique*; *Essai sur la Statique Chimique des Êtres Organisés*, &c. D. delivered the first Faraday lecture before the London Chemical Society in 1869. He was elected a member of the French Academy in 1876.

DUMB. See DEAF AND DUMB.

DUMB CANE (*Dieffenbachia seguina*, formerly called *Arum seguinum* and *Caladium seguinum*), a plant of the natural order *Araçeeæ*, remarkably differing from the plants of that order generally in its almost arborescent character, but agreeing with them in its acidity, which is in none of them more highly developed. It has a cylindrical stem, with ringed scars and oblongo-ovate leaves. It is a native of the West Indies, and has received its English name from the property which it has of producing dumbness when chewed, its acrid poisonous juice causing an immediate swelling of the tongue, accompanied with excruciating pain. The juice is, however, sometimes used to effect the granulation of sugar. A decoction of the stem is used as a bath and fomentation in dropsy, and the root-stock is used in obstinate constipation.

DUMBAR'TON, a royal parliamentary, and municipal burgh, seaport, and chief town of Dumbarton county, is situated mainly on the left bank of the Leven, near its junction with the Clyde, and 15 miles W.N.W. of Glasgow. It is rather closely built, and chiefly consists of a long semicircular street, parallel to the river. The chief branches of industry carried on in the town of D. are ship-building, marine-engine and machine making, iron-forging, iron and brass founding, and rope-making. It has regular steam-communication with Glasgow, Greenock, and other Clyde ports. Pop. (1881) 14,172. It unites with Kilmarnock, Renfrew, Rutherglen, and Port Glasgow in sending one member to parliament. D. is supposed to have been the Roman station *Theodosia*, and the capital of the kingdom of the Britons, on the vale of the Clyde. Alexander II., in 1222, made it a royal burgh. To the east of the alluvial plain at the mouth of the Leven stands the famous and picturesque castle of Dumbarton, on a steep, rugged, basaltic rock, rising to the height of 560 feet, a mile in circuit at the base, and forming nearly an is. and at high water. The rock almost hides the town of D. from the Clyde. The fortress, composed of houses and batteries, studded over the rock, is of considerable historical interest. The rock is accessible only at one part, which is fortified by a rampart. The castle has been often besieged. A huge two-handed sword, said to be that of Wallace, is shown here. D. gave the title of Earl of Dumbarton to a cadet of the house of Douglas, and commander of a regiment in the royal cause during the troubles in Scotland in the reigns of Charles II. and James II.; the popular song, *Dumbarton's drums beat bonny, O*, has reference to this personage, who died in exile after the revolution.

DUMBAR'TONSHIRE (anciently, Lennox, Levenax, or Leven's Field), a sickle-shaped county in the west of Scotland, bounded E. by Loch Lomond, Stirling, and Lanark; S., by Renfrew and the Clyde estuary; W., by Loch Long and Argyre; and N., by Perth. It is 35 miles long, and 15 (average 7½) broad, with 35 miles of coast; area, 297 square miles. On the east, it has

a detached part of 12 square miles, enclosed by Stirling and Lanark. The south coast on the Clyde is mostly low and sandy. Loch Long forms twenty miles of the west border. The Gare Loch, one mile broad and six long, forms, with Loch Long, the Roseneath peninsula in the south-west, studded with beautiful villas. Loch Lomond for 24 miles bounds the east side of the county, the hills rising from a low, narrow, and wooded shore. Here is the romantic scenery of part of Rob Roy's country described by Scott. The north of the county is mountainous or hilly, rising in Ben Voirlich 3300 feet.

The scenery of D. is very romantic, and the county forms the route to the West Highlands of Argyre and Perth. The ancient ferry from the Lowlands to the Highlands was between Port Glasgow and Cardross. There are many streams, and nine freshwater lakes, the largest being Loch Lomond. The chief rivers are the Clyde, along the south border; and the Leven, the outlet of Loch Lomond, and running six miles into the Clyde, at the foot of Dumbarton Rock. The rocks are mica-slate, tale-slate, clay-slate, trap, coal-measures, and carboniferous limestone. The mineral products are coal, freestone, limestone, ironstone, and slates. The climate is mild and humid. The arable lands lie chiefly south of Loch Lomond, and along the Clyde east and west of Dumbarton Castle. On the hills are reared Highland cattle and black-faced sheep, and on the plains Ayrshire cattle and Cheviot sheep. In 1879, 46,214 acres were under crops and grass, the chief crops being oats, turnips, barley, wheat, beans, and potatoes. D. has extensive and valuable woods. The chief branches of industry are ship-building and marine-engine making, and bleaching, calico-printing, and dyeing, there are also iron-foundries, breweries, tanneries, and rope-yards. D. is divided into 12 parishes. There are about 70 churches, Established, Free, and United Presbyterian. Pop. (1881) 75,333; valuation of the county in 1881-82, £384,627. D. sends one member to parliament. A portion of the Roman wall of Antoninus runs through the south-east corner of the county, and ends at Kilpatrick. At Luss is the cairn of St. Kessock, a martyr in 520. There are remains of Roman forts, and of a Roman bridge at Duntocher. Stone coffins and Roman vases and coins have been found.

DUMBNESS. See DEAF AND DUMB.

DUM'DUM, the name of a town and of a valley in India.—1. The town is well known in the military history of the country, standing in lat. 22° 38' N., and long. 88° 30' E. It is ten miles to the south-east of Barrackpore, and eight to the north-east of Calcutta, having extensive accommodations for troops, and a cannon-foundry. The place is famous in connection with the mutiny of 1857, as the scene of the first open manifestation on the part of the sepoys against the greased cartridges.—2. The valley leads into Cashmere from the south, over what is called the Pir Panjal Pass, whose crest is 11,800 feet above the level of the sea. It is about lat. 33° 45' N., and long. 75° E.

DUMFRIES, a royal, parliamentary, and municipal burgh, river-port, and county-town of Dumfriesshire, on the left bank of the Nith, nine miles from its mouth in the Solway Firth, 73 miles south-by-west of Edinburgh, and 33 west-north-west of Carlisle. It stands on a rising-ground, surrounded, except towards the sea, by fine undulating hills, many of which are green to the top. It is an irregularly built town of red freestone, and is reckoned the capital of the south of Scotland.

Two bridges cross the Nith to Maxwelltown, a suburb in Kirkcubright. One of the bridges is believed to have been built about 1280, by Devorgilla, the mother of John Balliol, and to have had 9 arches, although some antiquaries claim 13, with a central gate. It is largely, however, a structure of the 17th century; only six of its arches now remain; and it is limited to foot-passengers. The most noticeable building in D. is the Mid-steeple, in the center of the High Street, which was at one time believed to have been erected by Inigo Jones; the architect is now, however, ascertained to have been Tobias Baulup, of Alloa. The very high tides of the Solway Firth bring vessels of forty tons up to the town, and larger ones to the river quays below the town. In 1880, 585 vessels, of 30,239 tons, entered, and 580, of 28,958 tons, cleared the port. Pop. (1881) 17,090. D. has three large and two small manufactories of woollen cloths (tweeds); it manufactures hosiery, leather, baskets, and wooden shoes; and it has a considerable reputation for its dye-works, and the nurseries in its vicinity. The chief exports are woollen cloths, wool, hosiery, shoes, sheep, grain, wood, and bark. D. is noted for its markets, live-stock being here transferred from Scotch to English dealers. It unites with Annan, Sanquhar, Lochmaben, Kirkcubright, and its suburb, Maxwelltown, in sending one member to parliament. D. arose, it is believed, in a castle, of which nothing now remains. The early Scotch and English kings had frequent contests for its possession. About 1200, a monastery was founded here, in the chapel of which Comyn (q. v.) was stabbed by Robert Bruce in 1305. The Highlanders, under Prince Charles, in 1745, fined D.

£4000, and plundered and burned it. Burns spent the last years of his life here as an exciseman, and the house he resided in, and the mausoleum erected to his memory, are among the most notable objects of the place.

DUMFRIESSHIRE, a border county of Scotland, on the Solway Firth, having Kirkcudbright on the west. It forms an irregular ellipse, 55 miles by 32, with 22 miles of coast-line on the Solway Firth, to which its surface slopes; area, 1103 square miles, or 705,946 acres. The north half is mountainous, rising, in Hartfell, 2650 feet; Lowther Hills, 2522; Black Lark, 2890; Ettrick Pen, 2358; and Queensberry, 2259. The south part is undulating. The country on the Solway Firth (q. v.) for ten miles inland is flat, sandy, and gravelly, with tracts of 'cobbles,' or large stones. D. is drained principally by three rivers—the Nith, 45 miles long; the Annan, 40; and the Esk, 40; which run south-east and south into the Solway Firth from the north border of the county, and divide it into three districts or dales, called after the rivers. There are many small lochs, three of them near Lochmaben, containing vendace. D. consists of Silurian, Permian, and Carboniferous strata, with eruptions of trap.

Tortoise footprints have been found in the new red sandstone of Annandale, at Corneockle. The mineral products are coal, limestone, ironstone, lead, and silver. There are extensive lead-mines at Wanlockhead, two miles from Leadhills, in Lanarkshire. Gold has been obtained in quartz veins in the hills near Wanlockhead; a mass of five ounces found there is now in the British Museum. There are noted sulphureous springs at Moffat, and chalybeate ones at Hartfell. The climate is moist and mild, and most of the land has a southern exposure. There are rich alluvial tracts along the rivers and on the Solway Firth. The Locher Moss, a peat tract on the Solway Firth, is 13 by 2 to 3 miles, and contains shells, trees, and fragments of ships. The chief occupations are agriculture, and the rearing of cattle, sheep, and pigs. In 1881 there were 233,362 acres, or between one-third and one-fourth of the county, under all kinds of crops. Of these, 50,434 were under corn crops, and 26,518 under green crops. Sheep-farms occupy the hills. The chief exports are cattle, sheep, grain, wool, hams, and bacon. There are fisheries of salmon in the rivers. Pop. (1871) 74,808; (1881) 76,140; the valuation of the county in 1881–82 was, including railways, £572,945. D. sends one member to parliament. The county abounds in antiquities. D. formed part of Valentia in Roman times, and subsequently of the kingdom of Strathclyde.

DUMMOW', a town of India, in the division of Jubbulpore, Central Provinces, stands in lat. 23° 50' N., and long. 79° 30' E., being 775 miles to the westward of Calcutta. It has a large bazaar, and is abundantly provided with wells. Its *district* has an area of 2800 square miles, and a pop. of (1872) 269,642; the town, of 8189. D. is also spelt *Damoh*.

DUMONT, PIERRE ETIENNE LOUIS, an able propagator of the Benthamite philosophy, was born at Geneva, 18th July 1759, studied theology, and after officiating as a minister for a short time in his native town, proceeded to St. Petersburg in 1783, where he accepted the charge of the French Protestant Church. In 1785, he left Russia, went to England, and became tutor to the sons of Lord Shelburne, afterwards Marquis of Lansdowne. His superior talents, liberal sentiments, and fine character, soon recommended him to the illustrious Whigs of that period; with Sir Samuel Romilly, in particular, he formed a close friendship. During the early years of the French Revolution, D. was at Paris, where he became greatly attached to Mirabeau, regarding whom he has given the world much important information in his *Souvenirs sur Mirabeau et sur les deux Premières Assemblées Législatives* (which were not published till 1832, seven years after the author's death). From this work, it appears that D. wrote many of the best articles and speeches attributed to Mirabeau. In 1791, D. returned to England, and formed an intimacy with Bentham. This was certainly the most important event in his life. Deeply convinced of the value of that philosopher's views of legislation, he requested his friend to allow him to arrange and edit his unpublished writings on this subject. Bentham gave him his manuscripts.

D. labored earnestly to abridge, elucidate, correct, and simplify what he had received. The results appeared in his *Traité de Législation Civile et Penale* (Geneva, 1802), *Théorie des Peines et des Récompenses* (Geneva, 1810), *Tactique des Assemblées Législatives* (Geneva, 1815), *Preuves Judiciaires* (Geneva, 1823), and the *Organization Judiciaire et Codification* (1828, a posthumous work). D. returned to Geneva in 1814, and became a member of the representative council. In this office he found many opportunities of putting the principles of Bentham into practice, and thus greatly benefited his native city. He died in 1825, at Milan.

DUMOURIEZ, CHARLES FRANÇOIS, a French general, was born at Cambrai, 25th January 1739, entered the army in 1757, and served in Germany during the Seven Years' War. On the conclusion of hostilities in 1763, D. who possessed a restless, adventurous genius, went from one country to another, seeking

active employment. Under Louis XVI., he held the office of commandant of Cherbourg, where he commenced the formation of a great naval establishment. As the Revolution drew on, D. began to attach himself more closely to the popular party. In 1790, he became connected with the Jacobin Club, and during the same year was appointed military commandant of Lower Normandy. After holding for a short time the office of Minister of Foreign Affairs, he became Lieutenant-general in the army of the North, commanded by Maréchal Luckner. The allies were advancing in great force. By a series of bold and rapid *manœuvres*, D. prevented his enemies from sweeping over the plains of Champagne, and finally took up his position at Grand-Pré. Success quickly arrived, and the victory of Kellermann at Valmy compelled the invaders to retreat. It is generally admitted that by his admirable strategic movements at this critical period D. saved France. A winter campaign in Belgium followed and on the 5th and 6th November 1792, D. overthrew the Austrians under the Duke of Sacken-Teschén and Clairfait at Jemappes. The campaign of 1793, which aimed at the complete conquest of the Netherlands, was opened with the siege of Maestricht; Breda and other places were taken by the French; but at Neerwinde, D. sustained a severe defeat from the Austrians under Coburg. D.'s Jacobism had been cooling for some time, on account of the anarchy prevailing at Paris, and when commissioners were sent to remonstrate with him on account of his monarchical leanings, he told them nothing could save France from the horrors of anarchy but a constitutional monarchy; D. then entered into secret negotiations with Coburg, evacuated Belgium, and promised to exert himself on behalf of the Bourbon family. He was now accused of being a traitor, by the authorities at Paris; but when requested by the commissioners to proceed to the capital, and stand his trial, he answered by handing over the representatives of the people to the Austrians. He next endeavored, but in vain, to win the army over to his plan of marching upon Paris, and re-establishing the royal authority, and D. had to take refuge, accompanied by the Duc de Chartres, in the ranks of the enemies of France. The Convention set a price of 300,000 francs upon his head. After wandering through many countries of Europe, he finally settled in England, where he died an exile at Turville Park, near Henley-upon-Thames, 14th March 1823. Besides a multitude of pamphlets, D. wrote *Mémoires du Général Dumouriez* (Hamburg, 1796), and *La Vie et les Mémoires du Général Dumouriez* (3d. edit. Paris, 1822–1824).

DUN, a root common to the Celtic and Gothic languages, signifying a hill or height. Besides giving rise to the Fr. *dunes*, Ger. *dünen*, Eng. *durns* (q. v.), it enters extensively into the names of places (becoming often *dum*, *don*), as *Dunkirk*, *Dumbarton*, *Donegal*. It is allied to the Ang.-Sax *tun*, *ton*, whence *town* (q. v.).

DŮ'NA, DWŮ'NA, or DVŮ'NA, the name of a river of Russia, which rises in the government of Tver, in the neighborhood of the source of the Volga, and flows west-south-west in a course almost parallel to that of the Dnieper. At Vitebsk, the D. turns to the west, then to the north-west, and advances in that direction toward its debouchure in the Gulf of Riga, passing the towns of Dīna, Drissa, Dünaburg, Jacobstadt, and Riga. The entire length of the D. is about 650 miles. It is navigable from Dünamünde at its mouth, to Velij, on the border of the government of Smolensk—a distance of 400 miles; but the navigation, owing to its shallows, its rock-obstructions, and sand-banks, is extremely difficult and dangerous, except during the spring and autumn floods. The basin of the D. is estimated at 28,350 square miles; at Riga, its breadth is 2400 feet. In the spring, the surface of the D. is covered with rafts and planks, which are floated down from the forests of the provinces through which it flows. Its waters, which abound in fish, are connected with those of the Dnieper, by means of the Bersina Canal, which thus connects the Black Sea and the Baltic. See also **DWINA, NORTUERN**.

DŮ'NABURG, a strongly fortified town of Western Russia, is situated on the Dūna, in the government of Vitebsk. It is of great military importance, owing to the strength of its fortifications. It has three fairs in the course of the year, and considerable trade. Pop. (1880) 52,261. D. was formerly the capital of Polish Livonia.

DUNBAR, a royal, parliamentary, and municipal burgh, and very ancient seaport and town in the north-east of Haddingtonshire, on an eminence at the mouth of the Firth of Forth, 29 miles east-north-east of Edinburgh. The coast near D. consists of basaltic rocks and islets, and gives fine views of the Bass Rock, the Isle of May, and Fifehead. D. is a fine old town. It has a sailcloth and cordage manufactory, a paper mill and extensive tile-work, breweries, &c., but the chief industry is the fisheries, in connection with which there are large curing establishments. The old harbor is impeded at the entrance by craggy islets and sunken rocks, but is accessible to vessels of 300 tons. About the year 1840, an additional harbor, called the Victoria Harbor, was erected at D., at the expense of the Fishery Board and town; with recent

important repairs and improvements, it has cost altogether upwards £50,000. It has four feet at low water, and is considered one of the best suited for fishery purposes in the country. From 4000 to 5000 tons of herrings are annually exported from D., besides what are used for local consumption. The other exports are chiefly corn and potatoes. Pop. (1881) 3661. D. unites with North Berwick, Jedburgh, Haddington, and Lauder in sending a member to parliament.

On the high rocks at the entrance to the new harbor are a few fragments of the ruins of a castle, which, from the end of the 11th c., was the chief seat of the ancient Earls of March. It was once very strong, and an important security against English invasions; Edward I. took it, and Edward II. fled thither after the battle of Bannockburn; it was demolished in 1333, and rebuilt in 1336; it was successfully defended in a siege of six weeks against the Earl of Salisbury by Black Agnes, Countess of Dunbar, in 1338; it sheltered Queen Mary and Bothwell in 1567; and in the same year it was destroyed by the Regent Murray. In 1650, Cromwell, at the 'Race of Dunbar,' defeated the Scottish army under Leslie.

DUNBAR, WILLIAM, the greatest of the old Scottish poets, is supposed to have been born about 1460. In 1475, he went to St. Andrews, where, in 1477, he took the degree of B.A., and in 1479 that of M.A. Considerable obscurity rests upon his career for about twenty years after he left the university. From his own writings, we learn that he entered the order of St. Francis, and was employed for some time as an itinerant or preaching friar. In that capacity, he 'ascended the pulpit at Dernton and Canterbury and crossed the sea at Dover, and instructed the inhabitants of Picardy.' He appears to have entered the king's service, and to have been retained as 'clerk' or secretary to some of James's numerous embassies to foreign courts. In 1500, he obtained from the king a yearly pension of £10. In 1501, he visited England, in the train, as his biographers suppose, of the ambassadors sent thither to conclude the negotiations for the king's marriage. On the 9th May 1503, three months before the queen's arrival, he composed in honor of the event his most famous poem, the *Thrisail and the Rois*. He seems now to have lived chiefly about court, writing poems, and sustaining himself with hope of preferment in the church. On the 17th March 1504, he received a gift for saying mass for the first time in the royal presence. At Martinmas 1507, his pension was doubled, and three years afterwards, it again received augmentation. He is supposed to have visited the northern parts of Scotland in May 1511, in the train of Queen Margaret. After the ruinous defeat at Flodden, and the confusion consequent on the king's death and a prolonged regency, D.'s name disappears altogether. He is supposed to have died about 1520.

As a poet, he possessed a wonderful variety of gifts; his genius comprised the excellences of many masters. He is at times as rich in fancy and color as Spenser in the *Faery Queen*; as homely, and shrewd, and coarse as Chaucer in the *Miller's Tale*; as pious and devotional as Cowper in his *Hymns*; and as wildly grotesque in satire as Burns in his *Death and Doctor Hornbook*. When Scott read portions of his works to Crabbe, in Edinburgh, the latter remarked that, 'before the Ayrshire ploughman, Scotland possessed at least one great poet.' A complete and carefully elaborated edition of D.'s works, by Dr. David Laing, was published at Edinburgh in 1834.

DUNBLANE, a city and burgh of barony in the south of Perthshire, picturesquely situated on the left bank of the Allan, on the Scottish Central Railway, 28 miles south-west of Perth, and 5 north of Stirling. It takes its name from St. Blane, a bishop of the 7th or 8th c., said to have been born in Bute. It mainly consists of one street of old-fashioned houses. Pop. (1881) 2186. The cathedral of Dunblane, chiefly in the First-pointed or Early English style, about the year 1240, is now in ruins, except the choir, used as the parish church, 80 by 30 feet, with a tower 128 feet high, the first four stages of which are Romanesque work of about the year 1140. The prebendary stalls of richly carved oak still remain. Of the bishops of Dunblane, by far the most celebrated was Robert Leighton, who held the see from 1661 till 1672, when he was translated to Glasgow. A path near the river, which he is said to have frequented, still bears the name of 'The Bishop's Walk;' and the library which he bequeathed to his diocese, is still kept in the town. Two miles from D. was fought, in 1715, the indecisive battle of Sheriffmuir, between the royal forces, under the Duke of Argyle, and the troops of the Pretender, under the Earl of Mar. D. once had an ancient Culdee monastery.

DUNCAN, ADAM, VISCOUNT, a celebrated British admiral, was born in 1731 at Dundee, entered the navy as midshipman in 1746, became lieutenant in 1755, and in 1761, commander of the *Valiant*, of 74 guns, which took part in the expedition to Havanna under Admiral Keppel. In 1789, he was appointed Rear-admiral of the Blue, and in 1793, Vice-admiral of the Blue, but had little opportunity of distinguishing himself, and was even meditating,

it is said, retiring altogether from the service, when he was appointed to the command of the United English and Russian squadron in the North Sea, with the special design of watching the movements of the Dutch fleet—Holland and France being then both at war with England. D.'s blockade of the Texel was one of the most effective ever made, and the Dutch trade was almost ruined. During the blockade, a mutiny took place among the seamen, and D.'s position was for some time very critical, but the insubordination was ultimately quelled. Although weakened by the recall of the Russians, he gained a brilliant victory over the Dutch near Camperdown, 11th October 1797, where he took the Dutch admiral, De Winter, prisoner. D. was rewarded with a pension of £2000, and raised to the peerage, with the title of Viscount. In 1799, he was promoted to the rank of Admiral of the White, and died 4th August 1804, after having inherited the family estates in Perthshire, on the death of his brother.

DUNCAN, THOMAS, R.S.A., and A.R.A., was born at Kinclaven, Perthshire, May 24, 1807; and died at Edinburgh, 25th May 1845. He studied in the 'Trustees' Academy, under Sir William Allan; was his successor as head-master of that school, and one of the most distinguished members of the Royal Scottish Academy. His portraits, and historical and fancy subjects, evince delicate feeling for female beauty, and keen appreciation of the humorous in Scottish character. The drawing is always careful and correct, and the coloring remarkable for clearness and delicacy. Though he exhibited but few pictures in the Royal Academy of London, they at once attracted marked attention, and he was elected an Associate of that body in 1843. The principal works he exhibited there were: 'Anne Page and Slender,' an illustration from the ballad of *Auld Robin Gray*, now in the Sheepshanks Gallery, South Kensington; 'Prince Charles's Entry into Edinburgh after the Battle of Prestonpans'—and the same Prince, when a fugitive, concealed in a cave. He had now entered on a most successful career, and was engaged on the studies for two important works: 'Wishart Dispensing the Sacrament on the Day of his Martyrdom,' and a large picture for the Marquis of Breadalbane, 'Queen Victoria at Taymouth,' when he was seized with an illness which terminated fatally. One of his latest works was a portrait of himself; it is now in the National Gallery of Scotland, and is an excellent specimen of careful drawing, united to great power of color and effect. That D. was remarkable for energy and industry, is proved by the number and high quality of the works he executed, though he died at the early age of thirty-eight. His portraits, especially those of ladies and children, will always hold a high place. Though constantly engaged on fancy subjects, he every year exhibited a very considerable number of portraits. In addition to the works above referred to, the following is a list of the principal historical and fancy subjects exhibited by him in the Royal Scottish Academy—1829: 'The Death of Old Mortality,' and 'A Milk-girl.' 1830: 'The Braw Wooer,' and 'Children and Rabbit.' 1831: 'Lucy Ashton,' and finished sketch of 'Jeanie Deans and the Robbers.' 1832: 'Girl with Flowers.' 1834: 'Cuddie Headrig Visiting Jenny Dennison.' 1835: 'Mary Queen of Scots compelled to Sign her Abdication.' 1836: 'A Covenantanter,' and 'Old Mortality Renewing the Inscription on a Tombstone.' 1838: 'The Secret Chamber—Isaac of York Visiting his Treasure,' 'The Lily of St. Leonards,' and 'The Friends.' 1839: Study of 'A Highland Stag, with Dead Game and Fruit.' 1845: 'The Martyrdom of John Brown of Priesthill, 1685.' 1846: The finished sketch of 'Wishart Dispensing the Sacrament on the Day of his Martyrdom, March 1, 1546,' was exhibited after the artist's death.

DUN'CANSBY HEAD (the *Berubium* of Ptolemy), a promontory forming the north-east extremity of Caithness, in lat 58° 39' N., and long. 31° 1' W., and one mile and a half east of John o' Groat's House. In the vicinity are deep long chasms or *ghoes*, in the Devonian strata, and curious detached sandstone columns in the sea called *stacks*. One of the chasms is 300 yards long, 12 to 15 wide, and 100 feet deep, and communicates with the sea by three openings, one of which is arched. The horizontal beds of the sides of the perpendicular gullies look like ruined walls.

DUN'CIAD, THE, by Alexander Pope, was published in 1728, in three books; and to these, in 1742, a fourth book was added. Pope had been, during the greater part of his career, afflicted by a host of eritics and detractors. His own genius had not been spared; the worst motives, personal and literary, had been imputed to him; and he resolved to mete unto his enemies the measure which had been meted unto himself. Hence the origin of *The Dunciad*. Never was chastisement more complete. On its publication, a universal howl of rage and pain arose. The satire conferred immortality on his opponents. Pope was a good later, and his hatred and contempt defy the tooth of Time more completely than all the balsams of the Pharos.

DUNCOMBE, THOMAS SLINGSBY, an English politician, nephew of first Lord Feversham, was born 1796. He was elected M.P. for Hertford in 1824, assisted in carrying the Reform Bill,

and became a prominent member of the extreme Liberal party. In 1832, he was rejected at Hertford; but in 1834 he was returned for Finsbury, which seat he retained in the parliament which assembled in 1839. In 1842, he presented the Chartist petition, signed by 3,000,000 of the lower classes in favor of universal suffrage, vote by ballot, short parliaments, &c. In 1842, the then Home Secretary, Sir James Graham, having sanctioned the opening of the letters of Mazzini, D. stood up in the House of Commons and denounced, with bitter and scathing invective, the adoption of the post-office spy-system on English soil. He was an earnest advocate of Jewish emancipation; and his motion in 1858 for placing Baron Lionel Rothschild on a committee of the House of Commons, was soon followed by the concession, by the latter chamber, of the right of Jewish members to sit in the House of Commons. He died Nov. 13, 1861.

DUNDA'LK, a parliamentary and municipal borough and seaport, the capital of the county of Louth, Ireland, is beautifully situated at the mouth of the Castleton River, 50 miles north of Dublin. It is overlooked on the north-east by the Carlingford Mountains. Vessels drawing 16 feet can enter the harbor. D. has manufactures of tobacco, soap, leather, starch, and salt; steam flour-mills; considerable fisheries; a distillery, brewery, and a flax-spinning mill. The chief imports, especially from Liverpool, are groceries, timber, coal, iron, slates; and the exports, flax, linen, and all sorts of agricultural and dairy products and livestock. D. is the chief outlet for the produce of the counties of Louth, Monaghan, and Cavan. Pop. (1871) 11,327, of whom 8969 were Roman Catholics; (1881) 11,974. It sends one member to parliament. It has the remains of a Franciscan friary and a Druids' circle. The last king of all Ireland was crowned here. Edward Bruce took D. in 1315, and held his court here till killed in battle at Faughart, in the vicinity, in 1318. D. was captured by the Irish in 1641, by Cromwell in 1649, and by Schomberg in 1689. In 1879—1880 the annual value of property was £20,133; the harbor revenue was £9246. In 1878, 919 vessels, of 162,983 tons, entered the port.—**DUNDALK BAY** is eight miles broad by seven deep, and with four to six fathoms water in the middle. It receives the Fane, Dee, and Castleton rivers.

DUNDA'S. (1) A castle and manor on the south bank of the Firth of Forth, near South Queens-ferry; the castle is a square tower of the 15th c. with modern additions; the manor was the original seat of the distinguished family of Dundas, to whose progenitor it was granted by the Earl of March about the year 1150.—(2) A town in the province of Ontario, Dominion of Canada, at the head of Burlington Bay, at the west of Lake Ontario. Pop. (1871) 3135. It is a station on the Great Western Railway, and has a number of mills and manufactories.—(3) An island belonging to Great Britain, situated on the north-west coast of America, 40 miles north-east of Queen Charlotte Island. It has Dixon's Entrance (q. v.) on the west, and is separated by Chatham Sound from the most southerly of the Alaskan islands.—(4) A group of nearly five hundred islets, all of coralline formation, lying off the east coast of Africa, being about lat. 1° S. There is only one secure harbor.—(5) A river flowing into Delagoa Bay (q. v.).—(6) A strait in North Australia, separating Melville Island from Coburg Peninsula, being eighteen miles in breadth.

DUNDAS (of Arniston), the name of a Scottish family singularly distinguished for legal and political talent. Sir James Dundas, the first of Arniston, received the honor of knighthood from James VI., and was governor of Berwick. His son, Sir James Dundas, was appointed a judge of the Court of Session in 1662, and took his seat on the bench under the title of Lord Arniston, but was soon after deprived of his office for refusing to abjure the 'National and Solemn League and Covenant.' He died in 1679. His eldest son, Sir Robert Dundas, who also rose to the bench, died in 1727.—**DUNDAS, ROBERT**, the son of the preceding, was born 9th December 1685; became a member of the Faculty of Advocates in 1709; and in 1717 was appointed Solicitor-general for Scotland, an office which he filled with great ability in a period of much political confusion. In 1720 he was made Lord Advocate; and in 1722 was chosen to represent the county of Edinburgh in the British parliament, where he honorably distinguished himself by his attention to Scottish affairs. When Sir Robert Walpole came into power in 1725, D. resigned his office when he was elected Dean of the Faculty of Advocates. In 1737, he was raised to the bench, when, like his father and grandfather, he took the title of Lord Arniston. On the death of Lord President Forbes of Culloden, in 1748, he was appointed his successor. He died in 1753. As an advocate, D. was a powerful and ingenious reasoner, and though somewhat disliked on the bench, his ability was universally admitted.—**DUNDAS, ROBERT**, the eldest son of the preceding, was born 18th July 1713, studied at Edinburgh and Utrecht, was admitted to the Scottish bar in 1738, and rose to be Lord Advocate (1754) and President of the Court of Session (1760). D. died at Edinburgh, 13th December 1787.

DUNDAS, the **RIGHT HONORABLE HENRY, VISCOUNT MELVILLE**, and **BARON DUNIRA**, brother of the preceding, was born in 1741, and educated at the university of Edinburgh. He was admitted a member of the Scottish bar in 1763. As a younger son of a pretty numerous family, his circumstances were rather straitened; but his assiduity, his large share of the family talent, and no doubt of the family influence, soon procured him advancement in his profession. He was successively appointed Depute-advocate and Solicitor-general. In 1774, he was returned to Parliament for the county of Edinburgh, and in the following year was appointed Lord Advocate for Scotland. Two years after, he was made keeper of the King's Signet for Scotland. D.'s career in parliament was highly successful, though not very creditable to his political consistency. Elected in opposition to ministerial influence, he soon allied himself with the party in power, and became a strenuous supporter of Lord North's administration, being one of the most obstinate defenders of the war with the American colonists. When Lord North resigned in 1781, D. continued to hold the office of Lord Advocate under the Rockingham ministry. On the question of the war with America, D. had been opposed to Pitt; but when the Coalition Ministry was formed by Fox and Lord North, he passed over to the side of his old opponent, and became Pitt's ablest coadjutor. When Pitt returned to the helm of the state in 1784, D. was appointed President of the Board of Control. In 1784 he introduced a bill for restoring the estates in Scotland forfeited on account of the rebellion of 1745. In 1791, he was appointed principal Secretary of State for the Home Department. He also held a great number of other offices, one of which, the treasurership of the navy, involved him some years after in much trouble. D.'s aptitude for business was undeniable. Many of the most important public measures originated with, or were directly promoted by him. Among such were the formation of the fencible regiments, the supplementary militia, the volunteer corps, and the provisional cavalry; in short, the whole of that domestic military force raised during the war consequent on the French Revolution. When Pitt resigned in 1801, D. did the same. In 1802, under the administration of Mr. Addington, he was elevated to the peerage by the titles of Viscount Melville and Baron Dunira. In 1805, his lordship was accused of 'gross malversation and breach of duty,' while acting as treasurer of the navy. The trial commenced 29th April 1806; but in spite of the splendid array of Whig talent against him, D. was acquitted on all the charges. After this, however, he took little part in public affairs, spending the most of his time in retirement in Scotland. He died at Edinburgh, 27th May 1811.

DUNDEE (Lat. *Taodunum*, the 'hill or fort on the Tay'), a royal parliamentary and municipal burgh and seaport, in the south of Forfarshire, on the left bank of the estuary of the Tay, here two miles broad, 10 miles from the entrance of that river into the sea, 50 miles north-north-east of Edinburgh, 20 east-north-east of Perth, and 14 south-east of Forfar. In population, it is the third town in Scotland.

It stands mostly on the slope between Dundee Law (525 feet high, composed of trap, and with traces of ancient vitrification) and Balgay Hill and the Tay. The new streets are wide and well laid out. The most striking architectural features of the town are—the Town Hall, in the Roman Ionic style, with a spire 140 feet high, erected by the 'Elder Adams,' in 1734; the Albert Institute and Free Library, in 15th-century Gothic, from designs by Sir Gilbert Scott, recently erected at a cost of £30,000; the Royal Exchange, built in the Flemish pointed style of the 15th c., at a cost of upwards of £12,000, and opened in 1856; the Eastern Club House; the Corn Exchange, capable of containing 2000 people; the Infirmary; the Judiciary and Sheriff Court Buildings; the Post-office; the High School; the Town's Churches, with the old tower, 156 feet high, restored in 1873 under the charge of Sir Gilbert Scott, at a cost of £7000; St. Paul's Episcopal Church, with a tower and spire 217 feet high; St. Paul's Free Church, with a tower and spire 167 feet high; and St. Enoch's Free Church, with two handsome towers; the Morgan Hospital (opened 1868), erected and endowed at a cost of nearly £80,000, under the will of John Morgan, a native of Dundee, for the maintenance and education of 100 boys; and the new Orphan Hospital. D. has several public parks, one of which, the Baxter Park, on a beautiful slope to the eastward of the town, is 37 acres in extent, and was presented by the late Sir David Baxter, at a cost of £50,000; another, to the westward of the town, occupies the hill of Balgay, and is finely wooded and beautifully laid out, its extent being about 60 acres. D. is the chief seat in Great Britain of the manufacture of coarse linen fabrics (Osnaburgs, sheetings, ducks, dowlas, drills, canvas, and cordage). Manufactures of jute are almost exclusively carried on here. The consumption in D. of this material, which is grown in India, amounts to fully 150,000 tons annually. The raw material costs in D. a little over 2d. per lb.; and the cloth made from it, reckoned by weight, is the cheapest textile fabric made in Great Britain. Of jute many varieties of fabric are made, from the

coarsest nail-bagging to carpets of great beauty. This range includes pack-sheets for every species of merchandise, sacks for wool, coffee, guano, &c. The annual value of the flax, hemp, and jute manufactures in D. is upwards of £5,500,000. D. is also famous for its manufacture of confectionery, which is exported to all parts of the world. One firm uses 150 tons of bitter oranges annually in the manufacture of marmalade. D. is the center of the whale and seal fishing trade of Great Britain. Ship-building (both wood and iron) and machine-making are carried on to some extent. D. has magnificent harbors, in addition to the tide harbor, several large wet docks, a graving-dock, and a slip for large vessels. The docks have been erected at a cost of upwards of £700,000.

In 1878, 1535 vessels, of 426,014 tons entered the port. The direct railway communication of D. with the south, established in 1878 by the Tay Bridge, two miles long, was interrupted by a sad disaster at the end of 1879, when a great part of the bridge and a passenger train passing over it were thrown into the river. Steps were soon taken to have the bridge rebuilt at a somewhat lower elevation. Pop. (1871) 118,977; (1881) 140,239. D. sends two members to parliament. It was an important place in the 12th century. Edward I. was here twice. Wallace is said to have taken the castle in 1297, and Bruce demolished it in 1313. The Duke of Lancaster burned D. in 1385, and the Marquis of Montrose pillaged it in 1645. Charles II. lived here, after his coronation at Scone, in 1650. On the refusal of D. to submit to Cromwell, General Monk, in 1651, sacked and burned it, massacring 1000 citizens and soldiers, and filling 60 vessels with booty, which were totally wrecked on their voyage to England. D. was one of the first Scotch towns to adopt the Reformation. Wishart the martyr preached here during the plague of 1514.

DUNDEE, VISCOUNT. See GRAHAM, JOHN.

DUNDO'NALD, THOMAS COCHRANE, EARL OF, son of the ninth Earl of Dundonald, was born December 14, 1775. He, while still a boy, entered the 104th Regiment. At the age of 17, he joined the *Hind* corvette, commanded by his uncle, Captain Sir Alexander Cochrane. In 1800, he became master and commander of the *Speedy* sloop-of-war, of 14 guns and 54 men; and in ten months he took 33 vessels, carrying together 128 guns and 533 men, besides assisting in the capture of many others. D. received his post-rank, 1801, for the capture, by boarding, of *El Gamo*, a Spanish frigate of 32 guns, off Barcelona. In 1803, he was appointed to the *Arab*, 22, and served at the blockade of Boulogne. In 1804, he removed to the *Pallas* frigate, 32, and was sent out to assist his uncle, then employed in the blockade of Ferrol. He made several valuable prizes while cruising off the Spanish coast, among others the *Fortuna*, with specie to the amount of £150,000, besides merchandise, but generously returned 10,000 crowns to the Spanish captain and supercargo. In 1806, he cut out the *Tapa-guse* corvette, which lay in the Gironde, under the protection of two heavy batteries. He destroyed the semaphores along the French coast, and carried by storm the battery at Pointe l'Equillon, which he blew up. Being now transferred to *L'Impérieuse*, he took and destroyed, in the month ending January 7, 1807, 15 of the enemy's ships, chiefly laden with wine and provisions. He was next sent to co-operate with the patriots on the coast of Catalonia, and contributed to the surrender of the castle of Mongat.

After harassing the French coast, and destroying the semaphores on the coast of Languedoc, he volunteered for the defence of Fort Trinidad, at Rosas, on the coast of Catalonia. At the head of 80 of his own men, and the same number of Spaniards, he repelled 1000 of the enemy in an assault made by them upon the castle. He protracted the siege for 12 days, then blew up the magazine, and returned to his ship. In April 1809, he was selected by the Admiralty for the daring and hazardous service of burning the French fleet then lying at anchor, and blockaded by Lord Gambier, in the Basque Roads. At night he went on board one of the fireships, containing 1500 barrels of gunpowder, and performed the service intrusted to him with characteristic intrepidity. He was rewarded with the knighthood of the Bath. He had been chosen M.P. for Westminster in 1807, and his charges of incompetency against Lord Gambier led to a court-martial upon that nobleman. Lord Gambier, after a partial trial, was acquitted, and the professional prospects of his assailant were ruined. During the rest of the war, the country lost the incalculable benefit of his services at sea, the navy gaining, on the other hand, such small advantage as could in those days be derived from D.'s protests in parliament against naval abuses. Early in 1814, he was accused of complicity in fraudulent stock-jobbing transactions. A rumor of the downfall of Napoleon having caused a sudden rise in the funds, D. and his friends were charged with having fraudulently propagated the rumor, and with having 'sold out' to a large amount. He was found guilty of fraud, and was sentenced to pay a fine of £1000, to suffer a year's imprisonment, and to stand in the pillory. The latter part of the punishment was remitted, but

he was deprived of the order of the Bath, of his rank in the navy, and expelled from the House of Commons. A new writ was issued for Westminster; but his constituents immediately re-elected him, notwithstanding his expulsion from the House; and his daring was shown by his escape from prison, and his re-appearance in the House. He represented Westminster until 1818, when, panting for a more active and eventful career, he drew his sword in defence of the independence of the South American colonies of Spain. The command of the fleet of the republic of Chili was offered to him, and the terror of his name materially contributed to the success of the national cause. Valdivia, the last stronghold of the Spaniards, was captured by him. Another daring exploit was the cutting out of a large 40-gun frigate from under the guns of the castle of Callao, 5th November 1820. The Emperor of Brazil, Dom Pedro, afterwards gave him the command of the Brazilian fleet, and created him a marquis. In 1827 and 1828, he assisted in the Greek war of independence. In 1830, the Whig administration of Earl Grey came into office, and, believing him to have been the victim of a cruel and unjust persecution, hastened to restore him to his naval rank. In 1831, he succeeded to the earldom. In 1847, Queen Victoria conferred on him the Grand Cross of the Bath. He was also appointed commander-in-chief on the North American and West India station.

In 1851, he was Vice-admiral of the White, and in 1854, Rear-admiral of the United Kingdom, a distinction which he held until his death. On his retirement from active service, he devoted himself to scientific inventions. He made improvements in poop and signal lights, and especially turned his attention to naval projectiles. He declared himself to be in possession of a means of annihilating an enemy's fleet, and during the Russian war offered to destroy Sebastopol in a few hours with perfect security to the assailants. His plans were, however, rejected. When upwards of 80 years of age, he published his Autobiography—the record of a career almost unequalled even by British seamen for desperate service and dauntless exploit. He died October 31, 1860, and was interred in Westminster Abbey. In his naval expeditions, it was his fate to be constantly opposed to forces greatly superior to his own in numbers and metal. His inventiveness and fertility of resource under such circumstances have perhaps never been equalled. His daring would have been, in a man of less genius, the height of rashness, yet the almost unvarying success of his manoeuvres and exploits attests his forethought, and his happy adaptation of slender means to the achievement of great ends and noble enterprises. In person, he was tall and broad built; and a slight stoop, contracted by service in the small sloops and corvettes of his early days, scarcely impaired a height of stature that might be described as commanding. His features, were Scottish in character, and strongly marked, bearing in deep lines the traces of struggle, sorrow, and the wear and tear of an unusually long, active, and eventful life.—In 1877, a petition was presented to the Queen, asking compensation to D.'s heirs for his eighteen years' loss of pay and allowance as a naval officer—a petition which was ultimately granted.

DUN'DRUM BAY, an inlet of the Irish Sea, on the east coast of Ireland, in the county of Down, 5 miles to the south of Downpatrick, is about 10 miles at its entrance, and forms a long curve into the shore, with a uniform breadth of about 2½ miles. Here, in 1846, the steamship *Great Britain* was stranded, but was got off in the following year without having suffered any very serious damage.

DUNE'DIN, capital of the provincial district of Otago, in New Zealand, is situated in lat. 45° 50' S., long. 170° 36' E., on the east side of South Island towards its southern extremity. It is 200 miles by sea from Lyttleton, and 150 miles from Invercargill. Since its foundation by the New Zealand Company in 1848, the city has rapidly increased in importance; chiefly after the year 1861, when the discovery of extensive gold-fields in the neighborhood caused a sudden increase of population. For three years, the city, as well as the province, made great strides in wealth and prosperity; and although subsequently the excessive increase of population was checked by a decrease in the yield of gold, D. has ever since made steady progress. The population of the city proper in 1881 was 24,372, an increase of above 9500 since 1871; inclusive of the suburbs, near 35,000.

Within the last few years, the population has been increased by emigration from the colony of Victoria. D. is divided into four wards. It is as well laid out as the hilly nature of its site will allow; it is well paved, and lighted with gas. There are many handsome buildings—about a dozen of them churches; the First Presbyterian Church, lately built, being one of the finest in the colony. D. is the seat of an Anglican and a Roman Catholic bishop. Other public buildings are the post-office, hospital, government buildings, mechanics' institute, &c.; and the inhabitants of the city possess places of recreation in the Vauxhall Gardens, Botanical Gardens, and the grounds of the Acclimatization Society. The theater, burned down in 1875, has been rebuilt.

The University and High School are flourishing institutions. There are several daily papers, and numerous weeklies and monthlies. Amongst the manufactories, a woollen one is the principal. The street tramways are worked by locomotives. Railways connect D. with Christchurch to the north and Invercargill to the south. D., which is the most important commercial city in New Zealand, has frequent communication with the other colonial ports, with Melbourne and the home country.

DUNES, from the same root as *Dun* (q. v.), a hill, the name given to the sand-hills or mounds which stretch less or more along the sea-coast of the Netherlands and north of France. These dunes are a natural curiosity. 'As if anxious to save the low countries from tidal inundation, Nature has for centuries been energetically working to increase the magnitude of the mounds on the coast. At low water, when the beach is exposed to the action of the winds from the German Ocean, clouds of sand are raised into the air, and showered down upon the country for at least a mile inland; and this constantly going on, the result is, that along the whole line, from Haarlem to about Dunkirk or Calais, the coast consists of sandy mounds of great breadth, partially covered with grass and heath, but unfit for pasturage or any other purpose, and these are the bulwarks which protect the coast. In some places, these dunes look like a series of irregular hills; and when seen from the tops of the steeples, they are so huge as to shut out the view of the sea. The traveler, in visiting them from the fertile plains, all at once ascends into a region of desert barrenness. He walks on and on for miles in a wilderness such as might be expected to be seen in Africa, and at last emerges on the sea-shore, where the mode of creation of this singular kind of territory is at once conspicuous. Loose particles of sand are blown in his face; and as he descends to the shore, he sinks to the ankle in the drifted heaps. In some parts of these dreary solitudes, the sandy soil has been prevented from rising with the wind and injuring the fertile country, by being sown with the seeds of a kind of bent-grass, and in a few spots fir-trees have been successfully planted.'—*Tour in Holland*, by W. Chambers. The English term *dun*, (q. v.) has a similar meaning.

DUNFERMLINE, a royal burgh in Fife, of the western district of which it is the chief town. It is the seat of the sheriff courts of the district, which are held twice a week during the session. The town is situated on a long swelling ridge, 3 miles from the Firth of Forth, and 16 miles west-north-west from Edinburgh. It stands 300 feet above the mean level of the firth, and from the south has an imposing appearance. The date of its origin is not known, but it was a place of note before the end of the 11th century. Here, King Malcolm Canmore and his queen, St. Margaret, between the years 1070 and 1093, founded an abbey for Benedictines brought from Canterbury. In 1303—1304, Edward I. of England wintered here, the buildings being then described as capable of accommodating three kings and their suites. In 1588, D. was created a royal burgh by James VI. David II., James I. of Scotland, and Charles I., were born here; and Malcolm Canmore, his queen Margaret, Edgar, Alexander I., David I., Malcolm the Maiden, Alexander III., Robert Bruce, his queen Elizabeth, and nephew Randolph, Annabella, queen of Robert III., Robert Duke of Albany, governor of Scotland, were buried in the abbey and its precincts. The tomb of Robert the Bruce was discovered at the building of the new church, which was opened in 1821. The skeleton of the king was disinterred, and a cast was taken of the cranium. Some interesting fragments of the ancient regal and ecclesiastical magnificence of D. still remain. What is called Malcolm Canmore's Tower is a mass of shapeless ruins, but the south wall of the palace of the Stuarts still exists, overhanging the romantic glen of Pittencrieff, a noble wreck, with massive flying buttresses. Of the abbey, the Frater Hall or refectory, and a tower and arched gateway, still remain. The nave of the abbey church, consecrated in 1150, is in the Romanesque style, 106 feet long, and 55 wide. The choir, built about 1250, a fine example of the First Pointed style, was taken down in 1818—1821, when it was replaced by what is now the parish church, surmounted by a square tower 100 feet high, round which is the inscription, in open hewn capital letters, 'King Robert the Bruce.' The modern history of D. is chiefly remarkable in connection with the rise of Scottish dissent, Ralph Erskine and Thomas Gillespie having respectively been founders of the Seceder and Relief bodies, now joined under the name of United Presbyterians. The staple trade of the town is damask linen-weaving, which took its rise about the beginning of last century. There are establishments for the spinning of linen yarn, and several large factories where steam and hand-loom weaving is carried on. There are likewise large collieries and lime-works, iron foundries, breweries, dye-works, and fire-clay works. See **DAMASK**. The public buildings are—town-house and county buildings, each having a spire, and the prison, poor-house, and music-hall. There are eight fairs, a monthly cattle-market, and one weekly market for grain or country produce. Pop. of burgh

(1871) 14,958; (1881) 17,085. It joins with Stirling, Inverkeithing, Queensferry, and Culross in returning a member to parliament.

DUNGA'NNON, a parliamentary and municipal borough in the east of Tyrone, near a tributary of the Blackwater, eleven miles north-north-west of Armagh, and eight west of Lough Neagh. It lies on a hill-slope, in a densely peopled district, with high mountains to the west. It is well built, and consists of a square with diverging streets. In the vicinity are the largest lime-quarries and collieries in Ulster. The chief manufactures are linen, coarse earthenware, and fire-brick. Pop. (1861) 3886; (1881) 4081. It sends one member to parliament. It was the chief seat of the O'Neils, the kings of Ulster, till 1607. Its castle was destroyed by the parliamentary forces in 1641.

DUNGA'RVAN, a parliamentary and municipal borough, seaport, and bathing-place, Waterford county, Ireland, 25 miles west-south-west of Waterford. Pop. (1871) 7719; (1881) 7377, chiefly engaged in lake, cod, herring, and other fisheries. The chief exports are grain, butter, cattle, and fish. Vessels of more than 250 tons cannot discharge at the quay. D. has the remains of an Augustinian abbey, founded in the 7th c. by St. Garvan. It has besides the remains of walls built by King John, who also built the castle, now used as barracks.—Dungarvan Bay is three miles wide, about the same in length, and one to five fathoms deep.

DUNG BEETLE, the common name of many coleopterous insects of the tribe *Scarabæides*, which feed upon the dung of animals, and for the most part live in it. They are found in all parts of the world. Many of them belong to the section of *Scarabæides* called *Coprophagi* (Gr. dung-eaters); but others, as the **DOR**, or **SHARD-BORN BEETLE** (*Geotrupes stercorarius*), to the section called *Arenicoli* (Lat. sand-dwelling), distinguished by peculiarities in the antennæ, mandibles, &c. Neither section, however, consists exclusively of insects entitled from their habits to be called dung beetles, some of the *Coprophagi* feeding chiefly on marine vegetables in a state of putrescence, and some of the *Arenicoli* on the roots of plants. The **DOR** is one of the most common British beetles; it is of a stout form, less than an inch long; black, with brilliant metallic and blue reflections on the under surface; it may often be heard droning through the air towards the close of the summer twilight, and finds its way with rapidity and certainty to cow-dung, on which it feeds, and under which it barrows, making a large cylindrical hole, often of considerable depth, and depositing therein its eggs, enveloped in a mass of dung. These habits—more or less modified—are shared by many other species, which thus not only hasten the removal of what would otherwise become offensive on the surface of the ground, but even distribute it in the soil, where it affords nourishment to plants.—The sacred beetle or *Scarabæus* (q. v.), of the Egyptians (*Scarabæus sacer*, or *Ateuchus sacer* of modern entomologists) is a true **D.B.**, one of the *Coprophagi*, in size and color much resembling the **dor**. It is found not only in Egypt, but in the south of Europe and west of Asia, and deposits its eggs in dung, which it rolls into little balls for the purpose. A nearly allied insect (*Gymnopleurus pilularius*), a native of North America, is known as the **TUMBLE-DUNG BEETLE**, from its habit of rolling globular pellets of dung to the place where they are to be buried in the earth.



Dung Beetle (*Geotrupes stercorarius*).

Several individuals sometimes combine their strength in this curious operation, which is performed by the hind feet pushing backwards.—The **dor**, and some other dung beetles, simulate death to deceive their enemies when they apprehend danger, not, like many insects, by contracting their bodies as much as possible, and drawing in their legs, but by stretching every part out to the utmost, and rigidly fixing themselves in that position. Crows and other birds are supposed to prefer them in a living state.

DUN'GEON. See **DONJON**.

DUNKELD, a city and burgh of barony in the east of Perthshire, 15 miles north-north-west of Perth. It lies in a deep romantic hollow, on the great east pass (of Birnam) to the Highlands, on the left bank of the Tay, across which it communicates with the south by a handsome bridge, built in 1809 by the Duke of Athole. It is environed by dark wooded and craggy mountains. Pop. (1881) 768. D. is a place of great antiquity, dating probably from the 7th or 8th century. About the year 1130, King David I. made it the seat of a bishopric, of which the Culdees of the ancient abbey were the chapter. The choir of the cathedral, chiefly in the First Pointed style, was built between 1318 and 1337; the nave, in the Second Pointed style, was built between 1406 and 1464; and the tower and chapter-house, also in the Sec-

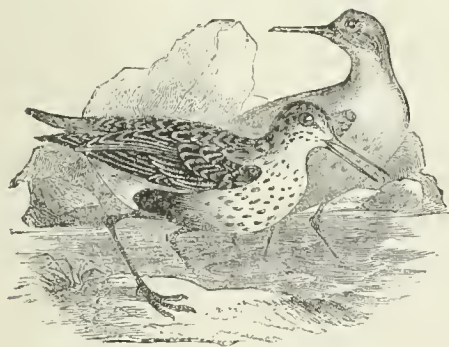
ond Pointed style, were built between 1470 and 1477. The choir is now the parish church. The nave, which is in ruins, contains one or two ancient monuments. The monument of the Wolf of Badenoch (Alexander Stuart, Earl of Buchan, who died in 1384) lies in the vestibule. The Duke of Athole's grounds, unsurpassed in Scotland for extent and beauty, lie on the west and north of D., and include the cathedral; Craig-vinean and Craig-y-Barns; 50 miles of walks, and 30 miles of drives; falls of the Bran (upper one, 80 feet), near Ossian's Hall at the Rumbling Bridge; and 20 square miles of larch-wood, including the first two larches planted in Britain (in 1737). D., in ancient times, is said to have been the seat of the Pictish kings. It was the seat of a diocese from 1127 to 1688. Three miles south of D. stood Birnam Wood, so famous in connection with the fate of Macbeth.

DUNKIRK, or **DUNKERQUE**, the most northerly seaport and fortified town of France, stands on the eastern shore of the Strait of Dover, in the department of Nord, its distance from Paris being in a straight line about 155 miles north, and from Lille about 43 miles north-west. The town, which is connected by railway and canal with the principal manufacturing centers of Belgium and France, is surrounded by ramparts and ditches, and is defended by a citadel. It is well built, the streets spacious and well paved, the houses chiefly of brick. Its quay and pier, its church of St. Eloi—a Gothic structure, having a handsome though rather incongruous frontispiece in its Corinthian portico—its town-hall, barracks, college, and theater, are the principal architectural features.

The harbor of D. is shallow, and the entrance difficult, but the roadstead is large and safe. D. has manufactures of soap, starch, beer, beetroot-sugar, cordage, and leather; also metal foundries, distilleries, salt-refineries, and ship-building yards. Forming as it does the outlet for the great manufacturing department of Nord, its trade by sea is very considerable. Since becoming a free port, it has also carried on a good trade in wine and liqueurs. Its cod and herring fisheries are actively prosecuted. The immediate vicinity of D. has a dreary and uninteresting appearance. Pop. (1881) 36,644.

D. is a place of considerable historic interest. It owes its origin, it is said, to the church built by St. Eloi in the 7th c., in the midst of a waste of sand-hills or dunes, and hence its name, 'Church of the Dunes.' D. was burned by the English in 1388, taken by them under Oliver Cromwell in 1658, but sold to Louis XIV. by Charles II. for a sum of money in 1662. By the treaty of Utrecht in 1715, the French were compelled to destroy the fortifications of D., which were again restored, however, in 1783. In 1793, the allies under the Duke of York laid siege to D., but were compelled by the French to retire, after having suffered severely. D. was made a free port in 1826.

DUNLIN, or **PURRE** (*Tringa alpina*, *T. cinclus*, or *T. variabilis*), a bird of the family *Scolopacidae* (Snipes, &c.), and of the large group to which the names Sandpiper and Stint are variously



Dunlin (*Tringa variabilis*);
Summer and winter plumage.

given. It is not quite nine inches in length from the extremity of the bill to that of the tail. The plumage undergoes great variations in summer and winter. It is a very widely diffused bird. In summer, it frequents even the desolate shores of Melville Island. It is to be seen in autumn and winter on the shores of Britain and of most parts of Europe; often in very great numbers on sandy or muddy sea-shores; and is equally common on those of America from the Gulf of St. Lawrence to the Gulf of Mexico. It exhibits great restlessness and activity in running about, searching and probing for its food. 'When flying in great autumnal flocks, its aerial movements are extremely beautiful, each individual of the vast assemblage yielding so instantaneously to the same impulsion as to exhibit alternately the upper and the under surface of the body, so that we have for a time a living moving cloud of dusky brown, and then a brilliant flash of snowy whiteness.'

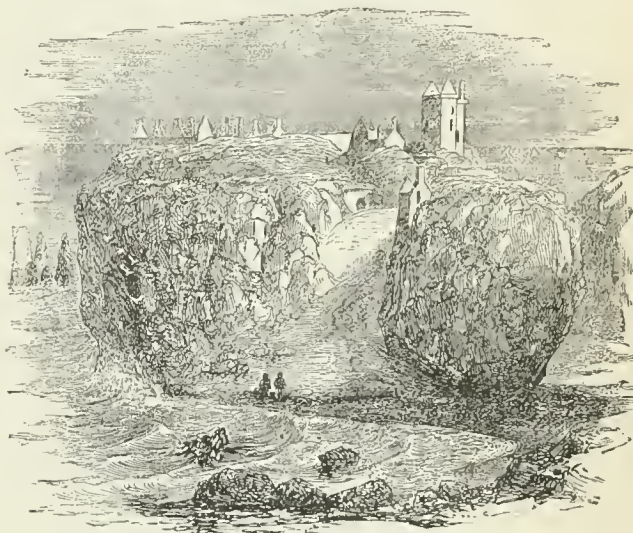
DUNMOW FLITCH OF BACON, a prize instituted at Dunmow, in Essex, in 1244, by Robert de Fitzwalter, on the following conditions: 'That whatever married couple will go to the priory, and kneeling on two sharp-pointed stones, will swear that they have not quarrelled nor repented of their marriage within a year and a day after its celebration, shall receive a flitch of bacon.' The prize was first claimed in 1445, two hundred years after it had been instituted. After 1751, up to which date only five presentations had taken place, the flitch was not again claimed till 1855. The tenth occasion of awarding the flitch occurred in 1876.

DUNNAGE, on shipboard, is a name applied to miscellaneous fagots, boughs, bamboos, old mats or sails, and loose wood of any kind, laid in the bottom of the hold to rest the cargo upon; either to keep the ship in trim, or to preserve the cargo from damage by leakage.

DUNNET HEAD, a rocky peninsula, 100 to 600 feet high, the most northerly point of Scotland, on the north coast of Caithness, in lat. 58° 40' N., and long. 3° 21' W. It consists of upper old red sandstone, resting on the middle flagstone of the same system. It is frequented by various species of sea-fowl, among which is the puffin.

DUNNOCK. See **HEDGE-SPARROW**.

DUNNOTTAR CASTLE, the ancient seat, now in ruins, of the Keiths, the Earls Marischal of Scotland, on the Kincairdineshire coast, a mile and a half south of Stonehaven. It occupies the top of a rock 3 acres in extent, and 160 feet high, overhanging



Dunnottar Castle.

the sea, with a deep though dry chasm between it and the mainland, and it is approached by a steep winding path. In 1296, Wallace is said to have taken the rock and the kirk of Dunnottar from the English. During the Commonwealth, the Regalia of Scotland were hid in the castle from the republican army, and before the garrison surrendered to Cromwell's troops in 1651, the Regalia were removed and secreted in the church of Kinneff, by Mrs. Grainger, the minister's wife. In the times of James II. and Charles II., D. C. was one of the state prisons, where the Covenanters were confined. It was dismantled after the rebellion of 1715, on the attainder of the last Earl Marischal.

DUNOIS, **JEAN**, called the Bastard of Orleans, Count of Dunois and Longueville, one of the most brilliant soldiers that France ever produced, was born about the year 1403. He was the natural son of Louis Duke of Orleans, brother of Charles VI., and was brought up in the house of that prince along with his legitimate children. D. is said to have been intended for the church, but this is doubted. His first important military achievement was the overthrow of the English at Montargis (1427). He next threw himself into Orleans with a small body of men, and bravely defended the place till the arrival of the famous Joan of Arc, whose religious enthusiasm combined with the valor of the Bastard raised the drooping spirits of the French, and the English were obliged to raise the siege. This was the turning-point in the fortunes of the French nation.

In 1429, D. and the Maid of Orleans won the battle of Patay, after which he marched, with a small body of men, through the provinces then overrun by the English, and took the fortified towns. The capture and death of Joan of Arc arrested for a moment the progress of the French arms, but the heroism of D. was

irresistible. He took Chartres, the key of Paris, forced Bedford to raise the siege of Lagny, chased the enemy from Paris, and within a very short period deprived them of all their French conquests except Normandy and Guienne. The next grand series of successes on the part of D. was the expulsion of the English from Normandy. Town after town yielded—Rouen, Harfleur, Honfleur, Caen, Falaise, Cherbourg. This splendid campaign lasted only a year and six days. Not less triumphant was his career immediately after in Guienne; Montguyon, Blaye, Fronsac, Bordeaux, and lastly Bayonne, fell into his hands. The English, in fact, were swept out of the country, and the freedom of France from all external pressure permanently secured. Louis XI., on his accession to the throne in 1462, despatched D. as governor to Genoa, which had yielded itself to France, but soon after, in a fit of jealousy and suspicion, deprived him of all his offices. D. now placed himself at the head of the alliance *Pour le Bien Public*, and by the treaty of Conflans, 1465, recovered all his confiscated estates. He died 24th November 1468. There is no name so popular in France as that of D.; there is no hero so national; he labored 25 years for the deliverance of his country, and this *alone*—his sword was never unsheathed, except against the English. He never had a force under him which could enable him to win a victory that might balance Agincourt or Crécy, but the multitude and constancy of his petty successes served the cause of France more effectively than great and sanguinary contests would have done.

DUNOO'N, one of the most frequented sea-bathing places and summer residences in the west of Scotland, is situated in the south-east of Argyshire, on the west side of the Firth of Clyde, nine miles west of Greenock. A village existed here from a very early date, but a new well-built town, with fine villas around, has of late years sprung up. The population of D. in 1881 was 4692. Dunoon Castle, of which only a small part now remains, stood on a conical hill near the pier, and was once a royal palace and strong fortress. The Argyle family once lived here, but the building became a ruin about 1700.

DUNS (or DUNSE), a burgh of barony in the Merse, in the middle of Berwickshire, the largest town in the county, on an eminence on the Whitadder. Pop. (1881) 2437. To the north of the town is Duns Law, 630 feet high. The name Dunse was changed to Duns (the ancient form) in 1882.

DUNSI'NNANE, one of the Sidlaw Hills, in the east of Perthshire, 1114 feet high, 7 miles north-east of Perth, and looking towards Birnam Hill (q. v.). On the top are the remains of the rampart and fosse of an ancient fortification, popularly called Macbeth's Castle.

DUNS SCO'TUS, one of the most famous and influential of the scholastics of the 14th century. His history is involved in considerable obscurity. England, Scotland, and Ireland all contend for the honor of having given him birth, but without anything to offer in support of their respective claims beyond inference from his name. As to the date of his birth, all that can be said is, that it was in the last half of the 13th century. Whatever was the history of his youth, he entered early the order of Franciscans, studied at Oxford, and soon became professor of theology. His prelections were attended by crowds of auditors, the number of students at Oxford then exceeding 30,000. About 1304, he removed to Paris, then the chief seat of scholastic philosophy, where he taught theology with great applause. He was especially distinguished for the zeal and ability with which he defended the immaculate conception of the Virgin against Thomas Aquinas. He is said to have demolished 200 objections to the doctrine, and established it by a cloud of proofs. It continued long a point of dispute between the Scotists and Thomists; and it was only in 1854 that the dogma was by papal authority declared a necessary doctrine of the Catholic faith, which it is now heresy to deny. In 1308, D. S. was called to Cologne to oppose the heresies of the Beguin brethren, and there he suddenly died, in the 34th or 43d year of his life. D. S. was mostly opposed to Thomas Aquinas in theological opinions, and held very tenaciously the doctrine of the absolute freedom of the human will, from whose spontaneous exercise he derives all morality. He was a realist in philosophy, and his followers are on that ground opposed to the Occamists, who were nominalists. See the article NOMINALISM. He defended his opinions in the style of dialectic then in vogue, and with an acuteness that got him from his contemporaries the name of Doctor Subtilis. When, however, at the revival of learning, the followers of Duns, or *Dunsmen*, saw that the hair-splitting style of reasoning was going out of fashion, they 'ragged,' as old Tyndal says, 'in every pulpit' against the new classic studies, so that the name gradually came to signify not only one opposed to learning, but one slow at learning; hence our word *dunce*, a blockhead. It would be difficult to indicate the nature of his speculative opinions without entering into particulars, nor are his writings as yet sufficiently known and explored for the formation of a decided judgment. The most famous of his works, besides his commentaries on

the Bible and on Aristotle, is his Commentary on the Sentences of Peter Lombard, called the *Opus Oxoniense*, of which the *Opus Parisiense* is an abridgment. The chief edition of his works is that of Luke Wadding (12 vols., Lyon, 1639), but it is by no means complete. The controversies carried on so long between the Scotists and Thomists owed their bitterness not so much to zeal for science and religion, as to the jealousy existing between the Franciscans and Dominicans.

DUNSTABLE, a town in the south of Bedfordshire, at the east base of the Chiltern chalk-hills or Dunstable Downs, 18 miles south-south-west of Bedford. It chiefly consists of one main street crossed by another. The houses are mostly of brick, some of them very old. Pop. (1881) 4627. D. is the chief seat of the British straw-plait manufacture, which employs many women. Whiting is also made. In winter, many large larks are caught in the neighborhood, and sold chiefly in London as an article of luxury. Henry I. founded here a priory of Black Canons, of which the present parish church is a part. D. was in 1110 the scene of some of the earliest theatricals, the subject being the miracles of Catherine, by Abbott Geoffry of St. Albans.

DUNSTAN. ST., was born at or near Glastonbury, in Somersetshire, 925 A.D. He was of noble birth, and is said to have been remotely related to the royal family, as well as connected with the church through influential relatives. His early studies, which he pursued with extraordinary assiduity, were superintended by Irish teachers; but besides his professional learning, D. possessed a variety of accomplishments. He was an excellent composer in music; he played skilfully upon various instruments; he was a painter, a worker in design, and a calligrapher; a jeweler, and a blacksmith. While quite a youth he was presented at the court of King Athelstan, who seems to have been delighted with his music; but the courtiers envying the favor of the sovereign denounced him as a dealer in sorcery, and procured his expulsion from court. D. now began to figure in a new character. Contiguous to the church of Glastonbury, he erected a cell, five feet in length by two in breadth, the floor of which was sunk beneath the surface, while the roof, on the outside, was only breast-high, so that he could stand upright in it, though unable to lie at full length. This was at once his bed-chamber, his oratory, and his workshop. It was here that (according to the monkish legends) he had his most celebrated contest with the devil. One evening, while the saint was employed at his forge, the devil thrust his head in at the window, and began to tempt him with some immoral propositions. D. patiently endured the annoyance until his tongs were red hot in the fire, when, snatching them suddenly up, he seized the foul fiend by the nose, and held him till the whole neighborhood resounded with the clamor of his agony. Gradually, D. acquired a great reputation for sanctity; and on the accession of Edmund to the throne in 940, he was recalled to court; but in spite of the exploits and penances which had made his banishment illustrious, he was still opposed by the courtiers, who saw his ambition, and dreaded his talents. A second time D. was dismissed, but the king made him Abbot of Glastonbury, and increased the privileges of that monastery. Edred, nicknamed *debilis pedibus* (weak in the feet), who succeeded Edmund in 946, showed D. great favor. The saint now began to distinguish himself as a statesman, and the vigorous policy of Edred's reign is affirmed to have proceeded from the inspiration of Dunstan. If such was the case, then to D. was owing the complete subjugation of the Northumbrian Danes. Edred was succeeded by Edwy in 955, who detested D., and not without reason, for the saint, on the day of Edwy's coronation, had grossly insulted his wife and her mother. Besides, Edwy had long suspected D. of pecculation in his charge, and this outrage made his wrath overflow.

D. was deprived of his clerical office, his places at court were taken from him, his so-called reform—viz., of compelling the clergy to become celibates—was frustrated, the monks were driven out of their monasteries, their functions handed over to the secular clergy, and D. himself was banished. He fled to Flanders, narrowly escaping having his eyes put out by the messengers whom the infuriated king had sent after him. After D.'s flight a rising took place among the Northumbrian Danes, instigated by Odo, Archbishop of Canterbury, himself a Dane, and a friend of the expatriated saint. Edgar, the brother of Edwy, was chosen king of the whole of the island north of the Thames, and D. returned in triumph from his brief exile. Meanwhile, Edwy's beautiful wife, Elgiva, had been seized and murdered, under circumstances of horrid cruelty, by the Mercians, who were armed in the cause of D. and Odo, or, as others say, by the immediate retainers of these churchmen themselves. Edwy himself died of a broken heart, or (according to an old MS. in the Cottonian Library) was assassinated, in 958, and was succeeded by his brother Edgar. The latter, as a boy of 15, could exercise little authority: he was long a passive instrument in the hands of D. and his party, who used their power in establishing their cause over the whole island, in enforcing the celibacy of the clergy, and in driving out by main force from all

abbeys, cathedrals, and churches, all such married clergymen as would not separate from their wives. At the same time, it cannot be denied that D. and the monks ruled the kingdom with vigor and success, and consolidated the detached states into compacter integrity and union than had ever been known before. The Danish districts of Anglia and Northumbria were divided into earldoms or governments; the fleet of the king was increased to 360 sail, which acted as a most efficient coast-guard, preventing the Norse rovers from making their usual destructive descents on the country. In 960, D. was made Archbishop of Canterbury on the death of his friend Odo, when, according to custom, he went to Rome to receive the pall at the hands of the pope. He also induced Edgar to visit in person every part of his dominions annually, when courts of justice were held in the various districts, audiences and feasts given, and appeals heard. The many other beneficial measures of Edgar's reign, such as the reform of the coinage, and the endeavor to extirpate wild animals in the mountainous districts, are generally, and with good reason, attributed to Dunstan. The king, who was zealous for the celibacy of the clergy, was himself one of the most viciously profligate of the Saxon kings; yet D. could wink at his crimes, so long as he himself was allowed to carry out his 'religious' schemes. On the death of Edgar, a fierce struggle took place between the partisans of Edward the Martyr and his half-brother Ethelred. The cause of the former was espoused by D., who succeeded in placing his favorite on the throne; but the mother of Ethelred, named Elfrida, a beautiful but ferocious woman, caused Edward to be murdered in 979 and D. was compelled to place the crown on the head of Ethelred.

The credit and influence of the great monk now declined; his threatenings of divine vengeance were treated with contempt; and soured and exasperated at the triumph of his enemies, he retired to his archiepiscopal city, where he died of grief and vexation, May 19, 988. D. was a man of extraordinary abilities. His vigor, his persistency of purpose, and his stern and unscrupulous disposition, would have elevated him to power in any age; but he possessed, in addition to these qualities, a deep knowledge of the weaknesses of human nature, and a clear and penetrating understanding, which enabled him to see what it was necessary and prudent for a ruler to do. Hence, though despotic to the last degree, he was not blindly so, like a common-place despot. His ambition was ever under the control of his wisdom and his fixed ideas. But the grand designs of his life—viz., the complete subjection and conformity of the Anglo-Saxon church to that of Rome, and the extension and multiplication of ecclesiastical interests—are not such as excite the admiration of modern times, and all discerning people will regret the success that attended the unpatriotic labors of the saint. That he *was* successful, there can be no manner of doubt. Though personally out of favor at court in the latter years of his life, his efforts to spread his official influence were unceasing. At an early period in his career, he had introduced a new order of monks into the land, the Benedictines, whose strict discipline had changed the character and condition of ecclesiastical affairs, and in spite of the confusion and even opposition thus caused, he persevered to the end. Monasteries continued to be founded or endowed in every part of the kingdom; and such were the multitudes who devoted themselves to the cloister, that the foreboding of the wise Bede was at length accomplished—above a third of the property of the land was in possession of the church, and exempted from taxes and military service. D.'s *Concord of Monastic Rules* will be found in Reyner's *Apostolatus Benedictinorum in Anglia*, fol., Duac. 1626, page 77 of the Appendix. Other writings have been attributed to him. See Wright, *Bing. Brit. Lit., Ang.-Sar. Period*. See also William of Malmesbury, Lingard's *History of England*, Kemble's *Saxons in England*, book ii., and *Memorials of St. Dunstan*, edited by W. Stubbs, M.A. (1875), a collection of six biographies of the saint.

DUODE'CIMAL SCALE (Lat. *duodecim*, twelve), is the name given to the division of unity into twelve equal parts, as when the foot is divided into 12 inches, and the inch into 12 lines; or the pound is divided into 12 ounces. This plan of counting has some advantages, as 12 admits of so many divisions into equal parts—viz., by 2, 3, 4, and 6. But the decimal scale, or division into ten equal parts, is now universally recognized as preferable, from its coinciding with our decimal system of notation.—**DUODECIMALS** is a term applied to a method of calculating the area of a rectangular surface when the length and breadth are stated in feet and inches.

DUODE'CIMO (Lat. *duodecim*, twelve) is that form of volume whose leaf is equal to the twelfth part of a folio—the folio being the large sheet called the *broadside*, folded once. A book is said to be *quarto*, *octavo*, *duodecimo*, &c., because the sheet of which the pages of the book are made up has been folded into four, eight, twelve leaves, &c. Quarto, octavo, and duodecimo, are almost always written 4to, 8vo, and 12mo.

DUODE'NUM. See **DIGESTION**.

DUPIN, ANDRE-MARIE-JEAN-JACQUES, a French statesman and lawyer, was born, 1st February 1783, at Varzy, in the department of Nièvre, and studied in Paris. In 1815, he was elected a member of the Chamber of Representatives, when he opposed the motion for proclaiming Napoleon II. successor to the throne. During the same year, he published his treatise, *Sur la Libre Défense des Accusés*. The attention excited by this work procured him the honor of defending Marshal Ney, and afterwards the English officers, Wilson, Bruce, and Hutchinson, accused of having favored Lavalette's escape. He had also the honor to defend the poet Béranger in 1821. From 1825 to 1829, he was the advocate of the liberal party. In his pamphlet, *La Révolution de 1830*, he endeavored to prove the legal character of this revolution; and on the question being mooted whether the new king should assume the title of Philippe VII., D. declared 'that the Duke of Orleans was called to the throne not *because* he was a Bourbon, but *although* he was a Bourbon, and on the condition that he should not follow in the footsteps of his predecessors.' After having been appointed to various important offices by the new government, D. found it necessary to pass over to the opposition, and was eight times chosen president of the Chamber of Deputies. On the revolution of 1848, he urged (but unsuccessfully) the Chamber to proclaim the Comte de Paris king of the French, with the Duchess of Orleans regent during his minority. In consequence of the confiscation of the Orleans estate in 1852, D. resigned his place, and retired for a time from public life; but in 1857 he consented to resume his previous office of *Procureur-Général* of the Court of Cassation. He is the author of many important works, mostly on legal questions, among which may be mentioned his *Manuel du Droit Ecclésiastique Français*, which had the high honor of being censured by the congregation of the *Index* at Rome. In 1853 appeared his *Le Morvan; Topographie, Agriculture, Mœurs des Habitants, Etat Ancien, Etat Actuel*; and in 1857, *Règles Générales de Droit et de Morale tirées de l'Ecriture Sainte*. D. died in 1865.

DUPIN, FRANÇOIS-PIERRE-CHARLES, BARON, a French economist, brother to the preceding, was born at Varzy, in the department of Nièvre, 6th October 1784, and educated at the Polytechnic School, Paris. During the Empire, he was actively employed as an engineer.

Between 1816—1819, he made several visits to England and Ireland, to study the great works of construction in those countries. The results of his investigations appeared in his *Voyages dans la Grande Bretagne* (6 vols. Paris 1820—1824, with atlas)—a comprehensive statement of the advantages and defects of British internal administration, exhibiting in a popular form a complete view of the roads, canals, aqueducts, bridges, ports, &c., of this country. D. was about this time appointed member of the Académie des Sciences, and in 1824 was raised to the rank of baron. In 1828, he was elected deputy for the department of Tarn, and he took part with the liberal opposition. After the February revolution of 1848, D. was member of the Constituent Assembly. After the *coup d'état*, he became a senator of the Empire. D. published many works on geometry, commerce, &c. He died in 1873.

DUPLEIX, JOSEPH FRANÇOIS, the celebrated governor of the French Indies, was born about the close of the 17th c. In 1820 he was appointed to a seat in the Council at Pondicherry, and ten years later became superintendent at Chandernagore. The remarkable success of his administration here led to his being appointed, in 1742, governor-general of all the French Indies. His policy had already begun to alarm the English Company, when war broke out in Europe between France and England (1744). La Bourdonnais, the governor of Mauritius, having sailed with a powerful squadron to the Coromandel coast, took Madras, but stipulated to surrender it on payment of a certain sum. This, however, D. refused to accede to, and violent disputes followed between the two governors, the result of which was that La Bourdonnais was recalled. The ambitious mind of D. now formed the project of founding a French empire in India on the ruins of the Mogul monarchy, and with this purpose he meddled with all the intrigues of Southern and Central India, made himself master of the court of Hyderabad, and placed a creature of his own on the throne of the Carnatic, while he impressed the native imagination by adopting all the pomp and splendor of the Oriental. His military designs, however, were frustrated by the English, but the struggle continued until 1754, in which year D. was recalled. The French Company had not seconded his ambitious schemes, and refused to reimburse him for the vast sums he had spent out of his private fortune in promoting the war. He died in poverty and neglect in 1763.

DUPLICATE RATIO. See **PROPORTION**.

DUPLICATION OF THE CUBE. See **DOUBLING THE CUBE**.

DUPONT, JACQUES CHARLES, styled **DE L'EURE**, a leader of the French liberal party, born 27th February 1767 at Neubourg, in Normandy. During the periods of the Revolution and

the Empire, he filled several important offices. In 1813, he became a member of the legislative body, and acted as vice-president when this assembly was convoked by Louis XVIII. on the fall of Napoleon. During the Hundred Days he was elected to represent the department of Eure, and, after the battle of Waterloo, became vice-president of the Chamber of Representatives.

After the revolution of 1830, he was appointed Minister of Justice, but at the end of six months sent in his resignation, and took his place in the ranks of the opposition. After the revolution of 1848, during the session of the 24th February, D. took the president's chair, and so far silenced the tumult of the populace, as to render it possible to appoint a provisional government, of which he was proclaimed president. He died in 1855. His political friends styled him the most virtuous among the virtuous, the Aristides of French liberalism. His disinterestedness was not denied even by his enemies; but he manifested fidelity to his convictions rather than energy of character.

DÜPPEL, or DYBBÖL, a village in the Prussian province of Schleswig-Holstein, 16 miles north-east of Flensburg. During the war between Germany and Denmark, it was bombarded for more than a month by the Prussians, and finally taken, April 18, 1864. It and Sonderberg, on the island of Alsens, now constitute a strong fortress.

DUPUIS, CHARLES FRANÇOIS, a distinguished French *savant*, was the son of a poor schoolmaster, and was born at Trie-Chateau, near Chaumont, 16th October 1742. He obtained admission into the college of Harcourt, where he so soon acquired such extensive knowledge that at the age of 24 he was made Professor of Rhetoric in the college of Lisieux. At the same time he went through a course of law-studies, and was admitted an advocate of the parliament. His acquaintance with Lalande introduced him to the study of mathematics and astronomy, and he was led to the thought of explaining mythology by means of astronomy. After several communications in the *Journal des Savans*, appeared his *Mémoire sur l'Origine des Constellations et sur l'Explication de la Fable par l'Astronomie* (Par. 1781). He was now appointed Professor of Eloquence in the Collège de France, member of the Académie des Inscriptions, and shortly after a member of the commission of public instruction. Although he rather shunned the storms of the Revolution, his reputation necessitated his becoming a member of the Convention, next of the Council of 500, and after the 18th Brumaire, of the legislative body. He was also one of the 48 individuals who formed the nucleus of the Institut National. His great work, *Origine de tous les Cultes, ou Religion Universelle* (12 vols., Par. 1794), which he had long withheld from fear of offending the religious world, was at last published at the instigation of the Cordeliers' Club. This circumstance rendered the book more an object of party bitterness than its own purely scientific character would probably have called forth. It made a considerable impression on France at the time, and no doubt originated the famous commission afterwards appointed by Napoleon to explore Upper Egypt, which D. had pointed out as the general source of southern mythology. No less attention was awakened by his memoirs on the origin and spread of the Pelasgi, and on the zodiac of Denderah (q. v.). In his last work, *Mémoire Explicatif du Zodiac Chronologique et Mythologique* (Par. 1806), he attempts to demonstrate the unity of the astronomical and religious myths of all nations. He died 29th September 1809.

DUPUYTREN, GUILLAUME, LE BARON, an illustrious French surgeon and anatomist, was born at Pierre-Buffière, in Limousin, 6th October 1777; educated at the Collège de la Marche in Paris; and on the formation of a new school of medicine there in 1794, was appointed to the office of *prosecteur*. In 1801, he was appointed *chef des travaux anatomiques*, and applied himself with intense ardor to pathological anatomy. In 1803, he was appointed assistant-surgeon, and later, in 1815, first surgeon of the Hôtel-Dieu. In 1813, he became professor of surgery to the medical faculty, an office which he exchanged, 1818, for the professorship of clinical surgery at the Hôtel-Dieu. In 1820, Louis XVIII. conferred on him the title of baron, and in 1823, appointed him royal surgeon. He died at Paris, 8th February 1835. D. possessed extraordinary penetration in diagnosis, a penetration that was generally justified by his bold and skilful operations, and an immovable firmness of nerve. He was the inventor of many ingenious modes of surgical operation and of various surgical instruments. He likewise made several important discoveries in pathological anatomy; and although he wrote very little, almost nothing indeed, he formed a large school of enlightened surgeons in his native country. Among his works may be mentioned *Leçons Orales de Clinique Chirurgicale faites à l'Hôtel-Dieu* (4 vols., Par. 1830—1834), published by some of his students; and his *Traité Théorique et Pratique des Blessures par Armes de Guerre*, edited by Paillard and Marx (2 vols., Par. 1834).

DUQUESNE, ABRAHAM, MARQUIS, one of the most eminent naval officers of France, was born at Dieppe in 1610, and trained

under his father, the captain of a ship, for the naval service. In the war between France and Spain, he brilliantly distinguished himself at Corunna, Tarragona, Barcelona, and other places. During the minority of Louis XIV., when the navy of France was inactive, he entered the service of Sweden, which was then at war with Denmark. D. defeated the Danish fleet near Gothenburg in 1643, was elevated to the rank of vice-admiral, and by a succession of victories over the united fleets of Denmark and Holland, forced Denmark to conclude peace. He then returned to France, where he found the Spaniards prepared to support Bordeaux, which had declared itself for the party of the *Fronde* in 1650. D. immediately collected a squadron at his own expense, and compelled Bordeaux to submit. He was next employed in punishing the pirates of Algiers and Morocco who infested the Mediterranean. On the revolt of Messina against the Spanish government, France sent him to support the insurgents in the Mediterranean. With a small force, D. gallantly opposed the united fleets of Spain and Holland, commanded by De Ruyter, and in April 1676, completely defeated his enemies off the coast of Sicily, in the vicinity of Mount Etna. De Ruyter died a few days after. France thus obtained possession of the island of Sicily. Louis XIV. rewarded D. with the title of marquis and a considerable estate. On the revocation of the Edict of Nantes, D. was made the only exception to the general decree of banishment issued against all Protestants. His last achievement was the humiliation of Genoa. D. died at Paris, 2d February 1688.—See *Duquesne et la Marine de son Temps*, by Henri Plon (Paris, 1872).

DUR'A DEN, between Cupar and St. Andrews, in Fifeshire, a small glen through which runs a tributary of the Eden, has become famous on account of the numerous and beautifully preserved fossil fish entombed in its yellow sandstone. This sandstone is one of the upper beds of the Old Red Sandstone. It is developed in D. D. to a thickness of 300 or 400 feet, and is rich in the remains of ganoid fishes. They occur in clusters and detached groups, sometimes crowded together in an extraordinary manner, so that nearly a hundred specimens have been counted on a single slab about five feet square. They are found only in one thin layer, no fragment of skeleton or scale having been obtained in any other portion of the sandstone. The specimens are beautifully preserved; they often exhibit the rounded plump form of the living animal, in some instances not a scale being displaced; the scales retain their original glistening enamel, very different from the white chalky appearance they present in other localities. The specimens consist of two species of *Holoptychius*, viz., *Andersoni* and *Flemingii*; also of *Dipterus*, *Platygnaethus*, *Phaneropleuron Andersoni*, *Glyptolemus*, *Glyptopomus* and *Pamphractus*. See *Dura Den*, by J. Anderson, D.D.

DURA MATER, the hard external membrane that envelopes the brain. See NERVOUS SYSTEM.

DURAMEN, or HEART-WOOD, in Botany, the inner and fully ripened wood of exogenous trees. The division is often very marked between the *D.* and the *Albumen* (q. v.), or sap-wood, the *D.* being more dense and compact, and its tubes thickened and filled with the peculiar secretions of the plant, so that juices no longer freely flow between them. It is also very frequently of a darker color than the albumen: in ebony, it is black; and some other trees are remarkable for the peculiar color of their wood, which appears, however, only in the *D.* and not in the albumen. As timber, it is much more valuable and durable than the albumen; and the distinction is as well known to the carpenter or cabinet-maker as to the botanist.

DURANCE, a river in the south-east of France, rises in the department of the Hautes-Alpes, near the base of Mont Genève, one of the peaks of the Cottian Alps. It flows through the department of the Basses-Alpes in a southerly direction; then curving westward, it proceeds towards the Rhone, forming the boundary between the departments of Vaucluse and Bouches-du-Rhone, and joins that river about three miles below Avignon. Its principal affluents are the Buech and the Calavon from the right; and the Ubaye, the Bleone, the Asse, and the Verdon from the left. Its total length is about 180 miles—no part of its course is navigable. Its current is swift and impetuous, and carries down with it great quantities of sand and pebbles. Large quantities of timber are floated down from the forest districts upon its banks to Arles, and thence to the Mediterranean. An aqueduct 51 miles long has been recently constructed from the *D.* to Marseille. This great work not only supplies Marseille with water, but affords water-power for driving machinery, and irrigates an otherwise parched area of 25,000 acres.

DURANGO, or GUADIA'NA, and also sometimes called CIUA'D DE VICTORIA, in honor of the first president of the Mexican Confederation, is a city in Mexico, and stands in the Sierra Madre, at the elevation of 6848 feet—almost a mile and a quarter—above the level of the sea. Lat. 24° 2' N., long. 104° 3' W. It is near the Culiacan (q. v.), being 150 miles to the north-

west of Zacatecas. It is regularly built, with a cathedral and other churches, and with convent, a theater, and a mint, and the inhabitants, 24,000 in number, carry on manufactures in iron, wood, wool, and leather. The city gives name to a department containing 42,500 square miles, and in 1873, occupied by 190,846 inhabitants.

DURAZZO (called by the Turks *Dratsch*, and by the slaves *Durtz*), a maritime town of Albania, European Turkey, is built on the rocky peninsula of Peli, in the Adriatic. Lat. $41^{\circ}19' N.$, long. $19^{\circ}27' E.$ It is fortified, and is a place of considerable antiquity. Its situation in a fertile district gives it an export trade in grain, oil, &c.; but in recent years, owing to partial failures in crops, and disease in olives, the exports have been small. D. has large imports of British manufactured goods; and also of sugar, coffee, rice, soap, and iron. It contained in 1871, only 1200 inhabitants.

D. is the ancient *Epidamnus*, which was founded about 627 B.C. by a conjoined band of Coreyreans and Corinthians under one Phaleus, a Heraclidean. It became a great and populous city, but was much harassed by the internal strifes of party, which ultimately led to the Peloponnesian War (q. v.). Under the Romans it was called Dyrrachium (whence its modern name), and became the seat of a Roman colony, and an important landing-place for those sailing from Brundisium in Italy to Greece. Here Pompey was for some time beleaguered by Caesar. Dyrrachium attained its highest consequence about the end of the 4th c., when it became the capital of the Byzantine eparchy of New Epirus. After being possessed successively by the Ostro-Goths, the Bulgarians, the Normans, and Venetians, and being destroyed by an earthquake, it was finally conquered by the Turks in 1502, in whose possession it still remains.

DURBAN, or **D'URBAN**, the chief port of the colony of Natal, is situated in lat. $29^{\circ}50' S.$, long. $31^{\circ}10' E.$ Durban was founded in 1842, and was named after Sir Benjamin D'Urban, governor of the Cape. It has railway communication with Pietermaritzburg, and with the coast. The number of vessels entered inwards in 1880 was 378 of 204,211 tons; cleared, 362 of 198,630 tons. Pop. of town and suburbs (1881) 14,000, including 7494 Europeans; a floating native population of 3800, and an Indian population of about 3000. An observatory has been erected at D. D. is also the name of a village about 10 miles from Cape Town, with 750 inhabitants.

DURBHANGAH, the capital of a district of the same name in Bengal, India, in the province of Behar, Patna division. Population in 1872, 47,450.

DÜREN (the Roman Marcodurum, whence its former name, Mark-Duren), an ancient town of Rhenish Prussia, situated on the Roer, 18 miles east of Aix-la-Chapelle. It is surrounded with walls, and has several churches remarkable for their fine architecture. D. has important manufactures of woollen cloths, iron and steel ware, paper, soap, leather, oil, &c. In the vicinity are iron foundries and other factories worked by water-power obtained from the Roer. Pop. (1880) 17,368. Here Charlemagne, on his way to attack the Saxons, held diets in 775 and 779 A.D. After an obstinate resistance, D. was taken and burned by Charles V. in 1543. In 1794 the French made it the capital of the department of Roer; but in 1814 it was handed over to Prussia.

DÜRER, ALBERT, the father of the German school of painting, 'the prince of artists,' as his countrymen loved to call him, was born at Nürnberg, in 1471, according to an entry in his father's day-book, 'on the day of St. Prudentius, on a Friday of the holy week.' His father was a humble pious goldsmith, of whom the great painter said: 'His daily speech to us was, that we should abound in love to God, and act faithfully towards our neighbor.' D. was carefully educated and instructed by his father in the goldsmith trade, and at 15 executed a piece of work in chased silver representing the seven 'falls of Christ'—in reference to the tradition that Christ fell seven times while bearing his cross to Mount Calvary. Even as a child, drawing was his delight, and he was wont to astonish by the exactness with which he drew parts of the human body, and even whole figures, also lines and circles at the first stroke, without ruler or compass. His father therefore bound him apprentice, in 1486, to Michael Wohlgemuth, the chief Nürnberg artist, with whom he served three years. From 1490 to 1494 he traveled in Germany and the Venetian States; and on his return his father 'bargained' with Hans Frei, a skilful mechanic of Nürnberg, to give him to wife his daughter Agnes, who turned out a perfect Xantippe, with nothing to recommend her but beauty and 200 florins, who embittered the whole course of his life, and, as his life-long friend Pirckheimer asserts, hastened his death. After receiving his diploma with all the honors and rights of a master, obtained for his famous drawing of Orpheus, he went to Venice in 1505, where he painted a picture of the martyrdom of St. Bartholomew, and one of Adam and Eve, afterwards bought for the gallery at Prague. He also visited Bologna, where it is said that he met with Raphael, who

esteemed him highly, and that each painted for the other his portrait. After this journey, his fame spread widely; and the Emperor Maximilian appointed him court painter, with an annuity of 100 florins; and Charles V. confirmed the same in a document still to be seen in the Nürnberg archives.

In 1520, he visited the Netherlands with his wife and their maid-servant; and they were splendidly entertained at Antwerp and Bruges by the painters, a costly dinner being served on vessels of silver, the whole party conducting them home late in the night by the light of many torches. His expenses were often defrayed at the inns, and he was escorted free from city to city. He says in his journal: 'The people did obeisance unto me as if they were leading some great lord.' D. warmly embraced the doctrines of the Reformation; and his journal contains a long lamentation and prayer on hearing that Luther had been carried off to the castle of Wartburg. At Antwerp he records: 'I was now overcome by a strange sickness, of which I never yet heard from any man.' This was in 1521, and the 'strange sickness'—no other than consumption—took yet seven years to consume his strong frame; he died in his native city, 6th April 1528, in his 57th year.

D.'s facility was almost incredible. He *thought out* his works, and then executed them without sketch, and never altered a line. Of his coloring, Fuseli says: 'Dürer excelled Raphael in juice and breadth of coloring as much as Raphael excelled him in every other quality.' His drawing was perfect. So quaint were the presentments of his genius, he may be called the Chaucer of painting. In his portraits, he not only caught the expression, but delineated character and passion. D. was the inventor of the art of etching. He found wood-engraving in its infancy, and raised it to be a pattern for all times; he also discovered the method of bringing out wood-cuts in two colors. Historical and other paintings by D. are to be seen at Vienna, Munich, Prague, Dresden, and Nürnberg. The oldest of his pictures extant is the portrait of himself of the year 1498, in the Florentine Gallery. His engravings and wood-cuts are so numerous, that with all his surpassing diligence it is known that for many of them he only gave the designs: 262 wood-cuts are known marked with his name, the most famous of which are the 'Great Passion,' the 'Little Passion,' his favorite work, the 'Revelation of St. John,' and the series called the 'Triumph of Maximilian,' a copy of which is in the Advocates' Library in Edinburgh. In the British Museum, there is a volume with more than 200 original drawings by D., formerly in the collection of Sir Hans Sloane, also an exquisite carving in hone-stone, of the Birth of St. John, and a number of engravings, bequeathed by Mr. Nollekens. His own list of his works enumerates 1254 pieces.

In the last three years of his life he published works on perspective and measurement, on fortification, and on human proportion, of which last he only lived to correct the first volume: 'See the lives by Heller, Roth, Campe, Thausing (transl. by Eaton, 1882); in English by W. B. Scott, Mrs. Heaton, and Heath. Deeply religious and reverent, he was also of a cheerful temperament, and was long chief magistrate of his native town, where there is a brass statue of him, designed by the famous sculptor Rauch, and his house is still to be seen at the corner of a street called by his name.

DÜ'RESS, in English Law, is the plea of a man who has obliged himself to pay or perform, or who has committed a misdemeanor, that he was constrained to do so, and therefore ought to be free from the consequences. There is both *duress of imprisonment* and *duress per minas*.

DÜ'REFEY, THOMAS, a writer of plays and poems in the reign of Charles II., with whom he was a favorite for his wit, liveliness, and songs. In literature, he is best remembered for his collection of songs, entitled *Pills to Purge Melancholy*, of which a fac-simile reprint was issued in 1872. Tom D., as he was usually called, lived to entertain Queen Anne by singing his catches and glees; but being without any settled means of support, he concluded his career in poor circumstances. Addison, who was his friend, pleaded in his behalf—'He has made the world merry, and I hope they will make him easy, as long as he stays among us. This I will take upon me to say, they cannot do a kindness to a more diverting companion, or a more cheerful, honest, good-natured man.' He died at an advanced age in 1723.

DÜ'RGAPU'JA. See UMA.

DURHAM, a parliamentary and municipal borough, and ancient episcopal city of England, near the middle of Durham county, built around a steep rocky hill 86 feet high, nearly encircled by the Wear. On the top of the hill are the cathedral and castle. Ancient walls partly enclose the hill, from which are fine views of the fertile wooded country around, and of the suburbs across the river. The chief manufactures of D. are carpets, paper, and iron. In the vicinity are coal-mines, and saline, chalybeate, and sulphureous springs. Pop. (1881) 14,932. It sends two members to parliament. D. arose about the year 995, when Bishop Aldune brought here St. Cuthbert's bones from Ripon, and built a church to en-

shrine them. On the site of this church, Bishop William de Carlisle, about 1093, began the present magnificent cathedral, a Romanesque structure in the form of a Latin cross, to which additions continued to be made till about 1500. It thus exhibits the gradual changes of style between these periods. It was restored during last century, and has lately undergone extensive renovation. It is 507 by 200 feet, with a central tower 214 feet high, and two west towers 138 feet high. A plan of it is given in illustration of the article CHURCH. The cathedral contains many old monuments. Here lie St. Cuthbert's (q. v.) remains. Here also are Bede's tomb and some manuscripts said to be in his handwriting. Cardinal Wolsey was a prelate here. The bishop's income is now £8000. The castle, formerly the residence of the bishops of D., but now the seat of the university of D., was founded about 1072, by William the Conqueror, in the Romanesque style, but it has since been much altered. The dormitory, now the new library of the cathedral, which belonged to the monastery of D., is one of the finest in England. Two of the bridges over the Wear were erected in the 12th century. D. was often attacked by the Scots.

A college was founded here in 1290 by the prior and convent of Durham. It was abolished, however, at the dissolution of monastic houses in the reign of Henry VIII., and its endowments given to the dean and chapter of Durham. Under the Commonwealth, Cromwell instituted a college here, and endowed it with the sequestered revenues of the dean and chapter, to whom, however, these revenues again reverted at the Restoration, when the college was suppressed. The present university of D. was opened for students in 1833, under the provisions of an act of parliament, obtained by the dean and chapter during the previous year. A royal charter in 1837 empowered the university to bestow degrees. The D. university comprises professorships in Divinity and Ecclesiastical History, Classical Literature, Mathematics and Astronomy, and Medicine, with lectureships in Hebrew, Classical Literature, and Mathematics, with several tutors and other teachers. It has two colleges—University College, and Bishop Hatfield's Hall. At Newcastle-on-Tyne, but in connection with the university, are the well-known Colleges of Medicine and of Physical Science.

DURHAM, a maritime county in the north-east of England, between Tyne and Tees. It has 32 miles of coast, generally low, but with some cliffs; area 973 square miles $\frac{5}{8}$ being arable. The surface is hilly, and slopes to the east. In the west, which is waste but rich in minerals, are branches of the Pennine chain, rising in Killhope Law, 2196 feet; Colber Law, 1678; and Pontop Pike, 1018. The two chief branches enclose the valley of the Wear, and send forth several parallel ranges, declining toward the coast, and enclosing many fertile tracts and sheltered valleys. The chief rivers are the Wear, Tyne, and Tees, navigable respectively for 12, 15 and 10 miles. The rocks are new red sandstone, magnesian limestone, millstone grit, carboniferous limestone, rich in lead; and coal measures, forming the valuable D. coal-field, 25 by 10 miles, with many faults, and with about 40 beds of coal, three to ten feet thick. Basalt and greenstone trap dikes intersect the west part of D. The mineral products are coal, limestone, black marble, freestone, ironstone, firestone, slate, millstone, grindstone, and lead. Large furnaces for the production of iron are in operation in various parts of the county. D. is one of the chief counties in England for the production and export of coal: 500 ships, besides a fleet of steamers, are employed at Sunderland for this export alone. There are 249 collieries. Five of the coal seams, at the depth of 20 to 100 fathoms, are worked horizontally for many miles: 212 miles of railway connect the mines and ports. The soil is clayey or dry loam. The chief crops are oats, barley, wheat, turnips, beans, and pease. The Teeswater or Holderness breed of cattle is famed for fattening, quantity of milk, and early maturity. The D. horses are famed for draught and the saddle. Many sheep are pastured on the hills. There are manufactures of iron, pottery, glass, alkalies and chemicals, and salt, and much ship-building at Sunderland, South Shields, Tarrow, Hartlepool, and Stockton. Coal is the chief export. D. is divided into 4 wards, 15 poor-law unions, and 60 parishes, many of which have been sub-divided, owing to the increase of population. In 1861 the population was 598,666; in 1871 it was 685,089; in 1881, 867,586. The chief towns are Durham, the county town, Sunderland, Darlington, Gateshead, South Shields, Stockton, and Hartlepool. The county sends four members to parliament. D. has some ancient barrows, and has afforded many Roman antiquities, as altars, urns, and coins. There are the remains of a fine Roman station at Lanchester. D. formed part of the Saxon kingdom of Northumbria (547 to 827). Subsequently, it suffered severely from the incursions of the Scots.

DURHAM COUNTY PALATINE, one of the three counties palatine of England, the other two being Lancaster and Chester. For the privileges of a county palatine, see PALATINE. The county palatine of Durham existed by prescription. It was the only

county palatine in the hands of a subject, and belonged to the Bishop of Durham. By 6 and 7 Will. IV. c. 19, the county palatine of Durham is separated from the bishopric, and vested in the crown.

DURHAM, JOHN GEORGE LAMETON, EARL OF, an English statesman, was the son of William Henry Lambton, Esq., of Lambton Hall, county of Durham, and was born at the family seat, 12th April 1792. The Lambton estate was not very large, but had been in the possession of the family since the 12th c., the male issue having never once failed during all that period. The antiquity of the family, however, exercised no narrowing influence on his opinions, which were markedly radical. He was educated at Eton; and when only twenty years of age, married at Gretna Green a Miss Harriet Cholmondeley, who died in the course of a few years. In 1814, he was returned for his native county, and though he did not speak on many questions, he took part in all the more important debates, opposing the Corn-law Bill of 1815, the additions made to the incomes of the royal dukes, the Indemnity Bill of 1818, the six repressive bills brought in by government to coerce the people after the great reform meeting at Manchester in 1819, &c. Two years after, he submitted to the House of Commons a scheme of parliamentary reform, which of course was not accepted. In 1828, he was raised to the peerage, with the title of Baron Durham of the city of Durham. He was one of the four persons who drew up the Reform Bill, and supported it in the House of Lords. In 1833, Lord D. was despatched on a mission to Russia. On his return to this country, his 'advanced liberalism' was proclaimed at a dinner given to Lord Grey at Edinburgh, in 1834, and in various other parts of the country. After a second mission to Russia, he was appointed governor-general of Canada, where he arrived in May 1839; but on account of a misunderstanding with the home government, he took the extraordinary step of returning to England in the course of half a year, without either being recalled or obtaining the royal consent. D. died at Cowes, Isle of Wight, 28th July 1840. He left a son, who succeeded him as Earl of Durham, and three daughters.

DURIAN, or DURION (*Durio zibethinus*), a fruit tree of the Malayan Archipelago, of the natural order *Sterculiaceæ*, of the same tribe or sub-order (*Bombacæ*) with the silk-cotton tree. It is a lofty tree, with leaves resembling those of the cherry, and large bunches of pale-yellow flowers. The fruit is of the size of a man's head, roundish oblong, with a hard thick rind, covered with soft spines, so that it somewhat resembles a hedgehog rolled up. The pulp of the fruit is of a sort of creamy substance and delicious taste, but has a smell which is at first very repulsive to Europeans. Persons accustomed to it, however, universally regard the D. as one of the very finest fruits of the East. It brings a higher price than any other fruit in the market in India. It contains ten or twelve seeds, as large as pigeons' eggs, which, when roasted, are not inferior to chestnuts. One tree yields about 200 durians in a year.—The cultivation of the D. has not yet been successfully attempted in our hot-houses, the great size of the tree forming one principal obstacle to it. The D. is not a native of India, nor of Ceylon, but is now successfully cultivated in the latter country.

DURKHEIM, a town of Rhenish Bavaria, six miles south-west of Mannheim, at the base of the Hardt Mountains. Many invalids resort to D. on account of its amenity, and to take the *grape-cure*. It has manufactures of tobacco, cutlery, and paper. Not far off are the salt-works of Philippsall. Pop. (1880) 6089.

DURLACH, an old town of Germany, in the grand-duchy of Baden, is situated on the river Pfalz, at the base of the Thurmberg, a highly cultivated hill, 3 m. E. of Carlsruhe. D. manufactures linen, tobacco, chicory, vinegar, and machinery, and has extensive fruit and grain markets. The environs abound with orchards. On the summit of the Thurmberg are the ruins of an old castle. D. is a station on the Mannheim and Basel Railway. Pop. (1880) 7474.

DURRA, DOURA, DURRA MILLET, INDIAN MILLET, or SORGHO GRASS (*Sorghum*), a genus of grasses, distinguished from *Andropogon*—in which many botanists prefer to include it—only by the ovate or oblongo-ovate hermaphrodite spikelets, with glumes that have three small teeth at the extremity. The species are generally annual, tall, broad-leaved grasses, having strong culms filled with a juicy and saccharine pith, and large panicles. Several of them are cultivated as corn-plants, chiefly in Asia and Africa, particularly the common D. (*S. vulgare*, or *Andropogon Sorghum*, *Holcus Sorghum* of the older botanists), also called *Jowar* and *Jowaree* in India. It grows 4–8 feet high, with thickly crowded panicles. It is a coarse, strong grass; its grain is round, a little larger than mustard seed. It is a native of the East Indies, is extensively cultivated in Asia, and may perhaps be described as the principal corn-plant of Africa. It is also cultivated to a considerable extent in the south of Europe. It is sometimes cultivated in Germany, but the summer is not sufficiently long and warm to secure its greatest perfection. The climate of Britain is

still less suitable. *D.* yields a very abundant produce, in this respect even rivaling maize, but the meal does not make good bread; it is excellent, however, instead of rice for puddings, and is prepared in various ways for food. The culms and leaves, although coarse, are excellent food for horses and cattle, as is also the grain.—The seeds of the *SHALOO* or *SUGAR-GRASS* (*S. saccharatum*) are more pleasant to the taste than those of the common durra. It is cultivated in the warm parts of Asia and in Africa, and has a diffuse and very spreading panicle. The sweet pith of the culm is eaten, and is also of value as a source of sugar. This plant has been cultivated to some extent in the Veronese, and its cultivation has been recently introduced into North America—where it is called *CHINESE SUGAR-CANE*—in order to the production of sugar. It seems likely to form an important new feature in American agriculture, succeeding well at least as far north as Maine, and yielding sugar in large quantity. In Britain, it succeeds only in the warmest parts. As a forage plant, it is very nutritious when young—*KAFIR CORN* (*S. Caffrorum*) has a very diffuse umbel-like panicle, with branches bending down all around. The culm is more than the height of a man, and has a sweet pith. This species is largely cultivated in South Africa, both by Kafirs and by the colonists. By the latter, the grain is chiefly used for feeding horses.—*S. Halcpense* is a troublesome weed in the fields of the north of Italy, like couch-grass. The sweet runners of the roots are kept by the apothecaries of that country as a substitute for sarsaparilla, under the name of *Garmignone*, or *Smilace dolce*.

DÜRRNBERG, a small town of Prussian Saxony, 5 miles S.E. of Merseburg, deserves mention only for its salt springs, which produce about 250,000 bushels of salt annually. Pop. 250.

DÜRRNSTEIN, a village of Lower Austria, is situated in a highly picturesque locality, on the left bank of the Danube, about 45 miles west-north-west of Vienna. It is chiefly notable for the ruins of a castle, which stand upon a ridge of bare rock overlooking the town. A peculiar interest attaches to this grand but desolate and shattered fortress, from its having been the prison in which Richard Cœur-de-Lion was confined by Leopold of Austria, for fifteen months. Pop. 650.

DURSLEY, a town in the west of Gloucestershire, amid picturesque scenery, at the base of a steep beech-covered hill, and near the Cotswold hills, 15 miles south-south-west of Gloucester. It is irregularly built, and chiefly consists of three streets, diverging in different directions from the market-place. Population (1881) 2344. In the oolitic and lias formation in the vicinity is a quarry of tophies or puffstone, which is a soft and easily worked stone, but hardens on exposure to the air.

DURUY, VICTOR, a French scholar who greatly promoted the cause of education in France, was born at Paris, 11th September 1811. Originally meant to be a designer in the lace-works at Gobelins, he showed singular aptitude for learned studies, entered the Ecole Normale in his nineteenth year, and in 1833 was a professor in the college of Henri IV. at Paris. In 1863 he was made Minister of Public Instruction, and as such carried out some important reforms. He is distinguished as the author of numerous important works of history and geography. Among the more important are his historical geographies of the Roman Empire, of the Middle Ages, and of France; his great histories of Rome, of France, and of Greece; and his Sacred History. These works, published between 1838 and 1852, appeared partly as sections of the series of works on Universal History of which he was editor. He has also published numerous minor works. He resigned his post in 1869, and was made a senator. He has held all the distinctions of the Legion of Honor, and holds some foreign orders.

DUSICYON, a genus of *Canidæ*, or sub-genus of *Canis* (Dog), consisting of a number of South American species or varieties, sometimes called Aguara Dogs. They have the body rather long in proportion to their height, and of considerable bulk, the muzzle rather sharp, eyes somewhat oblique, and aspect somewhat fox-like, the tail also has a more or less perfect foxlike brush. They are more diurnal than nocturnal in their habits, live in burrows, and feed on birds and small quadrupeds. Some of them have been domesticated by the Indians.—Akin to the Aguara Dogs, but more foxlike, are the Aguara Foxes (*CERDOCYON*, q. v.).

DUSKY BAY, a large inlet on the south-west coast of Middle-Isle, in New Zealand, is in lat. 45° 40' S., and long. 166° 20' E. It was entered by Cook in 1769, who here found good anchorage.

DÜSSELDORF, the chief town of the district of Düsseldorf, in Rhenish Prussia, and the capital of the former duchy of Berg, is situated in the center of a fertile district, on the right bank of the Rhine, at the confluence of the Düsseldorf with that river, in lat. 51° 13' N., long. 6° 45' E. It was formerly fortified, but its ramparts were converted into gardens and promenades at the treaty of Lunéville, 1802. It is seated in the midst of extensive garden-grounds, and is well-built. The streets, the houses of which are built of brick, are regular and spacious; while the rows of trees

with which many of them are planted, greatly enhance their appearance. *D.* is divided into the *Allstadt*, on the right bank of the Düsseldorf; the *Karlstadt*, founded in 1786 by the Elector Karl Theodore, on the left bank; the *Neustadt*, on the Rhine; and the recently built *Friedrichstadt*, to the south. A colossal equestrian statue of the Elector Johann Wilhelm, who founded a famous picture-gallery here in 1710—the pictures of which, however, were removed to Munich in 1805—stands in one of the five squares of Düsseldorf. The Düsseldorf Academy was founded in 1767, reorganized in 1822, and attained great eminence during the years 1822—1826, under the management of Cornelius and Schadow. An Art Exhibition and a Steel and Iron Exhibition were held here in 1880. The principal buildings of *D.* are the old electoral palace; the present palace, the residence of the governor of the province; the government house, the observatory, town-hall (built in 1567), theater, gymnasium, and public library. Of the ecclesiastical edifices, the most remarkable are the churches of St. Andrew and St. Lambert, and the church of the Jesuits, a handsome and highly ornate structure, having two steeples. The Hofgarten, one of the finest public gardens in Germany, is a very agreeable promenade. *D.* has manufactures of woollens, cottons, leather, hats, tobacco, jewelry, mirrors, railway-carriages, &c., and its trade and industries generally are steadily progressing. A great part of its importance may be said to be derived from its position on the Rhine, as on this account great quantities of goods are sent to *D.* from the surrounding districts for exportation. Pop. (1880) 95,458, most of whom are Catholics. Along with the duchy of Berg, *D.* came into the possession of Prussia in 1815. It was made a free port in 1829, and since that time it has prospered. Industry and commerce have likewise received a new impulse since *D.* became the central point of several lines of railway.

DUST, COSMIC or METEORIC. The constant presence of dust in the air may be demonstrated by the familiar experiment of admitting a beam of sunlight into a dark room. The path of the beam becomes plainly visible owing to the reflection of the light by the myriad particles floating about. Were the air quite pure, of course nothing of the kind would be seen. To prove that dust also exists in the open air, if we cover a plate with a thin coating of glycerine and expose it to a strong wind numerous particles of matter will be found deposited on its surface. Examined with the microscope, these prove to be pollen-grains from flowers, bits of vegetable fibres and hairs, mineral and rocky fragments of all kinds, and iron. The presence of vegetable and mineral particles is easily explained; but not so the iron.

Showings of dust are not uncommon near active volcanoes. Mr. Wymper witnessed an eruption of Cotopaxi, in which dust and ashes calculated to weigh about two million tons were thrown into the air. But dust-showers of other than volcanic origin have frequently been observed both in ancient and modern times. Nordenskjöld found particles of metallic iron and nickel in the snow at Stokholm in 1871, on the Polar ice, and in the snows of Finland. Hailstones have sometimes been found to have a metallic nucleus of iron pyrites. Glycerined plates exposed to the winds have had iron particles deposited on them. Dr. Reichenbach, of Vienna, has shown that the dust which covers the tops of mountains and other elevated places contains metallic particles. And magnetic dust was found by Mr. Murray, of the *Challenger*, in the dredgings of the sea-bottom.

Arago said in 1832: 'The attentive observation of falls of dust renders it presumable that they are not essentially different from those of the ordinary aërolites.' In this opinion he has been followed by Reichenbach, Nordenskjöld, Silvestri, and Tissandier; but two dissentients have appeared in Tacchini and Von Lasaulx, who believed that the so-called cosmic dust is of terrestrial origin.

The main argument for the cosmic or extra-terrestrial origin of such dust is the similarity of its composition to that of meteoric stones (aërolites), though sometimes the dust differs materially from the constituents of an aërolite. Another reason is, that the fall both of aërolites and showers of non-volcanic dust seems generally to be preceded by the appearance of a fireball or luminous meteor. As is well known, many of the best authorities believe that comets are a source of meteoric phenomena—shooting-stars, fireballs, aërolites, and, if the theory we are discussing is true, meteoric or cosmic dust. Meteors seem to be due to the earth passing through rings of matter which revolve round the sun in cometary or elliptic orbits, the larger masses of this matter reaching the earth as aërolites, and the smaller ones being frittered into dust by the resistance of air. See METEORS.

A contrary opinion is adopted by Professor Tacchini of the Collegio Romano in Rome, who has analyzed the dust which fell in various parts of Sicily and Italy during 1879. The dust was borne on the sirocco, a dry wind which blows from the African desert. The examination revealed the presence of the usual constituents—granules of metallic iron, nickel, cobalt, phosphorus, magnesia, &c. His theory is: Whirlwinds and cyclones in the Sahara raise

quantities of dust into the higher regions of the atmosphere; it there remains suspended for several days until transported across the Mediterranean; then a small descending cyclone—the cause of the barometric depression—brings it to the surface of the earth. And he thinks that Nordenskjöld's discovery of native iron in Greenland justifies the belief that it may occur in the dust of the Sahara. But no supporter of the terrestrial origin of the dust has explained the fact that the iron particles found in it are particles of meteoric iron as distinguished from any terrestrial iron known to us. Meanwhile, therefore, the cosmic origin seems most probable.

DUST-BRAND. See **SMUT**.

DUSTEE, the largest river of Beloochistan, enters the Arabian Sea, in lat. $25^{\circ} 3' N.$, and long. $61^{\circ} 45' E.$ In proportion to length, it is certainly the least considerable stream in existence. It is about 1600 miles long; and yet it has been found to be, at its mouth, 20 inches deep, and 20 yards wide. During its entire course, it is, in its permanent character, remarkably shallow; and, in fact, the water-courses of the country depend without exception, almost exclusively on the rainy season.

DUSTY-FOOT was a court of summary jurisdiction established at fairs in England for the speedy determination of questions arising between those who resorted to the fair. See **PIE-POWDER COURT**.

DUTCH GOLD is an alloy of copper and zinc, in the proportion of three or four ounces of zinc to one pound of copper. It can be beaten out into thin leaves resembling gold-leaf, when it receives the name of *Dutch gold-leaf*, and almost rivals gold in appearance. It is very liable to be tarnished by gases, such as hydrosulphuric acid (sulphuretted hydrogen), which are constantly present in the air, especially in town districts, and it may be distinguished from true gold-leaf by the action of strong nitric acid, which instantly dissolves Dutch gold, and leaves true gold unaffected.

DUTCH LIQUID is an oily substance obtained by mixing chlorine and olefiant gases, which combine together and yield **D. L.**, with the formula $C_2H_2Cl_2$. It has a specific gravity of 1280 (water = 1000), boils at $184^{\circ} F.$, is not miscible with water, but readily dissolves in ether and alcohol. It possesses the power producing Anæsthesia (q. v.), just as Chloroform (q. v.) does; but the great difficulty of preparing **D. L.** in commercial quantities must retard its employment as an anæsthetic.

DUTCH RUSHES. See **EQUISETUM**.

DUTENS, LOUIS, a French writer, was born at Tours, 16th January 1730. Being a Protestant, he sought to make his way in England, and occupied himself at first in teaching and self-improvement. At last, he accompanied the English ambassador to the court of Turin as his secretary, and afterwards remained as *chargé-d'affaires*, a position which he occupied twice subsequently. He held a pension, and was presented to the rich living of Elsdon, in Northumberland; and was likewise made Historiographer Royal of Great Britain. He died in 1812. His numerous works display great versatility and knowledge of the world. He undertook the first comprehensive, though not complete, edition of Leibnitz's works (6 vols., Geneva, 1769). In his *Recherches sur l'Origine des Découvertes attribuées aux Modernes* (2 vols., 1766), he rates the knowledge and invention of the ancients by far too high. The *Tessin* (Rome, 1769), which afterwards appeared under the title of *Appel au Bon Sens* (Lond. 1777), contains some sharp attacks on Voltaire and Rousseau.

There is considerable historical interest in his *Histoire de ce qui s'est passé pour le Rétablissement d'une Régence en Angleterre* (Lond. 1789). He also wrote several able treatises on numismatics and other subjects. In the *Considérations Théologiques sur les Moyens de réunir toutes les Eglises Chrétiennes* (Par. 1798), he proposed that a council should compose a confession of faith grounded on the decrees of the councils of the first six centuries. His *Mémoires d'un Voyageur qui se repose* (Par. 1806) met with general favor.

DUTROCHET, RENE JOACHIM HENRI, an eminent French physiologist and physician, was born at the Château de Néon (Poitou), 14th November 1776, and came to Paris in 1802, to study medicine. His career as a student was brilliant, and in 1808 he was appointed military physician to Joseph Bonaparte, king of Spain. Soon after, he became physician-in-chief of the hospital of Burgos, then devastated by typhus fever. Returning to France in 1808, he gave himself up exclusively to the study of nature, and published a series of works on physics and physiology, full of new ideas. In 1819, he became a correspondent of the Royal Academy of Science; in 1823, of the Royal Academy of Medicine; and in 1831, a member of the former. He died 4th February 1847. The substance of all D.'s investigations and discoveries is contained in his *Mémoires pour servir à l'Histoire Anatomique et Physiologique des Végétaux et des Animaux* (Paris, 1837). He is best known by his researches on the passages of fluids through animal and vegetable substances. The passage of a fluid from without, inwards,

he calls *endosmosis*; and from within, outwards, *exosmosis*. These terms have since been widely adopted by physiologists. See **DIFFUSION OF LIQUIDS AND GASES**.

DUTTEEAH, a city of Bundelcund, in Central India, lies between Agra and Saugor, being 125 miles to the south-east of the former, and 148 to the north-west of the latter. With a population of about 50,000, the place has many good houses, the residences of the principal zemindars or landholders of the neighborhood. Like most towns in Bundelcund (q. v.), D. has a rocky site; and it is surrounded by a stone-wall 30 feet high. The lat and long. are $25^{\circ} 40' N.$, and $78^{\circ} 31' E.$

DUTTEEAH, the principality or raj of which the above-mentioned city is the capital, is a protected but not tributary state, extending in N. lat. from $25^{\circ} 32'$ to $26^{\circ} 18'$, and in E. long. from $78^{\circ} 15'$ to $78^{\circ} 54'$. It contains 850 square miles, and 120,000 inhabitants. The revenue is fully £100,000; and the armed force numbers 6000 men.

DUTY. See **ETHICS**.

DUYSE, PRUDENS VAN, a Belgian writer, was born in Den-dermonde, in Belgium, September 28, 1804. After completing his academical career, he was appointed Archivist of his native town, from which he was removed to the same office in Ghent. He soon afterwards received the office of Professor of National History in the Athenæum, and was made a member of various learned societies both in Belgium and France. He died November 13, 1859. D. was one of the chief contributors to the revival of Flemish literature.

As a poet, he was less remarkable for genius than for prodigious fertility; his pieces all bear the stamp of improvisation, of which he was a great master. Several of his productions, both poetical and prose, obtained prizes from literary societies. Of 47 poetical publications issued by D. between 1836 and 1859, we may mention *Vaderlandsche Poëzy, Natalia, Elegiën, Gedichtjes voor Kinderen, Het Klaverblad, and Nieuwe Kindergedichtjes*.

DWALE. See **BELLADONNA**.

DWARF. See **GIANTS AND DWARFS**.

DWARFED TREES, growing in flower-pots, are a characteristic ornament of Chinese and Japanese houses and gardens, and the production of them is an art which has been carried to great perfection. It depends on the prevention of an abundant flow of sap, so that whilst the tree is kept living and healthful, vegetation does not go on with its natural activity. The trees are planted in shallow and narrow flower-pots; care is taken that their roots never pass into the ground beneath; they are very sparingly supplied with water; their strongest and leading shoots are pinched off, and their branches are bent and twisted in various ways. A very extraordinary dwarfing is the result of these and other such processes; and the dwarfed trees not unfrequently abound in flowers and fruit.

DWA'RKA, a maritime town of the province of Guzerat, in India, stands on the west side of the peninsula of Kattywar, being in lat. $22^{\circ} 15' N.$, and long. $69^{\circ} 1' E.$ It is one of the most sacred places in this part of Hindustan. On an eminence overhanging the sea-shore, which was once an islet, stands a great temple of Krishna, presenting to the mariner a conspicuous landmark; while, connected therewith by a colonnade, is a smaller edifice dedicated to Deoki, the mother of Krishna. The Gumti, a bordering rivulet which barely reaches the ankle, is, notwithstanding its insignificance, an object of profound veneration.

DWIGHT, DR. TIMOTHY, a well-known American theologian, was born at Northampton, in Massachusetts, May 14, 1752; studied at Yale College, New Haven; and was licensed to preach in 1777. During the War of Independence, he was for some time a chaplain in the American army. In 1783, he was ordained minister of Greenfield in Connecticut, where he also conducted an academy for twelve years with distinguished success. In 1787, the College of Princeton, New Jersey, conferred on him the degree of D.D.; and in 1795, he was elected President of Yale College and Professor of Divinity. He died January 11, 1817. D.'s principal work is his *Theology Explained and Defended in a series of 173 Sermons* (5 vols., Middletown, Conn. 1818, &c.). It has been frequently reprinted in England; and used to be—as probably it still is in quiet country quarters—very popular among elderly persons of a serious turn of mind. D. was not a great or original thinker; but his mind was fertile in the production of respectable ideas, which, though sufficiently commonplace, were yet pleasing both in themselves and from the important nature of the subjects to which they referred. Among his other writings may be mentioned, *The Conquest of Canaan, an Epic Poem* (1785); *Travels in New England and New York* (1821), reckoned by Southey the most important of his writings; and two volumes of *Sermons* (Edin. 1828).

DWINA, NORTHERN—as distinguished from the Western Dwina or Düna (q. v.)—an important river of Russia, has its origin in the confluence of the Suchona and the Jug, two streams,

the latter more than 200 miles, and the former nearly 300 miles in length, rising in the south of the province of Vologda, and uniting in lat. $60^{\circ}45'$ N., long. $46^{\circ}30'$ E. The D., from the union of these streams, flows north for about 50 miles, and receives the Vytchegda from the east, a river 500 miles long. At this point, the D. becomes navigable, and here it alters its direction, and proceeds north-west toward the Gulf of Archangel, into which it flows, having been joined on the right by the Pinega, and on the left by the Waga, and having traversed a course of about 700 miles. The basin of the D. comprehends an area of 125,900 square miles. Its average width is from 500 to 600 feet; before debouching into the White Sea, however, its surface, which is there marked by many islands, increases in width to about four miles. The waters of the D., the largest river that falls into the White Sea, are abundantly supplied with fish. Large vessels cannot enter the D. on account of the shoals at its mouth.

DYAKS. See BORNEO.

DYCE, ALEXANDER, an English literary historian, was born at Edinburgh, 30th June 1798. He was educated at the High School of that city, and afterwards at Oxford. After officiating for some time as curate, he settled in London in 1827. His literary reputation is chiefly based on his editions of the older English poets and authors—George Peele, Robert Greene, John Webster, Shirley, Thomas Middleton, John Skelton (an author of the beginning of the 16th c., previously little known), Beaumont and Fletcher, Ford, and Marlowe, with biographies of the authors, and instructive notices. He also edited the poems of Shakspeare, Pope, Akenside, and Beattie, for Pickering's Aldine Edition of the Poets. An old play discovered by him, called *Timon*, and which may possibly have first suggested to the great poet the idea of his drama of the same name, was besides published for the Shakspeare Society, as well as another entitled *Sir Thomas More*. In conjunction with Collier, Halliwell, and Wright, he founded the Percy Society for the publication of old English ballads, plays, and poems. His ability as a commentator on Shakspeare is proved by his *Complete Edition of the Works of Shakspeare; the Text revised; with Account of the Life, Plays, and Editions of Shakspeare, Notes, &c.* (1858). He died in 1869.

DYCE, WILLIAM, R.A., a distinguished painter, was born at Aberdeen in 1806. He was educated at the university there, and at the age of 16 took the degree of Master of Arts. After acquiring the rudiments of his art-education he went to Rome, where he studied for some years. His tendency at first was very strongly, and continued so under certain modifications, towards early Italian, or pre-Raphaelite art, and his productions attracted the marked attention of Overbeck, the head of the modern German school. On his return to this country, he settled in Edinburgh, where besides painting portraits, he contributed largely to the Exhibitions.

The first picture he exhibited in Edinburgh was in the Perugino style, and though evincing great power, was at that period, 1829, but little felt or appreciated; his 'Puck,' however, exhibited at the same time, was very successful, and most of his after-contributions to the Exhibitions of the Royal Scottish Academy, of which he was a member, were deservedly popular, particularly his picture of 'Francesca da Rimini,' exhibited in 1837. After this he went to London, having been nominated to the head-mastership of the New School of Design at Somerset House, an office which he obtained on account of his general acquirements and knowledge of art, and which he held for three years. Soon after this he was appointed Professor of Painting in the London University. He distinguished himself at the Westminster competition by his frescoes, and in consequence was one of the artists selected to decorate the Palace of Westminster and the House of Lords, and at Osborne House several works in fresco have been executed by him. D. was elected an Associate of the Royal Academy in 1844, and Academician in 1848. The following are some of the works he exhibited in Royal Academy: 'King Joash Shooting the Arrow of Deliverance,' a 'Madonna and Child' (1846), a 'Meeting of Jacob and Rachel' (1850), 'Christabel' (1855), 'The Good Shepherd' (1856), 'Titian Preparing to make his Essay in Coloring,' 'Neptune Assigning to Britannia the Empire of the Sea,' a study for a fresco at Osborne (1857), 'St. John Leading Home his Adopted Mother,' 'The Man of Sorrows' (1860), and 'George Herbert at Bemerton' (1861). He died in 1864.

DYCK, SIR ANTHONY VAN. The history of this celebrated painter is of great interest, not only from the high position he held as an artist, but from his having settled in England, where he executed numerous works, which enable us to realize most of the personages whose actions form prominent points in the history of this country. He was born at Antwerp, 22d March 1599. His father, according to Houbraken, was a glass-painter; and it is said that his talent was fostered by his mother, who painted landscapes, and was skilled in embroidery. After making very considerable progress under Van Balen, he was, in 1615, admitted as a pupil of Rubens, who was not slow to appreciate his great talents.

In a letter, dated 17th July 1620, addressed to the Earl of Arundel, known historically for his patronage of art, the writer states, 'Van Dyck lives with Rubens, and his works are beginning to be esteemed little less than those of his master. He is a young man of one-and-twenty, whose parents are persons of considerable property, and it will be difficult, therefore, to induce him to remove.' Soon after this—namely, in 1621—by advice of Rubens, he visited Italy. The works of the great Venetians were the first to attract his attention.

After leaving Venice, Genoa was the next city he resided in, then Rome, and he went a second time to Genoa, from whence he made a short visit to Palermo. Van Dyck was five years in Italy, and from the number of portraits painted by him in Genoa—many of the best of his works in his Italian manner are still there—he must have lived a considerable portion of the time in that city. On his return to Antwerp in 1626, he executed various pictures for churches, and the portraits classed among those painted in his Flemish style; the series of cabinet portraits of the painters of his day, engraved by Vostermans, &c., and most of which are now in the possession of the Duke of Buccleuch, were also painted at this time. About 1630—1631, Van Dyck visited England, and, meeting with no encouragement, remained only a short time; this fact, once doubtful, was proved by Carpenter. In 1632, he came to England, by invitation of the Earl of Arundel, at the command of Charles I. He was lodged at Blackfriars, was soon afterwards knighted, and had a pension of £200 a year settled on him. His commissions were now numerous, he was enabled to live in great style, entertained people of high rank, and had a country-house at Eltham, in Kent. His wife, Marie Ruthven, by whom he had one daughter, was the daughter of Patrick Ruthven, physician, fifth son of Lord Gowrie. Van Dyck died in London in 1641, leaving property to the amount, it is said, of about £20,000. Only twenty years are included within the time when Van Dyck left the studio of Rubens till the period of his death; and during that short career, the number of pictures executed by him, on what is thought to be good authority, seems almost incredible, for in Smith's Catalogue Raisonné of the Works of the Dutch and Flemish Painters, there are descriptions and interesting particulars of upwards of 950. The artist's works may be classed as executed in three distinctly marked styles—1. Those painted in Italy during his residence of five years, from 1621 till 1626; these are distinguished by deep tone and color, and dignity of character and expression. The portraits of the Lomellini Family and an Italian Nobleman, in the Scottish National Gallery, are good examples of his style at this period. 2. His productions between 1626 and 1631, when he lived in Flanders, are known as done in his Flemish style; these works are executed with much *impasto* or body of color in the lights, and transparency in the shadows. Perhaps it was during this period of his career that he executed his finest works, among which the best are the portrait of Snyder the painter, now the property of the Earl of Carlisle; the companion-picture of Snyder's wife, now belonging to the Earl of Warwick; and the portraits of Philip le Roy and of his wife Madame le Roy, purchased by the Marquis of Hertford at the sale of the king of Holland's pictures. 3. The portraits he painted in England between 1631 and 1641; these are noted for grace and elegance, but many of them were often slight in execution, or done partly by assistants. Van Dyck's biographers and critics generally dwell at great length on his Scripture subjects, and express regret that he devoted so much of his time to portrait-painting; but different notions seem to be now gaining ground.

No Scripture subjects by Rubens or Van Dyck, or produced in any of the later schools, will stand comparison, for purity of feeling and appropriate technical execution, with the works of the earlier masters; and the allegorical pieces so much in vogue in the 17th c., are little in accordance with the ideas of the present time. But the portraits by Van Dyck are all interesting and valuable histories, recorded with marvelous truth and vividness, of characters who played important parts in an era noted for great events. Van Dyck's etchings are admirable. Several of the portraits in the collection of portraits of artists, are etched by him. The impressions of those that were thrown off, when the heads merely were etched, are of great value. See Carpenter's *Memoir* (1844), the short monograph by Head, but especially the great work of Guiffry, *Antoine Van Dyck, sa Vie et son Œuvre* (Paris, 1882).

DYEING is the art of staining or coloring yarn or cloth. It has been practised among eastern nations from time immemorial; and in the sacred writings, we read of the vestments of the high-priest being dyed purple, of linen cloths being dyed blue, purple, and scarlet, and of rams' skins being dyed red. The famous Tyrian purple is believed to have been discovered by an inhabitant of Tyre fifteen hundred years B.C.; and immediately afterward the Tyrian purple became the badge of royalty, and cloth dyed with it commanded a princely price. The Egyptians, Greeks, and Romans practised the art of dyeing; and gradually it became

more and more wide-spread as civilization advanced, the discovery of America and other lands materially increasing the number of dye-stuffs. In earlier times, dyeing was much more extensively followed as a domestic art than it is at the present time. In the Highlands of Scotland, however, females are still in the habit of dyeing cloth *brown* by immersing it in a solution of copperas (sulphate of iron), and then treating it with a decoction of sumach, logwood, and croctel (*Parmelia omphalodes*), a lichen which covers many rocks and trees in moist situations; *black*, by immersing the cloth or yarn in an infusion of the bark of the alder-tree (*Alnus glutinosa*), along with copperas and a little sumach; *yellow*, by the common heather (*Calluna vulgaris*) and alum; *red*, by the roots of bed-straw (*Galium verum*) and alum, &c.

The Dye-stuffs (q. v.) employed in the various processes of dyeing are numerous, and when two or more are associated together, many different shades and colors are produced besides the original color yielded by each. The dyeing materials are procured from the mineral, vegetable, and animal kingdoms, and are often very costly. The arrangements connected with dyeing operations are at times simple, whilst at other times they are complex, and require the greatest care and skill on the part of the dyer.

In communicating the deep indigo blue to woollen cloth and yarn, a vat is taken, about 6 or 7 feet in diameter, and 8 to 9 feet in depth, and nearly filled with water, along with 18 to 22 lbs. of indigo, 10 to 20 lbs. of madder, 7 to 9 lbs. of bran, and generally 7 to 9 lbs. of wood. After the requisite boiling, and the addition of 7 or 8 lbs. of lime, to form an alkaline liquid in which the indigo can be held in solution, the whole is well closed over with tightly fitting wooden covers; and in a day, the putrid fermentation of the wood and bran proceeds, the result of which is to abstract the oxygen from the blue indigo, the color of which is gradually reduced till it assumes a yellowish color, and the solution then contains indigo white. If woollen yarn or cloth is now dipped in this liquid, it comes out of a yellow tint, from the attachment of the white indigo solution; but when exposed to the air, the oxygen immediately begins to act upon the white indigo, combining with it, so as to form oxidized or blue indigo, and as the process of oxidation proceeds, the yarn or cloth becomes first of a greenish and then of a blue color. If the cloth be again soaked in the yellowish solution, and subsequently exposed to the air, the depth of the blue color may be increased step by step, till it arrives at that deep shade of blue so well known, especially in the coarser qualities of woollen cloth. In the dyeing of cotton with indigo, the vat is prepared differently. The indigo is first ground into a thin paste with water, and afterwards placed in a vat with protosulphate of iron and milk of lime. The lime (CaO) takes the sulphuric acid (SO₄) from the sulphate of iron (FeSO₄), forming sulphate of lime (CaSO₄), and liberating protoxide of iron (FeO), which immediately abstracts the oxygen from the blue indigo, reducing it to white indigo, and the latter dissolves in the excess of lime present in the vat, yielding a colorless solution. When cotton cloth or yarn is dipped in this, it comes out of the vat almost colorless; but on exposure to the air, the indigo becomes re-oxidized, and the cloth passes to a green, and ultimately to a deep blue shade. The cloth or yarn is then washed in water, and afterwards soaked in very dilute sulphuric acid, to remove any oxide of iron remaining attached, and re-washed in water, when the blue color becomes more bright and clear.

In the fixation of color upon cloth, recourse is often had to a mordant (see CALICO-PRINTING), which acts as a middle agent, and attaches the color to the cloth. The principal mordants are alum, cream of tartar, and salts of tin. Previous to the application of any color, the cloth or yarn must be well cleansed from grease, oil, &c., by scouring in soda or in soap, and except where the material is to be dyed of a dark color, the goods are also subjected to the process of bleaching. In the case of fabrics which require a smooth surface, the preliminary operation of singeing off the loose hairs is resorted to. See CALICO-PRINTING.

DYEING OF COTTON.—The following receipts for the dyeing of cotton apply to 10 lbs. weight of cotton yarn or cloth, which is found to be the smallest quantity capable of being well dyed at one time. The proportions of each ingredient may be altered, however, so as to correspond with the quantity of cloth or yarn to be operated upon.

1. *Common Black.*—Take 3 lbs. sumach, and treat with hot water; steep the goods in the hot decoction for some hours; wring out; wash for 10 minutes in lime-water, and for 30 minutes in a solution of 2 lbs. copperas. Wash the goods well in cold water, sometimes repeating the treatment with lime, and re-washing; then work the goods for 30 minutes in a warm solution of 3 lbs. of logwood, and afterwards with 2 oz. copperas; work again for 10 minutes; wash, and dry.

2. *Jet Black.*—Proceed as at 1, adding 1 lb. of fustic with the logwood; and when 3 pints of iron liquor are used instead of the 2 oz. copperas, a more brilliant black is obtained.

3. *Blue Black.*—Use the indigo blue vat, and then proceed as at 1.

4. *Brown.*—Treat the goods with a yellow dye; then work for 30 minutes in a decoction of 2 lbs. lima wood and 8 oz. logwood; lift and work with 2 oz. alum for 15 minutes; then wash, and dry.

5. *Catechu Brown.*—Immerse the goods at a boiling temperature in a decoction of catechu; then work for 30 minutes in a hot solution of 6 oz. bichromate of potash. Wash in hot water, and if the latter contain a little soap, the color will be improved.

6. *Chocolate or French Brown.*—Dye the goods with a spirit yellow; then treat for half an hour with a solution of 3 lbs. of logwood; raise with a little red liquor; work for 10 minutes; wash, and dry.

7. *Red.*—Make a hot solution of 3 lbs. of sumach; introduce the goods, and let stand till the liquor is cold; then wring out, and work in water containing in each gallon a gill of red spirits (prepared by adding 2 oz. of feathered tin by degrees to a mixture of three parts of hydrochloric acid, one part of nitric acid, and one of water in the cold) for 30 minutes; wring and wash well; then work the goods for 30 minutes in a lukewarm decoction of 3 lbs. of lima wood, and 1 lb. of fustic; add a gill of red spirits; work the goods longer; wash, and dry. The famous Turkey-red is imparted to the cloth by first impregnating it with an oily or fatty substance, and then subjecting it to a decoction of madder. It is one of the most durable of all colors.

8. *Yellow or Straw.*—Work the goods in a weak solution of acetate of lead; then wring out, and work in a dilute solution of bichromate of potash; wring out, and work again in the lead solution; wash, and dry.

9. *Leghorn Yellow.*—Proceed as at 8, but add a little arnotto liquor with the solution of bichromate of potash.

10. *Spirit Yellow.*—Work the goods through a weak solution of protochloride of tin for 30 minutes; then work in a solution of quercitron bark for 15 minutes; lift out, and work again in tin solution, and wash in cold water.

11. *Orange.*—Proceed as at 8, and afterwards pass through lime-water at the boiling-point, ultimately washing in cold water.

12. *Blue.*—The goods are worked in various strengths of solutions of salts of iron, such as nitrate of iron; wring out; wash in water, and then work in solution of yellow prussiate of potash; wring out, and wash in water containing a little alum. The various shades of blue may be obtained by using stronger or weaker solutions.

13. *Green.*—Dye the cloth blue; then work in red liquor (acetate of alumina); wash in water; work in decoction of fustic or bark; raise with solution of alum; wash in cold water, and dry. The darker shades of green, as olive or bottle green, are brought out by the use of sumach and logwood along with the fustic.

14. *Puce or Lilac.*—Work the cloth or yarn in red spirits (see 7), then in logwood solution at a temperature of 140° F., adding a little red spirits, red liquor, or alum; wash, and dry; or dye the cloth blue (12); then work in solution of logwood; add alum; work again; wash, and dry.

15. *Purple.*—Soak the goods in a warm decoction of sumach till cold; work for an hour in red spirits; wash; work in hot solution of logwood; then add a little red spirits, and work again; wash, and dry. The various shades of purple may be obtained by altering the strength of the chemicals; the more sumach, the browner the hue, and the more logwood, the bluer the purple becomes.

16. *Lavender or Peach.*—Work the goods for 20 minutes in spirit-plumb (a strong solution of logwood, treated with about one sixth of its volume of a solution of tin, made by dissolving tin in six or seven parts of hydrochloric acid, one part of nitric acid, and one of water); wring out, and wash well in cold water.

17. *Safflower Lavender* is obtained by dyeing the goods a light-blue, then working in decoction of safflower, which places a pink on the top of the blue.

18. *Drab.*—Work the goods in a decoction of sumach; lift, add copperas; rework; wash in water; then work in a mixed decoction of fustic, lima wood, and logwood; raise with a little alum; wash, and dry. Catechu is occasionally employed.

DYEING OF WOOL.—In the dyeing of woollen yarn and cloth, the various steeps are used warm, but the washings in water are done cold. Care must be taken to remove every particle of grease from the wool by washing with soda and soap, before it is subjected to the process of dyeing, else the coloring matters will not adhere. The more common and important colors are obtained as follows:

19. *Black*—by working the cloth in a bath of camwood, then of copperas; after which wash out; then treat with decoction of logwood and copperas; or work in a bath of bichromate of potash, alum, and fustic; lift, and expose to the air; then immerse in decoction of logwood, barwood, and fustic; thereafter of copperas.

20. *Brown.*—The goods are worked in a bath of fustic, madder, peachwood, and logwood; then introduce into dilute solution of copperas; or the goods are treated with a bath of bichromate of potash, argol, and alum, washed, and then introduced into a bath of fustic, madder, peachwood, and logwood.

21. *Red*—by working in a decoction of bichromate of potash and alum, and subsequently in a bath of peach or lina wood, with a little alum. Scarlet is obtained from cream of tartar, cochineal, sumach, and fustic.

22. *Crimson*—from cochineal, cream of tartar, and chloride of tin. Cudbear gives a wine tint.

23. *Pink*.—Work the goods in a bath of tartar, alum, cochineal, and red spirits.

24. *Orange*—from a bath of sumach, cochineal, fustic, tartar, and red spirits.

25. *Yellow*—from a bath of tartar and alum; then a decoction of bark, sumach, fustic, and red spirits.

26. *Blue*.—Various shades may be obtained from immersion in salts of iron, and then in solutions of yellow prussiate of potash (see 12). Also work the wool in a bath of argol, alum, and indigo extract.

27. *Green*.—Work the goods in a bath of fustic, argol, and alum, and thereafter in a solution of indigo. The dark shades of green, such as olive, are brought out by a bath of fustic, logwood, madder, and peachwood, and afterwards of copperas.

28. *Violet*—from cudbear, logwood, barwood, or camwood, and peachwood; as also alum. The addition of copperas brings out a puce tint.

29. *Drab*.—The manifold shades of this color are procured from variable strengths of decoctions of madder, peachwood, logwood, fustic, associated with alum and copperas.

DYEING OF SILK.—The operations connected with the dyeing of silk are similar to those already sketched out, but a more thorough scouring of the raw material requires to be made, so as to remove all the gum and wax belonging naturally to the fibre.

30. *Black* is obtained by working the silken material in copperas (sulphate of iron), then in logwood containing some chamber liquid, and repeating the treatment with copperas and logwood till the requisite shade is procured. A little nitrate of iron tends to give a more full, deep black; and alum and white soap are also used with advantage. Acetate of copper is occasionally used.

31. *Blue Black*.—Dye a blue as at 12, and then proceed as at 30.

32. *Brown*.—Obtain an orange by immersion in a solution of annotta, then treat with copperas; and introduce into a bath of fustic, logwood, archil, and a little alum. If a more yellow tint is required, add more fustic; redness is obtained by adding peachwood, and blueness by the addition of logwood.

33. *Reds* are obtained from peachwood and fustic, and thereafter red spirits. Annotta is used in getting up the scarlet shades, and cochineal and safflower in the more expensive red dyes. Rubies and maroon require cudbear.

34. *Pink*—from safflower, associated with sulphuric acid and cream of tartar.

35. *Orange and Yellow*—by treating the goods with more or less strong solutions of annotta, associated with alum and white soap.

36. *Blue*—from salts of iron and yellow prussiate of potash; or from solutions of sulphate of indigo, assisted with a little alum.

37. *Green*—from steeping in decoctions of fustic and sulphate of indigo, along with a little alum. The darker shades have copperas added and logwood.

38. *French and Pearl White*.—Work the silk in a lather of white soap, to which archil or cudbear has been added, to give the required shade.

39. *Drab*—from decoctions of sumach, fustic, logwood, and more or less copperas, according to the depth of shade required.

DYEING OF MIXED FABRICS.—The coloration of textile fabrics composed of more than one kind of material, generally requires two or more processes, as the plan pursued in dyeing wool is seldom capable of fixing the color upon cotton. The customary plan followed is to immerse the fabric in the requisite baths, to dye the wool, and then to treat the partially dyed material in the manner found suitable for cotton. Occasionally, the woollen thread of the cloth is dyed of one color, and thereafter the cotton is treated so as to acquire a different shade or color. The producing of a colored pattern on cloth has already been considered under **CALICO-PRINTING**.

DYER, GEORGE, an antiquary and scholar of some eminence, was born in London, March 15, 1755, and was educated first at Christ's Hospital, and afterwards at Emanuel College, Cambridge, which he entered in 1774, and where, after four years' study, he took his degree of B.A. During the next fourteen years, he was variously engaged, chiefly at Cambridge, as usher, tutor, and as minister (in the Baptist denomination), but he finally settled in London in 1792. Here he devoted himself principally to literature, and produced, among many works of less note, the *History of the University and Colleges of Cambridge* (Lond. 2 vols., 1814), and *Privileges of the University of Cambridge* (Lond. 2 vols., 1824). He also contributed largely to magazines. He died in London in 1841.

D. was a man of remarkable straightforwardness and honesty of character, qualities which are everywhere discernible in his works. He was also a poet, although now forgotten and never famous.

DYER, REV. JOHN, an English poet, was born at Aberglasney, in Caermarthenshire, in the year 1700, and educated at Westminster School. He was intended for the law, but, however, abandoned that study for painting. In 1727, he published his poem of *Grongar Hill*, remarkable for simplicity, warmth of feeling, and exquisite description of nature. He then made the tour of Italy, and returning home in bad health, took orders, and obtained some respectable ecclesiastical preferment. In his didactic poem, entitled *The Fleece* (1754), the difficult subject is treated with great success; but the unpretending tone of the poem made no impression upon his contemporaries. Another poem, *The Ruins of Rome* (1740), abounds in isolated beauties. D. died in 1758. A collected edition of his poems appeared in 1761.

DYE-STUFFS. The substances used in dyeing as the sources of coloring matter, are derived from the animal, mineral, and vegetable kingdoms, the greatest number from the last mentioned. To the animal kingdom, and to the class of Insects, we are indebted for *Cochineal*—and consequently for *Carmin*—*Kermes*, and *Lac*, and less directly for *Galls*. The *Tyrian purple* of the ancients is also said to have been a product of the animal kingdom, obtained from a mollusc.—The dye-stuffs obtained from the vegetable kingdom are numerous, and in every part of the world there are some in domestic use, which have not become articles of commerce. Such are those dye-stuffs of the Highlands of Scotland, mentioned in the article **DYEING**.

Dye-stuffs are procured from plants of widely different natural families: there are some indeed in which certain coloring matters appear to be extensively prevalent, as in *Rubiaceæ* (madder, &c.), and the genus *Casalpinia* (q. v.). They are also obtained from almost all different parts of plants, as the heart-wood (*duramen*) of the stem (Logwood, Brazil-wood, Camwood, Fustic, &c.); the bark (Alder, &c.), the root or its bark (Barberry root, &c.); the leaves and other herbaceous parts (Indigo, &c.); the corolla (Safflower); the fruit (French Berries, Annotta, &c.). The principal dye-stuffs are the following: *Alkanet* (q. v.), useful in dyeing various shades of lilac, lavender, and violet, which are, however, liable to fade on exposure to light. *Aloes*, obtained by evaporating the juice of the aloes, which is grown in the East and West Indies, Sicily, Italy, and Malta. It contains a brown coloring matter named *Aloetin*, which may be employed in the production of a brown tint. *Arnotto* (q. v.), employed in imparting the various shades of yellow, orange, and scarlet, to silk, wool, and cotton. *Archil*, yielding, when infused in water, a crimson dye of great beauty, though fugitive, and used in giving a finish to wool and silk which have been previously dyed. *Barberry root*, imported from the East Indies, and containing a yellow coloring matter called *berberin*. *Brazil wood*, often called *peach-wood*, containing *brazilin*, which, in contact with the air, yields a rich red color. *Camwood* (q. v.) or *Barwood*, has a red color similar to that of Brazil-wood, is generally employed in the form of a coarse powder, and readily imparts its color to water. *Catechu*, yields a reddish-brown solution in water, and performs an important office in the dyeing of many shades of brown, black, and green. *Chica* (q. v.), employed in the dyeing of wool and cotton of an orange-yellow color. *Cochineal*, employed directly, or indirectly in the form of carmine (extracted from the cochineal), in imparting the most beautiful red and crimson colors. *French, Persian, Turkey, or Spanish berries*, obtained from several species of *Rhamnus* (see **BUCKTHORN**), yield a powerful yellow dye. *Fustet*, the finely divided wood of *Rhus cotinus* (see **SUMACH**), a yellow dye. *Fustic*, or *yellow wood*, used for dyeing cloth yellow, and for communicating a good green tint to cloth already rendered blue; as also, in conjunction with other dyes, in imparting various shades of drabs, olives, fawns, &c. *Galls* or *gall-nuts* are employed in dyeing cloth of a dark or black color. *Indigo* (q. v.), very extensively used in the dyeing of yarn and cloth of a deep blue color, which may be afterwards rendered green by a yellow dye. *Kermes*, *Kermes grains*, or *Alkermes*, an excellent material for dyeing many shades of red, and one of the most ancient dye-stuffs employed in the coloring of silk.

Lac (q. v.). *Shell-lac*, or *Stick-lac*, is used in the preparation of red dyes. *Logwood* (q. v.), broken up into small chips, or reduced to powder, is employed in the dyeing of reds, and, when associated with other substances, yields purples, violets, and blues. *Madder* (q. v.), one of the most important of dye-stuffs, is extensively used in the dyeing of cloth and yarn red, purple, brown, &c. *Murjeet* or *Indian madder* is used in India instead of madder. *Quercitron* yields a rich orange-yellow, or yellow-red dye, capable of being afterwards made a brown; and when used after a blue dye, it changes the latter to a bright green. *Safflower* yields a rich yellow dye. *Sandal-wood*, *Santal* or *Saunders wood*, yields a red color, which, along with other substances, may be altered to vio-

let, reddish brown, and scarlet. *Sumach*, occasionally called *young fustic*, is employed as a yellow dye, and also for the tannin and gallic acid it contains, which enables decoctions of sumach to be used with great effect for imparting depth or solidity to other colors. *Turmeric*, or *Indian saffron*, is employed as a yellow dye, but is very fugitive. *Weld*, or *Wold*, produces a rich but fugitive yellow. *Wood* is employed as a blue dye for woollen and silk yarn and cloth, either with or without indigo. *Wongshy* is a new yellow dye-stuff procured from the seed-vessels of a plant belonging to the family of *Gentianae*, and imported from Batavia.

The above list of dye-stuffs comprehends those which are obtained, directly, or indirectly, from the vegetable and animal kingdoms; and a more lengthened notice of the substances will be found under their respective names. Other dye-stuffs less generally used are also noticed in the articles devoted to different orders and genera of plants. The metallic salts and compounds employed in dyeing will be specially noticed under the various metals; thus for acetate of lead, see **LEAD**; sulphate of iron, see **IRON**; &c.

COAL-TAR COLORS.—The most recent discovery of importance in dyeing, is the extraction of colored substances of great beauty from coal-tar, and the application of these to the coloring of cloth. At the present time, these dyes of coal-tar origin are most extensively employed, and give rise to the fashionable colors named Aniline purple, Tyrian purple or Mauve, Violine, Roseine, Fuchsine or Magenta, Solferina, Bleu de Paris, Aniline green or Emeraldine, Azuline, &c. It is only, however, within the last 30 years that these dyes have become practically known, though the preliminary discoveries in connection with their extraction were made in 1826. The condensable product or gas liquor obtained during the destructive distillation of coal in gas-works, consists of aqueous matter, holding salts of ammonia in solution, and tar with naphtha. The tar consists of a numerous class of bodies, of which aniline and benzole are two. The aniline is present in minute quantity; and for manufacturing purposes, means are generally resorted to for the conversion of the benzole of gas-tar into aniline. The process followed on the commercial scale is to act upon the benzole by nitric acid, by which it is converted into nitro-benzole, and thereafter, by the action of acetate of the protoxide of iron, it becomes aniline.

Aniline Purple.—In the preparation of the dye known as aniline purple, solutions of equal equivalents of sulphate of aniline and bichromate of potash are mixed together; and when the reaction is complete, a black precipitate is obtained, which is dried, and then digested several times in coal-tar naphtha; to separate all resinous matter. The residue is dissolved by successive quantities of alcohol; and the solution being placed in a retort, the alcohol is distilled off, and the aniline purple is left as a beautiful bronze-colored substance. Aniline purple is slightly soluble in cold water, more so in hot water, and is readily dissolved by the alcohols and aniline itself. It is nearly insoluble in ether and naphtha.

Roseine is most readily prepared on the commercial scale by adding two equivalents of binocide of lead to a boiling solution of one equivalent of sulphate of aniline, and boiling the whole for a short time. On filtration, a rose-colored solution is obtained, which is evaporated down to small bulk, when some resin separates, and the roseine is precipitated by soda or potash, and being collected on a filter, can be washed and dried. This dye is readily soluble in alcohol, and yields a very intense crimson color, which, on being evaporated to dryness, leaves a dark metallic-looking and brittle residue of roseine. It is soluble in water, but not in naphtha.

Violine is procured by the oxidation of aniline, and the process generally followed is to heat a mixture of two equivalents of sulphuric acid, one equivalent of aniline, and some water, to the boiling-point, then add binocide of lead, boil for some time, and filter hot. A purple liquid is obtained, which is boiled with potash till the aniline present is volatilized, and the coloring matter is precipitated, when the latter is thrown on a filter, washed with water, and dissolved in a dilute solution of tartaric acid. On filtration, the colored liquid is evaporated to small bulk, refiltered, reprecipitated by potash and soda, and the precipitate being dissolved in alcohol, yields an alcoholic colored solution, which on distilling off the alcohol, leaves the violine as a brittle bronze-colored substance. Violine is very slightly soluble in water, is readily dissolved by alcohol, and is insoluble in ether and naphtha.

Fuchsine or Magenta is prepared by adding anhydrous bichloride of tin by degrees to aniline. The materials are constantly stirred during the operation, to keep down the intensity of the action, and the result is, that much heat is evolved, the mixture becomes pasty, then liquid and brown; and as the temperature approaches the boiling-point, it becomes a dark, almost black liquid, which in very thin layers presents a rich crimson color. This liquid is boiled for some time, much water added, the whole reboiled, so as to volatilize any free aniline, and chloride of sodium (common salt) added till saturation, when the fuchsine or magenta is pre-

cipitated as a golden green, semi-solid, pitchy substance. Any resinous matter still remaining may be separated by digestion in benzole. This dye may also be obtained by acting upon aniline with nitrate of mercury. Fuchsine or magenta is sparingly soluble in water, dissolves to some extent in alcohol, and is insoluble in ether and naphtha.

Bleu de Paris is prepared by heating 9 parts by weight of bichloride of tin and 16 parts of aniline to a temperature of about 350° F., in a sealed tube, for 30 hours, when a blue product is obtained, which is soluble in alcohol, and crystallizes therefrom in fine needles of a lively blue color. Bleu de Paris is soluble in water, alcohol, wood-spirit, and acetic acid, and is insoluble in ether and bisulphuret of carbon.

Aniline Green or Emeraldine is obtained by acting upon a hydrochloric acid solution of aniline by chlorate of potash, when the aniline becomes oxidized, and yields a dull green precipitate, which on drying becomes an olive-green residue. It is insoluble in water, alcohol, ether, and benzole, and in the presence of a free acid the green color improves in appearance, though it returns to its original shade when the free acid is removed.

Quinoline or Chinoline is present in coal-tar, and may be employed to yield three coloring matters—a violet, a blue, and a green; but the processes as yet followed in their preparation belong more to the laboratory experiments of the scientific chemist than to the practical operations of the manufacturer.

Pieric Acid is obtained by acting upon many organic substances, such as indigo, aniline, carbolic acid, salicin, silk, aloes, gum-resins, &c., by nitric acid. On the commercial scale, carbolic acid is generally employed, and it is first treated with nitric acid of slightly less density than 1300 (water = 1000), and afterwards boiled with stronger acid, when it passes into pieric acid, and is precipitated on dilution with water. It can be purified by recrystallization from boiling water. Pure pieric acid crystallizes in lamina of a primrose yellow color.

Azuline is the only other coloring matter of practical importance derived directly or indirectly from coal-tar. It is a brittle, non-crystallizable substance, with a copper-colored metallic appearance. It is sparingly soluble in water, but is soluble in alcohol, yielding a fine blue solution with a shade of red. Treated with concentrated sulphuric acid, it becomes a fine blood-red liquid, which, on dilution with much water, gives a red precipitate of azuline.

Pittacal is a blue coloring matter obtained from coal-tar.

Dyeing of Silk and Wool by the Coal-tar Colors.—This department of the operations of the dyer is very simple, as the silk and wool fibres possess the power of taking up and fixing the majority of these coloring matters with great rapidity, whenever the yarn or textile fabric is placed in the vessel containing a solution of the color. In the dyeing of silk with aniline purple, violine, and roseine, the alcoholic solution of the color is diluted with eight times its volume of hot water acidulated with tartaric acid, and thereafter treated with a larger quantity of cold water. The silk is merely worked in this comparatively weak solution of the dye till the shade of color is deep enough. The addition of a little sulphate of indigo to the dye-vat assists in bringing out a more decided blue tint. The same result is obtained by first dyeing the goods with Prussian blue before immersion in the coal-tar color. When silk is to be dyed with fuchsine, pieric acid, chinoline blue or chinoline violet, the goods require only to be worked in water-solutions of these colors. A little acetic acid added to the vat containing the fuchsine or pieric acid is advantageous, and if a solution of sulphate of indigo is mixed with the solution of pieric acid, the goods acquire a fine green color.

Azuline is attached to silk with more difficulty than any of the preceding colors. The silk requires to be worked first in a solution of azuline acidulated with sulphuric acid, and thereafter the liquid is raised to the boiling-point, and the silk continued to be worked in it. The goods are then washed in water, worked in a bath of soap-lather, rinsed, and finished in a weak acid bath.

Wool is dyed with aniline purple, violine, roseine, fuchsine, and chinoline by merely working the yarn or cloth in a vat containing a water-solution of the coloring matter at a temperature ranging between 112° and 140° F.

Cotton has not the power of firmly attaching, directly, coal-tar colors to its fibres so as to resist the action of soda and of soap. When the cotton, however, is treated with a solution containing much tannin, such as a decoction of sumach, or galls, for an hour or so, then introduced into a dilute solution of alum or stannate of soda, and, lastly, passed into a dilute acid liquor, and washed in water, it acquires a great power of firmly attaching aniline purple, roseine, violine, fuchsine, and chinoline colors, whenever it is worked in a dye-vat containing these coloring matters. This principle of the attachment of these colors to cotton by means of a mordant of tannin and alum, may be applied in printing patterns upon cloth, as in Calico-printing (q. v.). The pattern is printed on the cloth by means of tannin and alum dissolved in water and thickened with gum; and afterwards, when the prepared

goods have been introduced into a hot dilute acid solution of the coloring matter, the dye becomes attached to those parts on which only the tannin has been printed, and leaves the other parts uncolored. Another mode is to mix the dye with albumen or lacterine, print on the cloth, and then subject to the action of steam, which coagulates the albumen or lacterine, and at the same time fixes the color on the cloth.

DYING DECLARATION. By the law of all nations, the declaration of a party, made in the immediate prospect of death, relative to the mode of his death, is received as evidence. The ground of this exception to the general rule of law, that hearsay evidence is inadmissible, is thus clearly stated by Lord Chief Baron Eyre: 'That they are declarations made in extremity, when the party is at the point of death, and when every hope of this world is gone; when every motive to falsehood is silenced, and the mind is induced, by the most powerful considerations, to speak the truth: a situation so solemn and so awful is considered by the law as creating an obligation equal to that which is imposed by a positive oath in a court of justice.' In Scotland, the dying declaration of a witness is admissible even though he is not himself conscious of the danger of death. In this respect, the law of Scotland differs from that of England and America.

The general rules as to dying declarations are, that they cannot be received in any civil case, and in criminal cases only where the death of the deceased is the subject of the charge, and the circumstances of the death are the subject of the dying declaration. They must be made, except in Scotland, with the full knowledge of impending death; they are subject to the ordinary rules of law as to capacity to give evidence; they must relate to facts only, and not opinions, and must be freely made; they must be complete in themselves, and if it appear that the dying man intended to qualify them, they cannot be received. See Taylor on *Evidence*.

DYKE, or DIKE (Dutch, *dyk*), an artificial mound along the bank of a river or sea-shore, erected for the purpose of preventing inundation. The term is from the same root as *dig*—hence also *ditch*, or the hollow from which the dyke is formed. The French employ the term *levée* to signify this species of embankment, of which there is a notable example in the *levées* erected along the Mississippi near New Orleans. The principle on which dykes or *levées* are formed is very simple. The embankment must be of sufficient breadth and height to resist the pressure of the water, and must be constructed with that easy slope which will allow the floods to rise without any particular impediment. This is quite understood in practical engineering. Flowing water must not be abruptly resisted, but suffered to rise gradually and expend itself. It is accordingly of the first consequence, in all attempts to restrain water by embanking, that the mounds should possess not only magnitude, but a very gradual rise in the side which has to resist the impact of the flood. For want of attention to this method of embanking, there has often been much ineffectual dyking of the sea and rivers liable to do damage by flooding.

In no country has the erection of dykes been carried to such a length as the Dutch Netherlands. Consisting to a large extent of low meadow-land, formed of materials brought from Switzerland and Germany by the Rhine, there is a constant liability to be deluged by the several branches of that river previous to their entering the sea. Inspired by a sense of their perilous situation, as well as a naturally industrious and painstaking disposition, the Dutch have for ages been distinguished for their ingenious system of river-embanking; till at length the dykes of Holland are spoken of as almost one of the wonders of the world. While the country generally is guarded against sea-inundations by high mounds of sand or dunes, created by the deposit of light sand blown from the level shores (see *DUNE*), the interior is secured from the rivers by the system of dykes here referred to. These ramparts are in appearance long green mounds, broad at the base, graduated in their slope, and often of sufficient width to admit of a canal or road, or both, being formed along the top. To give strength to the fabric, willows are planted and also interwoven like wicker-work on the sides.

Carried along the banks of rivers, and in some places along the margin of the sea, as well as crosswise in different parts of Holland, a singular net-work of embanking is presented, which answers the double purpose of a protection from inundation and a means of having canals, by which superfluous water pumped from the meadows, or *polders*, may be run off into the sea. The whole system of dyking is placed under local and general superintendence, at a considerable cost to the public. One of the most gigantic of these dykes is that along the Helder; it measures about six miles in length, 40 feet broad at the summit, along which there is a good road, and descends into the sea by a slope of 200 feet, inclined about 40 degrees. Notwithstanding the precautions taken, one or other of the lower branches of the Rhine occasionally overflows its banks and lays a wide district of country under water. One of these inundations took place in the winter of 1860—1861, and, committing immense havoc, was the cause of much

loss and suffering. A good example of dyking for the purpose of drainage is shown near Haarlem, where it has facilitated the withdrawal of the Haarlem Lake (q. v.).

DYKES. In volcanic districts, rents frequently occur which are filled with molten materials from below, that subsequently solidify, and form solid walls, filling the fissures, and separating the edges of the disjointed strata. To these walls, geologists apply the term *dyke*, a Scottish word for a wall or fence. Similar walls of intruded matter occur in stratified rocks of all ages, and have been connected with volcanic eruptions belonging perhaps to every geological epoch. They consist of similar materials to whatever period they belong—viz., lava, either in a granular, compact, or glassy condition. The dykes connected with Vesuvius have been minutely described. Those in the great escarpment which Somma presents to the modern crater of Vesuvius permit of a careful examination. They are chiefly vertical, and traverse at right angles the beds of lava, scoriae, breccia, and sand which form the ancient cone. They project in relief several inches, or sometimes feet, from the face of the cliff, being extremely compact, and less destructible than the intersected tuffs and porous lavas. In vertical extent they vary from a few yards to 500 feet, and breadth from one to 12 feet. Many of them cut all the inclined beds in the escarpment from top to bottom, others stop short before they ascend above half-way, and a few terminate at both ends, either in a point or abruptly. In mineral composition, they scarcely differ from the lavas of Somma. Their texture is different at the edges and in the middle; toward the center, the rock is larger grained, while at the edge it is always finer grained, sometimes vitreous. This evidently arises from the rate of cooling, it being known that molten trap or lava, when suddenly cooled, assumes a vitreous structure, while a slow cooling, as it permits the mass to remain in a condition fitted for the operation of the crystalline force, and the segregation of the separate materials, produces a more or less granular structure, in proportion to the time occupied in cooling. The rock forming the dykes is far more compact than that of ordinary lava, for the pressure of a column of melted matter in a fissure greatly exceeds that in an ordinary stream of lava; and pressure checks the expansion of those gases which form vesicles in lava. When the fissures have been worn and smoothed by the current, the intense heat having melted all projections and obstructions to the passage of the incandescent fluid.

The appearance of ancient trap-dykes are very similar to those of recent volcanic dykes. Trap-dykes generally are prominent objects in the landscape, because, while the softer rocks through which they have intruded have been abraded by the sea, rivers, or rain, they, being more compact, stand out prominently in the face of precipices or on the level surface of a country. Sometimes, however, from chemical action, and chiefly from the oxidation of the iron which all trap-rocks contain to a greater or less extent, the intruded dyke decomposes more rapidly than the containing rock. It then for some feet or yards leaves the original fissure again unoccupied. A singular modification of this arrangement may sometimes be noticed, when the intruded igneous rock has so indurated the beds through which it passed as to make them less liable to weather than the unaltered portions of the beds, or than even the dyke itself. In such cases, we find two parallel walls of indurated strata rising above the general level of the country, and forming the banks of a ditch produced by the disappearance of so much of the dyke. All these appearances may be observed in the island of Arran, a locality unsurpassed for observing those remarkable geological phenomena. Some dykes have had no apparent influence on the adjoining strata, even when these consist of materials most liable to be affected by heat. Thus seams of coal sometimes remain unaltered, though in contact with the supposed injected molten matter. Considerable doubt is thus cast upon the generally received opinion, that in all cases dykes were intrusions of lava. The effects that have been produced in numerous instances can, however, only be accounted for by supposing that the adjacent rocks have been affected by heat. The writer has observed in Arran, at a place where a dyke cut at right angles an older one, that the edges of the older dyke, which had been acted upon by the current of liquid lava, were converted into true obsidian to the depth of nearly half an inch. In Anglesea, shale at the edge of a dyke 134 feet wide has been converted into hard porcellaneous jasper; and argillaceous limestone loses its earthy texture, and becomes granular and crystalline. The chalk, in Antrim, is converted, by basaltic dykes, into granular marble. Coal, as might have been expected, is often altered in an extraordinary degree. Witham describes the effects of the Cockfield Fell dyke on a seam of coal through which it passes. It is a nearly vertical wall of trap, 18 or 20 yards thick, and is traceable to a distance of 70 miles running in a south-east direction. The coal is about 6 or 8 feet thick, and is affected about 50 yards from the dyke. It first loses the calcareous spar, which occurs in the joints

and faces, begins to look dull, and loses its quality for burning. As it comes nearer, it assumes the appearance of a half-burnt cinder; and approaching still nearer the dyke, it grows less and less in thickness, becoming a pretty hard cinder only two feet and a half in thickness. Eight yards further, it is converted into real cinder; and more immediately in contact with the dyke, it becomes a black substance resembling soot caked together, the seam being reduced to nine inches in thickness. The coal thus deteriorated is 25 yards of bad short coal, half reduced to cinder; 16 yards of cinder; and 10 of sooty substance.

DYNA'MICS is that division of Mechanics (q. v.) which contains the doctrine of the motion of bodies produced by forces. It is essentially a science of deduction from the laws of motion (see **MOTION, LAWS OF**), under which head will also be found a brief sketch of the growth of the science. The branches of dynamics capable of being treated in the present work will be found discussed under separate heads. We shall here confine ourselves to giving a view of the main branches and their correlation. I. The first branch of dynamics deals with the fundamental conception of the science, their names and definitions, such as velocity (q. v.) and the different kinds of motion (q. v.), and accelerated motion (q. v.); force, accelerating force, and moving force (see **FORCE**). Under this branch also falls the composition of motions (see **COMPOSITION OF FORCES AND MOTIONS**). II. The second main branch of dynamics treats of the motion, free or constrained, of points. Here two problems are solved in each case—i. e., whether the motion be free or constrained—viz., a direct and an inverse problem; as, for example; 1. To determine the path of a point when the forces are given which act upon it; 2. To determine the forces or force acting on a point when its path is given. This division of dynamical problems into direct and inverse, obtains in all the branches. It may be mentioned that it was by solving the inverse problem that Newton and Huygens effected their greatest glories in connection with dynamics. The method of treating the case of a free point now generally employed, is due to Euler. See, under this head, **CENTRAL FORCES; FALLING BODIES, and PROJECTILES**. III. The third main branch of dynamics is concerned with the motion of a rigid system of points, or of a solid body. Few of the sub-branches of this part of dynamics are capable of exposition in this work, but see **CENTER OF GYRATION, CENTER OF OSCILLATION, CENTER OF PERCUSSION, and PENDULUM**. The honor belongs to D'Alembert of establishing a general method of treating problems in rigid dynamics. Previous to his time, each set of such problems was treated on some principle peculiarly applicable to itself. D'Alembert invented one (which goes by his name) applicable to all such problems. For a statement of this principle, see **RIGID DYNAMICS**. IV. The fourth main branch of dynamics is concerned with motions of rotation. A system of rigid points may be subject to two independent kinds of motion. It may suffer a motion of *translation* in space, or a motion of *rotation* about some point or axis within itself, or it may suffer at once a motion of translation and a rotary motion. These may clearly be treated conjunctly or independently; they are now uniformly treated independently, by investigating, 1. The velocity and direction of the center of gravity of the system; and, 2. The direction at each instant of the spontaneous axis of rotation passing through the center of gravity (see **ROTATION**), and the velocity of the rotation of the system round that axis. To effect the second task, Poinsot proposed his theory of *Couples* (q. v.). For the conservation of living forces (*virium vivarum*), and the principal of least action, see **FORCES**. See also **MOMENT**.

Dynamics is used by some recent writers with a wider significance, as denoting the science which investigates the action of Force (1) in compelling rest or preventing change of motion, and (2) in producing or changing motion; the former branch being called *Statics*, and the latter *Kinetics*.

DY'NAMITE, a powerful explosive compound, now much used in mining, in breaking up old metal, in torpedoes, &c. The names litho-fracteur, gly-oxiline, nitrate of methyl, &c., are applied to the same or similar substances, of which nitro-glycerine is the main ingredient. See **NITRO-GLYCERINE**.

DY'SART, a royal, parliamentary, and municipal burgh and seaport in the south of Fife-shire, on the rocky shore of the Firth of Forth, 12 miles north-north-east of Edinburgh. It chiefly consists of three streets, with a small square. In the High Street are many antique houses, with inscriptions and dates. It has ship-building, flax-spinning, and manufactures of damasks and ticks. In the vicinity are coal and ironstone mines. Pop. (1881) 2659; of parl. bor., 10,877. It unites with Kirkcaldy, Burntisland, and Kinghorn, in sending a member to parliament.

DYSCRA'SIA (Gr. *dys*, difficult, and *krasis*, a mixture), a pathological term much used in Germany by certain authorities, to indicate an altered condition of the blood and fluids of the system, leading to constitutional diseases, as dropsy, cancer, delirium tremens, lead-poisoning, &c. See **CACHEXIA** and **DIATHESIS**.

DY'SENTERY (Gr. *dys*, difficult, and *enteron*, the intestine), a form of disease attended by discharges from the bowels, and differing from Diarrhoea (q. v.) chiefly in being attended by marked fever and pain, as also by the presence of blood and inflammatory products in the discharges. Dysentery is, in fact, a disease of the mucous membrane of the Colon (q. v.) or great intestine, and when severe, it is followed by the destruction of that mucous membrane to a great extent, the intestine becoming much contracted at intervals, especially in its lower part, and the evacuations being therefore apt to be retained, especially the solid portions. The most distinctive symptoms are excessive pain in evacuating the bowels, and frequent ineffectual attempts at evacuation (*tenesmus*), tenderness on pressure in the left side of the abdomen, discharges of blood mixed with mucus, and comparatively little fecal matter; these symptoms being accompanied or followed by intense fever, passing into early depression of strength. Dysentery is a disease of extreme danger in many cases, and should always be placed early under medical treatment. The best domestic plan, when medical advice cannot be at once procured, is to give a moderate dose of castor oil, guarded by twenty or thirty drops of laudanum, and then either Dover's powder in ten-grain doses every hour or two, or ipecacuanha wine in two or three successive teaspoonful doses at similar intervals, each with ten or twenty drops of laudanum, according to the effect on the system.

If vomiting is repeatedly produced, the dose of ipecacuanha wine should be lessened. If the pain and irritation of the bowels are extreme, the opium had better be given by a small injection (see **CLYSTER**) with starch, after the lower bowel has been well cleansed by a larger warm-water injection; and it will be well to repeat the simple warm-water injection at intervals throughout the treatment. Dysentery, in its most severe forms, is commonly a disease of the tropical zone. It is often found in connection with inflammation of the liver.

DY'SLYSINE is an organic substance ($C_{14}H_{26}O_4$) obtained by boiling choleic acid with hydrochloric acid for some time. It is a neutral resinous body, which is difficultly soluble in naphtha, turpentine and other common solvents.

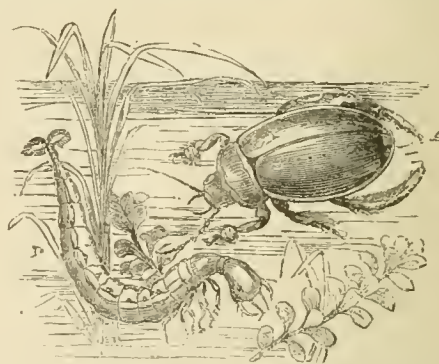
DY'SODIL, a yellow or grayish laminated bituminous mineral, often found with lignite. It burns vividly, and diffuses an odor of assafoetida.

DYSPE'PSIA (Gr. *dys*, difficult, and *pepsis*, digestion), a scientific term for Indigestion (q. v.).

DYSPNE'A (Gr. *dys*, difficult, and *pnæa*, breathing), a word the meaning of which is sufficiently indicated by its etymology. See **ASTHMA; RESPIRATION, ORGANS AND PROCESS OF**.

DYSUR'IA (Gr. *dys*, difficult, and *ourus*, urine), a difficulty of passing urine. It may depend on a variety of causes, as regards which, see **BLADDER; and URETHRA**.

DYTI'SCUS (Gr. *dytes*, a diver), a Linnæan genus of aquatic coleopterous insects or water-beetles, now forming the tribe or



A, *Dytiscus Marginalis*, or great Water-Beetle; B, larva.

family *Dytiscidae*. They are *pentamerous* coleoptera; that is, have all the *tarsi* five-jointed. Their general form is oval, the outline little broken, and the surface very smooth. The respiratory organs of the perfect insect are not adapted to the extraction of air from water, and it must occasionally come to the surface to breathe, where it rests for a short time back downward, and with the extremity of the abdomen exposed to the air, the openings of the air-tubes being in the last segment. The *Dytiscidae* are excessively voracious, feeding upon any kind of animal food, and boldly attacking creatures larger than themselves. They are very amusing inmates of the fresh-water aquarium, and sometimes live in it for a year or two, getting tame, and readily coming to be fed with small earthworms, bits of beef, &c. The species are numerous, and vary much in size, some being very small, and some almost two inches in length.

A very common British species is *D. marginalis*, about an inch and a quarter in length, of a dark olive color, the thorax and outer sides of the elytra margined with yellow. All the species are found in lakes, ditches, marshes, and the still parts of rivers. They often leave the water by night, and can fly well. Their larvæ have the body long and tapering, composed of eleven rings or segments, besides the head. They hide themselves in the earth, in chambers which they make for themselves, before changing into pupæ.

DY'VEKÉ (i. e., *dove*), called by the Latin chroniclers Columba, the mistress of Christian II. of Denmark, has been often celebrated in works of poetry and fiction. She was born in Amsterdam in 1488, and Christian became acquainted with her in 1507 in Bergen, where her mother, Sigbrit Wyms, had settled as an innkeeper. She followed him to Opslow, and, when he mounted the throne, to Copenhagen. Notwithstanding the marriage of Christian with Isabella, the sister of the Emperor Charles V., his relation with D. was continued, and her mother acquired unbounded influence in the affairs of the country. Though D. herself never interfered, she was naturally hated by the party of the nobles; and her death, which happened suddenly in 1516, was attributed, with almost certainty, to poison. The poison was understood to have been administered to her in cherries by the noble and proud relations of the governor of the palace, Torben Oxe, who was a suitor for the affections of Dyveké. On her death, the character of Christian broke out in all its savageness. He first ordered the treasurer Faaborg to be executed for having said that Torben Oxe had enjoyed the favor of D.; and then at the instigation, as was given out, of a nightly vision, Torben Oxe himself. Samsøe, a Danish poet, wrote, about the end of the 18th c., a tragedy called *Dyveke*, often represented in Copenhagen. The story has since been made the subject of several novels and tragedies; e. g., *Wilhelm Zabern*, by J. C. Hauch, a Dane; and Riekhoof's tragedy, *Dyveke* (Berl. 1843).

DY'VOUR AND DYVOUR'S HABIT (from the Fr. *devoir*, to owe; a debtor). In the old legal language of Scotland, a dyvour seems to have been synonymous with a bankrupt. Skene speaks of a dyvour, or 'bairman' (bare-man), as one who, 'being involved and drowned in debts, and not able to pay or satisfy the ame, for eschewing of prison and other pains, makes cession and assignation of all his goods and gear in favor of his creditors, and dons his devour and duty to them, proclaiming himself bairman and indigent, and becoming debt-bound to them of all he has.' It was ordained by Act of Sederunt (q. v.) of 17th May 1606, that a

pillory be erected near the Market Cross of Edinburgh, with a seat upon it, upon which dyvours shall be exposed once on a market day; and before their liberation from jail, they are required to provide themselves with a hat or bonnet of yellow color, to be worn by them while thus exposed, and constantly thereafter, while they continue dyvours, under pain of three months imprisonment if they be found without it.

By subsequent acts (26th February, 1669, and 23d January 1673), the dyvour's habit is appointed to be a coat or upper garment, half yellow and half brown, with a party-colored cap or hood, to be worn on the head; any of his creditors being entitled to imprison him if he be found without it. The act of sederunt of 18th July 1688 prescribes as the dyvour's habit, 'a bonnet, partly of a brown and partly of a yellow color, with uppermost hose, or stockings, on his legs, half brown and half yellow colored, conform to a pattern delivered to the magistrates of Edinburgh, to be kept in their tolbooth;' and declares that the Lords will not hereafter dispense with it, unless in the case of innocent misfortunes. Finally, by statute (1696 c. 5), the Lords of Session are prohibited from dispensing with the dyvour's habit unless, in the process of Cessio Bonorum (q. v.), the bankrupt's failure be alleged and proved to have been by misfortune. This statute is repeated, and the dyvour's habit abolished, by 6 and 7 Will. IV. c. 56—previous to which time the barbaric practice of wearing the habit had, by sufferance of the court, been departed from.

DZE'REN. See ANTELOPE.

DZI'GGETHAI, DJI'GGETAI, KĪ'ANG, KHUR, or GOOR (*Equus Hemionus*), a quadruped nearly allied to the ass, and believed to be the *hemionus* of Herodotus and Pliny. See ASS. It inhabits the elevated steppes of Tartary, extending into the south of Siberia and to the borders of India. In appearance and characters, it is intermediate between the horse and the ass, whence the ancient Greek name *hemionus* (half-ass). In size it approaches the horse, which it resembles also in gracefulness of action, and in its neighing, which is even more deep and sonorous. Its general shape is much like that of a mule. The D. lives in small herds, sometimes of several males and several females, sometimes of a single male with about twenty females and foals. It is an animal of great fleetness and shyness, or watchfulness, and possesses also great powers of endurance in flight, so that it is with difficulty killed by the hunter. The Mongols and Tungûs, however, hunt it very eagerly on account of its flesh. It has been domesticated and reduced to the service of man, but there does not seem to be any evidence of its ever breeding in a state of domestication.

E.



THE fifth letter in the Græco-Roman alphabets. Its original and fundamental sound is that heard in Eng. *tent*. The sound heard in *me* is not given to it in any language but English. In the series of vowels it stands intermediate between *i* and *a*. See LETTERS AND ARTICULATE SOUNDS, where the various vowel-sounds represented by the character *e* in English will be noticed.

E, in Music, is the third note or sound of the natural diatonic scale, and is a third above the tonic C, to which it stands in proportion as 5 to 4. As a major third, that is, when the tonic C vibrates 4 times, the E above vibrates 5 times. E is the third harmonic which arises naturally from C as a fundamental note. E major, as a key, has four sharps at its signature, viz., F, C, G, and D sharp. E minor, as a key, has only one sharp, F, same as G major, of which E is the relative minor.

EADMER OF CANTERBURY, a man of considerable mark in the beginning of the 12th c., would seem, from his name, to have been the child of English parents. At an early age, he entered the Benedictine monastery of Canterbury; and when St. Anselm, in 1093, was made archbishop of that see, E. became one of his most devoted friends, sharing his exile, watching his death-bed, ordering his burial, and writing the chronicle of his life. E. continued at Canterbury, in high esteem with St. Anselm's successor, Archbishop Ralph, until 1120, when, at the request of King Alexander I., he went to Scotland, and was there chosen Bishop of St. Andrews. The question of lay investiture of ec-

clesiastical benefices was then in its crisis; there was a controversy between Canterbury and York for jurisdiction over the see of St. Andrews; that see, again, asserted its independence of either of the English metropolitans; and E. seems to have added to all these perplexities a difficulty as to his monastic allegiance. 'Not for all Scotland,' he said to the Scottish king, 'will I renounce being a monk of Canterbury.' The king, on his side, was equally unyielding; and the issue was the return of E. to his English monastery, unconsecrated, indeed, but still claiming to be Bishop of St. Andrews. He was made precentor of Canterbury, and died, it is supposed, in January 1124. He tells us that, from his childhood, he was a diligent observer of contemporary events, especially in church affairs; and this habit has given more than usual interest to his writings. The most valuable are his *Historia Novorum*, or History of his Own Times, first printed by Selden in 1623, and his *Vita Anselmi*, or Life of St. Anselm, first published at Antwerp in 1551. Both these work are included in the selection of his writings published by the Benedictines of St. Maur (as a supplement to their edition of the works of St. Anselm), in 1 vol. fol. (Paris, 1721). His lives of St. Odo, St. Dunstan, and St. Bregwyn, of Canterbury, and of St. Wilfrid and St. Oswald, of York, were printed, some of them, by Wharton, in the second part of his *Anglia Sacra* (Lond. 1691), and others by Gerberon in his *Anselmi Opera* (Paris, 1675). The history of E. in relation to the bishopric of St. Andrews, is given at considerable length by Lord Hailes, in his *Annals of Scotland*, vol. i. pp. 59—71, and, still better, in Mr. Grub's *Ecclesiastical History of Scotland*, vol. i. pp. 209—217 (Edin. 1861).

EADIE. JOHN, a distinguished Scottish divine, was born in Stirlingshire in 1810, and was educated at Glasgow University. As pastor of the Secession Church in Glasgow, he took part in the union which constituted the United Presbyterian Church (q. v.), and soon became known for his scholarly works on Biblical criticism and interpretation. Among these are a *Biblical Cyclopædia*, and an *Analytical Concordance*; also, a work on *Early Oriental History*; a *Life of Dr. Kitto*; and a *History of the English Bible*. E. died in 1876.

EAGLE (*Aquila*), a genus of birds of prey, by some naturalists subdivided into several genera, constituting a group which contains the largest and most powerful of the *Falconidae*. From the most ancient times, the E. has been universally regarded as the emblem of might and courage; and, like the lion, it has been fancifully invested with other attributes of greatness, such as men thought to harmonize with these. Its extraordinary powers of vision, the vast height to which it soars in the sky, the wild grandeur of the scenery amidst which it chiefly loves to make its abode, and perhaps also its longevity, have concurred to recommend it to poetic regard. It was associated with Jupiter in the Roman mythology; its figure on the standards of the Roman legions expressed and animated their confidence of victory (see under).

The eagles have the beak not curved from the very base, like the true falcons, nor notched on the edge, neither are their wings so long in proportion to their size. Their wings are, however, very broad and expansive; their legs are very robust; their claws curved, sharp, and strong. In the most restricted use of the generic term, the true eagles, of which the Golden E. may be taken as a type, have a rather short bill, curved from the cere, with a slight festoon on the edge of the upper mandible, the tarsi are short, and feathered down to the toes. This last character distinguishes them at once from the *Ernes* (q. v.), often also called eagles. There are several species of true eagles well ascertained, although in this as in allied genera much confusion has arisen from the diversity of plumage at different ages.—The **GOLDEN E.** (*A. chrysaetos*)—of which what is called the Ring-tailed E. is the young—is about three feet or three feet and a half in length, and eight feet in spread of wing. The female is rather larger than the male; the color is dark brown, in some parts almost black, the head and back of the neck in mature birds covered with pointed feathers of a golden-red color; young birds have a considerable part of the tail white. The Golden E. is the largest of the European eagles, and is found not only throughout Europe, preferring wild and mountainous situations, but throughout almost the whole northern hemisphere: it is amongst the birds of India, of the north of Africa, and of North America; and the savage warrior of the Rocky Mountains, 'as well as the Highland chieftain, glories in his eagle plume.'

Although occasionally seen in all parts of Britain, it builds its nests only in mountainous districts, carrying a few sticks and brambles to the inaccessible shelf of a rocky precipice, where the eggs are deposited almost on the bare rock. The Golden E. is now rare even in the Highlands of Scotland. A great quantity of prey is necessary to support a pair of these birds and their two or three young ones; and not only hares, game of every kind, and lambs are carried to the eyrie, but larger animals are sometimes attacked, and almost every district where eagles build their nests has its story of children carried off to feed the eaglets, and often of their almost miraculous preservation.—The next in size to the Golden E. among the eagles of Europe, is the Imperial or Grecian E. (*A. imperialis*), but it is more common in Egypt than in Europe, and has never been seen in Britain.—The spotted E. (*A. nevia*) has occurred in the south of Ireland.—There is an Australian E. (*A. fucosus*).

Eagles were ranked among what were called, in the language of falconry, ignoble birds of prey, as incapable of being tamed and employed to assist in the sports of man. But either the Golden E. or the Imperial E. is used by the Tartars in the chase of antelopes, wolves, foxes, hares, &c.

The White-tailed E. or Cinereous E. of Britain is the common *Erne* (q. v.). The White-headed E. or Bald-headed E. of America—the chosen emblematic E. of the United States—is also an *erne*. What particular species was the emblematic E. of the ancients is not more certain than what is the original emblematic Scotch thistle.—Others of the E. group of *Falconidae* are known as Marsh Eagles, Harpy Eagles, Eagle-hawks, Ospreys, &c., some of which will be noticed in their places.

The head and foot of the golden eagle are figured in the article *ACCIPITRES*, its skeleton in the article *BIRDS*.

EAGLE, the king of birds, is used heraldically as an emblem of magnanimity and fortitude. It is variously represented, the best known mode being Displayed (q. v.), or spread out, either with two heads—as in



Eagle Displayed.

the arms of the Austrian empire, in which case it is popularly known as a spread eagle—or with one head, as in the arms of the German empire.

EAGLE, as a military standard, was adopted by the Romans, and even by nations preceding them in history. The Persians, in the time of Cyrus the Younger, bore an eagle on a spear as a standard. The Romans for some time used the eagle, the wolf, the boar, the horse, and the minotaur for standards, but afterwards abandoned the last four, and confined themselves to the first. The Roman Eagle, sometimes of gold, but more frequently of silver, was about as large as a pigeon with extended wings, and was borne on the top of a spear, with a cross-bar or a shield to support it. Some of the eagles were represented as holding thunderbolts in their talons, and usually bore the name of the legion to which each respectively belonged. The eagle was sometime made of steel, but rarely.



Roman Eagle.

In modern times France, Russia, Prussia, Austria, and the United States of America, have all adopted the eagle as a national military symbol. The Austrian eagle is represented double-headed.

EAGLE, a gold coin of the United States of America, of the value of ten dollars. See *DOLLAR*.

EAGLE, BLACK, ORDER OF THE, in Prussia, was founded by the Elector of Brandenburg, on 17th January 1701, the day of his coronation as king of Prussia. The number of knights, in addition to the princes of the royal family, was originally 30, but it is now unlimited. They must at their nomination be at least 30 years of age. They must prove their noble descent for four generations through both parents. A chapter is held twice a year.

The insignia of the order consist of an octagonal cross of blue enamel, and a black eagle, displayed between each of the arms of the cross. The cross is suspended by a broad ribbon of orange



Star of the Order of the Black Eagle.



Ribbon and Cross of the Order of the Black Eagle.

color across the left shoulder, and it is accompanied by an embroidered silver star, fastened on the left breast. The center of the star represents a black flying eagle, holding in one claw a laurel wreath, and in the other a thunderbolt, with the legend, *Suum cuique*. Fifty ducats must be paid by every new member for the support of the Orphan Asylum at Königsberg, and he then receives gratis the costume and insignia of the order, of which a full description will be found in *Burke's Orders of Knighthood*, p. 199. As the Black Eagle is the highest order in Prussia, no member of it, with the exception of foreign princes and knights of St. John, is permitted to wear any other order along with it; and as it is generally granted only to those who are expected to be about the person of the king, no one who holds it is permitted to travel from the court more than twenty German miles without giving notice. Knights of the Black Eagle are likewise knights of the Red Eagle (q. v.), first class.

EAGLE, RED, ORDER OF THE, in Prussia, founded in 1734 by the Markgraf George Frederick Charles, as a reorganization of the 'Ordre de la Sincérité,' which had been instituted in the beginning of the century by the hereditary prince of Anspach and Baireuth. After passing through various modifications, the order of the Red Eagle was raised in 1791 by Frederick William II. to the rank of the second order in the monarchy, and it was then that the decoration of a white enamelled Maltese cross, surmounted by a royal crown, with the Brandenburg eagle in the corner, was adopted. All the knights of the Black Eagle were received into this new order; and it was later decreed that only those who had been decorated with the Red Eagle, in the first instance, could be received into the black. In 1810, the order of the Red

Eagle was reorganized, and two more classes were added to it. In 1830, the second class was subdivided into two, one of which only was allowed to wear a square star.

EAGLE HAWK (*Morphuus* or *Spizaetus*), a genus or sub-genus of *Falconide*, of the eagle group, but consisting of species of



Eagle-Hawk (*Morphuus cristatus*).

comparatively small size, and characterized by short wings, long slender legs (*tarsi*), and comparatively feeble toes and claws. Some of the species are extremely beautiful in form and colors. They are natives of warm climates, chiefly of South America, but also of Africa and the East Indies. The crested E. (*M. cristatus*) of Guiana, and the Brazilian E., or Urubitinga (*M. Urubitinga*), may be mentioned as examples. The latter, although not so large as a goose, is sometimes called the Brazilian eagle.

EAGLE OWL (*Bubo*), a genus of the owl (q. v.) family (*Strigidae*), characterized by a somewhat incomplete facial disc, two tufts of feathers (*horns* or *egrets*) of considerable size on the head, ears with small openings (*conchs*), legs and toes covered with feathers, short strong curved bill, and long curved sharp claws. To this genus belong the largest of the nocturnal birds of



Eagle Owl (*Bubo maximus*).

prey. The E. O. of Europe (*B. maximus*) is a little inferior in size to the Golden Eagle, and preys on quadrupeds such as hares, rabbits, and young deer, and on grouse, partridges, and other kinds of game. It seizes its prey with its feet, and seldom touches it with the bill till its struggles are over. It is an inhabitant of many parts of Europe and Asia, but it is only a rare occasional visitor in Britain.

The loud peculiar cry of this bird, resounding strangely through the night, has obtained for it its German name of *Uhu*, and an intimate association from time immemorial with evil omens and superstitious terrors.—The E. O. of America (*B. Virginianus*), the VIRGINIAN HORNED OWL, or GREAT HORNED OWL, is very similar to the species just noticed, but of inferior size, although still a large and powerful, as it is also a bold bird. It does not scruple to attack half-grown turkeys, and often succeeds in making them its prey. It carries off with ease almost any other inhabitant of the poultry-yard. It is found in almost all parts of America.

EAR, THE ANATOMY AND PHYSIOLOGY OF. The apparatus of hearing, as it exists in man and the mammalia, is composed of

three parts—the external ear, the middle ear or tympanum, and the internal ear or labyrinth.

The *external ear* consists of two portions, the *auricle* or *pinna*, (the part popularly recognized as the ear), and the *auditory canal* or *external meatus*.

The *auricle*, on its outer or more exposed surface, presents various eminences and depressions, resulting from the form of its cartilaginous framework. These have received special anatomical names, to which it is unnecessary to advert further than to mention that the deep capacious central space to which several grooves converge, is termed the *concha*, and that the lowest and pendulous portion of the ear is termed the *lobe*. The cartilage forming the basis of the external ear consists of one principal piece, in which there are several fissures, which are filled up by fibrous membrane. Several muscles are described as passing from one part of the auricle to another, but they are so little developed in man that they do not require notice; there are additionally three muscles—the *attollens aurem* (or *superior auris*), the *attrahens aurem* (or *anterior auris*), and the *retrahens aurem* (or *posterior auris*), which pass from adjacent parts of the scalp to the ear, and which, though more developed than the previous group, are of little or no real importance in man (at least in his civilized state), but are of considerable use in many mammals. Their actions are sufficiently indicated by their names.

The auditory canal passes from the concha inwards, and a little



Fig. 1.

General view of the external middle, and internal ear, showing the interior of the auditory canal, tympanic cavity, and Eustachian tube.

a, the auditory canal, *b*, the tympanum; *c*, the Eustachian tube, leading to the pharynx; *d*, the cochlea; and *e*, the semicircular canals and vestibule, seen on their exterior by the removal of the surrounding bony tissue.

forwards, for rather more than an inch. It is narrower at the middle than at either extremity; and on this account there is often considerable difficulty in extracting foreign bodies that have been inserted into it. The membrane of the tympanum which terminates it is placed obliquely, in consequence of the lower surface of the meatus being longer than the upper. The canal is partly cartilaginous and partly osseous; the osseous portion consisting in the fœtus of a ring of bone, across which the membrane is stretched, and in many animals remaining persistently as a separate bone.

The orifice of the meatus is concealed by a pointed process, which projects from the facial direction over it like a valve, and which is called the *tragus*, probably from being sometimes covered with bristly hair like that of a goat (*tragos*); and it is further defended by an abundance of ceruminous glands, which furnish an adhesive, yellow, and bitter secretion (see CERUMEN), which entangles small insects, particles of dust, and other small foreign bodies, and prevents their further passage into the meatus.

The *middle ear*, or *cavity of the tympanum*, is a space filled with air which is received from the Pharynx (q. v.) through the Eustachian tube (see fig. 1. *b*, *c*), and traversed by a chain of very small movable bones (fig. 2), which connect the membrane of the tympanum with the internal ear. It lies, as its name implies, between the external meatus and the labyrinth or internal ear, and opens posteriorly into the cells contained in the mastoid portion of the Temporal Bone, which are also filled with air, and anteriorly into the Eustachian tube. The cavity is of an irregular shape, and is lined by a very delicate ciliated epithelium, which is a prolongation of that of the pharynx through the Eustachian tube.

Its external wall is mainly formed by the membrane of the tympanum, which is nearly oval, and placed in a direction slanting inwards, so as to form an angle of about 45° with the floor of the auditory canal (see fig. 1). The handle of the malleus (or hammer), the first of the chain of ossicles (see fig. 2), is firmly attached to the inner side of this membrane in a vertical direction as far downwards as the center, and by drawing it inwards, renders its external surface concave.

Its internal wall has two openings communicating with the internal ear, each of which is closed by a delicate membrane. These

openings are termed, from their respective shapes, the *fenestra ovalis*, and the *fenestra rotunda*; the former leads to the vestibule, and is connected by its membrane with the base of the stapes (or stirrup-bone), the last of the chain of ossicles; while the latter opens into the cochlea.

The ossicles of the tympanum are three—viz., the *malleus*, the *incus* (or anvil), and the *stapes*. We have already explained how the malleus is connected with the membrane of the tympanum by

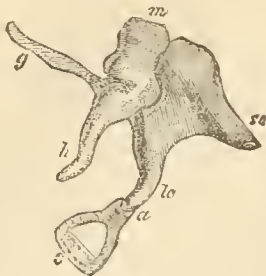


Fig. 2.

Ossicles of the left ear, as seen from the outside and below.

m, head of the malleus; *g*, the slender process, or *processus gracilis*; *h*, the manubrium or handle; *sc*, the short crus, and *lc* the long crus of the incus; *a*, the position of the lenticular process, through the medium of which it articulates with the head of the stapes; *s*, the base of the stapes. Magnified three diameters.

means of its handle. Through this connection, the tension of that membrane may be modified by the agency of one or two muscles which are attached to this ossicle. These muscles are the *Laxator tympani*, which arises from the spinous process of the Sphenoid Bone (q. v.), and is inserted into the *processus gracilis*; and the *Tensor tympani*, which arises from the under surface of the petrous portion of the temporal bone, and is inserted into the handle of the malleus immediately below the commencement of the *processus gracilis*. The existence of the former of these muscles is doubtful, many anatomists regarding the structure in question as ligamentous rather than muscular. The mode in which this bone articulates with the incus is sufficiently explained by the figure. The *incus* much more closely resembles a molar tooth with two fangs, than the anvil from which it derives its name. Of the two processes which it gives off (see fig. 2), the short one, *sc*, runs backwards, and projects into the mastoid cells behind the tympanic cavity; while the long one, *lc*, inclines downwards, and terminates in the lenticular or orbicular process *a*, to which the head of the stapes is attached. The *stapes* is almost sufficiently described by the figure. It has a head, neck, two branches, and a base, which, as has been already mentioned, fits into the *fenestra ovalis*. A minute muscle, the *stapedius*, takes its origin from a hollow conical eminence termed the *pyramid*, which lies behind the *fenestra ovalis*, and is inserted into the neck of the stapes; by pulling the neck backwards, it probably compresses the contents of the vestibule.

The Eustachian tube, into which the tympanic cavity opens anteriorly, is about an inch and a half in length, and passes down-



Fig. 3.

Interior of the Osseous Labyrinth:

V, vestibule; *av*, aqueduct of the vestibule; *o*, fovea semielliptica; *r*, fovea hemispherica; *S*, semicircular canals; *s*, superior; *p*, posterior; *i*, inferior; *a, a, a*, the ampullar extremity of each; *C*, the cochlea; *st*, osseous zone of the lamina spiralis, above which is the scala vestibuli, communicating with the vestibule; *st*, scala tympani, below the spiral lamina. Magnified $3\frac{1}{2}$ diameters.

wards, forwards, and inwards to its opening in the pharynx. It is partly bony, but chiefly cartilaginous. Its use is to allow the free passage of air in and out of the tympanum, and to admit of the egress of the mucus secreted in that cavity.

The *internal ear* or *labyrinth* is the essential part of the organ

of hearing, being the portion to which the ultimate filaments of the Auditory Nerve (q. v.) are distributed. It is composed of three parts—viz., the *vestibule*, the *semicircular canals*, and the *cochlea*, which form a series of cavities presenting a very complicated arrangement, and lying imbedded in the hardest part of the petrous portion of the temporal bone. They communicate externally with the tympanum by the two openings already described—the *fenestra ovalis*, and the *fenestra rotunda*; and internally with the internal auditory canal, which conveys the auditory nerve from the cranial cavity to the internal ear. The very dense bone immediately bounding these cavities is termed the *osseous labyrinth*, to distinguish it from the *membranous labyrinth*, which lies within a portion of it.

The *vestibule* is a common central cavity into which the semicircular canals and the cochlea open (see fig. 3, V). It is about a fifth of an inch in height, and in length from before backwards its transverse diameter (from side to side) being somewhat less. On its posterior wall are five orifices for the semicircular canals, one of the orifices being common to two of the canals. Anteriorly, the cochlea enters it by a single opening, the beginning of the *scala vestibuli*. On its outer wall is the *fenestra ovalis*, and on its inner are the *fovea hemispherica*, containing several minute orifices for the entrance of filaments of the auditory nerve, and the *fovea semi-elliptica*.

The *semicircular canals* are three in number, and open at both ends into the vestibule. They vary in length, and notwithstanding their name, each is considerably more than a semicircle, the superior vertical canal being the longest. Their average diameter is about a twentieth of an inch, the extremity of each canal exhibiting a dilatation or *ampulla*. Each canal lies in a different

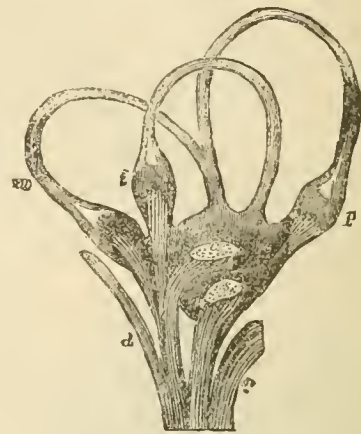


Fig. 4.

Membranous Labyrinth of the Left Side, with its Nerves and Otoliths.

sw, superior semicircular canal, with the ampulla and its nerve at one end, and the other end joined by *p*, the posterior canal to form a common tube; *i*, inferior or horizontal canal, with the ampulla and its nerve at one end and the other entering the utricle separately; *c*, powdery otolith seen through the transparent wall of the utricle or common sinus; *o*, powdery otolith of the sacculus, seen with its nerve in a similar way; *n*, cochlear division of the auditory nerve, cut through; *d*, *portio dura*, or facial nerve, leaving the auditory nerve, or *portio mollis*, to enter the aqueduct of Fallopius. Magnified.

plane, very nearly at right angles to the planes of the other two, hence their names of the *superior vertical*, the *inferior vertical*, and the *horizontal* canals.

The *cochlea*, which derives its name from its resemblance to a common snail-shell, forms the anterior portion of the labyrinth. It consists of an osseous and gradually tapering canal, about an inch and a half in length, which makes two turns and a half spirally around a central axis, termed the *modiolus*, which is perforated at its base for the entrance of the filaments of the cochlear portion of the auditory nerve. This spiral canal gradually diminishes towards the apex of the cochlea. At its base, it presents two openings, one into the vestibule, and the other (closed by a membrane and communicating with the tympanum) being the *fenestra rotunda* already described. Its interior is divided into two passages (*scalæ*) by an osseo-membranous lamina. This is the *lamina spiralis*, which divides the cochlea into an upper passage, the *scala vestibuli*, and a lower one, the *scala tympani*.

At the apex, these two passages communicate by an opening to which the term *helicotrema* has been applied. Between the two *scalæ*, there is a third space termed the *ductus cochlearis*, or *scala intermedia*. In this space the filaments of the auditory nerve terminate, by being connected with a complicated arrangement of peculiarly formed epithelial cells, constituting the organ of Corbi. For a notice of the membranous portion of the *lamina spiralis*, see AUDITORY NERVE.

We now return to the *membranous labyrinth*. The membranous

and osseous labyrinths have the same shape, but the former is considerably smaller than the latter, a fluid, termed the *perilymph*, intervening in some quantity between them. At certain points, recent investigations have shown that the membranous is firmly adherent to the inner surface of the osseous labyrinth. The vestibular portion consists of two sacs, an upper and larger one, of an oval shape, termed the *utricle*, or *common sinus*, and a lower and smaller one of a more globular shape, called the *sacculus*.

The membranous semicircular canals resemble in form and arrangement the osseous canals which enclose them, but are only one-third of the diameter of the latter. The ultimate filaments of the Auditory Nerve (q. v.) mainly go (see fig. 4) to the utricle, to the sacculus, and to the ampulla of the canals.

The membranous labyrinth is filled by a fluid which is termed the *endolymph*; and in certain spots, especially at the terminations of the vestibular nerves, we observe, both in man and the lower animals, calcareous matter either in a powdered or solid form. In man and mammals generally, and in birds and reptiles, it occurs as a powder, and is termed *otoconia* or *ear-powder*, and it always consists of carbonate of lime.

We now proceed to consider the different functions or offices of the various parts of the organ of hearing.

1. *Of the External Ear.*—A true auricle only exists in the mammalia, and in this class it varies from little more than an irregularly shaped cartilaginous disc, with little or no motion, as in man and the quadrupeds, to an elongated funnel-shaped ear-trumpet, movable in all directions by numerous large muscles, as in the horse, the ass, and the bat.

The mode in which we see it employed by those animals in which it is highly developed, sufficiently indicates that its main function is to collect and concentrate the sounds which fall upon it. But the experimental investigations of Savart, with an apparatus constructed to resemble the tympanic membrane and the external auditory apparatus, show that these parts are also adapted to enter into vibrations in unison with those of the air; and he suggested that the human auricle, by the various directions of different parts of its surface, could always present to the air a certain number of parts whose direction is at right angles with that of the molecular movement of that fluid, and therefore is the most favorable position for entering into vibrations with it.

2. *Of the Tympanum and its Contents.*—Savart's experiments show that the membrane of the tympanum is thrown into vibration by the air, and that it always executes vibrations equal in number to those of the sonorous body which excites the oscillations in the air. He further ascertained that the malleus participates in the oscillations of the tympanic membrane, and that these vibrations are propagated to the incus and stapes, and thus to the membrane of the fenestra ovalis. The malleus has further the office of regulating, through the *tensor tympani* muscle, the tension of the tympanic membrane; and to allow of the motion necessary for this purpose, we find movable joints between it and the incus, and again between the latter bone and the stapes. The contraction of the stapedius muscle similarly modifies the tension of the membrane of the *fenestra ovalis*; and as compression exercised on this membrane extends to the perilymph, and is propagated through it to the *fenestra rotunda*, the tension of the membrane of the latter opening is also influenced by the muscle in question. The incus is much more limited in its motions than either of the other bones, and its use seems to be to complete the chain of ossicles in such a manner as to prevent any sudden or violent tension of the membranes, such as we can easily conceive might occur, if the conductor between the membranes were a single bone. The presence of air in the tympanic cavity serves a double purpose: in the first place, it preserves a uniform temperature on the outer surfaces of the fenestral membranes, and thus supports a fixed elasticity in them, which would not be the case if they were freely exposed to ordinary atmospheric changes; and secondly, the action of the chain of ossicles as conductors of sound is materially increased by their being completely surrounded by air, as is obvious from the first principles of acoustics.

3. *Of the Labyrinth.*—Sound is conducted to the labyrinth in three ways: first, by the chain of bones; secondly, by the air in the tympanic cavity; and thirdly, through the bones of the head.

Müller has shown, by very ingenious experiments on an apparatus constructed to resemble, on a large scale, the middle and internal ear, that while the air in the tympanum conducts sound to the cochlea, through the *fenestra rotunda*, the chain of bones forms a much better conductor to the vestibule, through the *fenestra ovalis* (see chapter on Hearing in his *Physiology*). Hence, we infer that the vestibule is adapted to receive sounds from the membrane of the tympanum and the external ear, while the cochlea, on the other hand, as its structure and connections indicate, may be regarded as that part of the labyrinth which is specially affected by sounds communicated through the bones of the head.

That the vestibule is the essential or fundamental part of the organ of hearing, is sufficiently proved by its constancy, other parts gradually disappearing as we descend the animal scale, and by its

central position in the ears of the higher animals. The use of the otoconia or ear-powder is to strengthen the sonorous undulations, and to communicate to the membranous vestibule and ampullae, and to their nerves, stronger impulses than the perilymph alone, could impart. The action of otoliths or ear-stones, such as occur in osseous fishes, must be still more decided, and is well illustrated by the following experiment of Camper. Fill a bladder with water, and place a pebble in it. The slightest impulse communicated to the bladder disturbs the pebble, which consequently produces a greater impression on the hand supporting the bladder than the water alone could do.

Nothing certain is known regarding the functions of the semicircular canals, but their constant existence and number* in the vertebrate animals indicate their importance; and in most cases of congenital deafness they are more or less defective. The fact of their position corresponding with the three dimensions of a cube—namely, its length, breadth, and height—has led to the opinion that they are concerned in conveying a knowledge of the direction of sounds. This view is supported by Professor Wheatstone, who believes that we distinguish best the direction of those sounds which are sufficiently intense to affect the bones of the head, and that it is from the vibrations which are transmitted through these bones that our perception of direction is obtained. Thus, if the sound be transmitted in the plane of any one canal, the nervous matter in that canal will be more strongly acted on than in either of the other two; or if it be transmitted in a plane intermediate between the planes of this canal and the adjacent one, the relative intensity with which these two canals will be affected will depend upon, and indicate the direction of the intermediate plane.

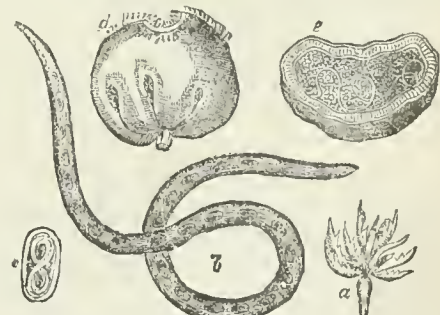
The range of hearing, like that of vision, varies remarkably in different persons. Some persons are insensible to sounds which others can readily hear. The ordinary range of human hearing comprised between the lowest notes of the organ and the highest known sound emitted by insects includes, according to Wallaston, more than nine octaves, the whole of which are distinctly perceptible by most ears. He relates, however, several cases in which the range, in reference to the perception of high notes, was much less. In one individual, the sense of hearing terminated at a note four octaves above the middle E of the pianoforte, the F above it being inaudible, although his hearing in other respects was as perfect as that of persons in general; another case was that of a lady who could never hear the chirping of the field-cricket; and in a third case the chirping of the common house-sparrow could not be heard. See his *Memoir on Sounds Inaudible by Certain Ears*, *Phil. Trans.* 1820.

The sensation of sound, like that of light, frequently lasts longer than the exciting cause. We have familiar proof of this fact in the noise which remains in the ears after a long journey in a coach or railway; and it was clearly demonstrated by Savart, who found, in his experiments on toothed wheels, that the removal of one tooth did not produce any interruption of the sound.

For diseases of the ear, see DEAFNESS.

EAR, in Music, is a figurative expression, meaning the possessing of a sensitive, just, and delicate appreciation of sound and measure.

EA'R-COCKLES, PU'RPLES, or PE'PPER-CORN, a disease



Ear-Cockles:

a, diseased wheat; b, the vibrio, greatly magnified; c, its egg, with embryo; d, diseased germ of wheat; e, section of diseased germ of wheat, greatly magnified, showing vibrio and their eggs.

in wheat, owing to the presence of *Vibrio tritici*, one of the *Infusoria*. This is an animal of worm-like form, yellowish-white, slender, tapering towards the tail, and more suddenly attenuated to a point at the head. Its minute eggs are supposed to be introduced into the sap of the wheat from infected seed, and so to find

* The only exceptions that we can call to mind are those presented by the myxine or hag and the lamprey—the former has only one, the latter two, semicircular canals. Both are fishes of very low organization.

their way to the flowers, where they are hatched in the germen; the infected grains become dark green, then black, rounded like small pepper-corns, and furrowed on the surface; the glumes spread open, and the awns become twisted; the grains are filled with a white cottony substance, which at once dissolves in water, liberating the *Vibrio* in great numbers. Henslow calculates that 50,000 of the young *Vibrio* might exist in a grain of wheat. If the wheat is dried, the *Vibrio* becomes dormant, but retains its vitality in this state for six or seven years, and is ready to revive on the application of moisture.

EARL (Ang.-Sax. *eorl*—a corruption of *ealdor*). The distinctive name of the noble amongst the northern races was *eorl*, or *jarl*, as opposed to the mere freeman, the *ceorl*, or *karl*; from which latter name come the modern German word *kerl*, and the Scotch word *carl*. From indicating the whole noble class, the title of *eorl* among the Anglo-Saxons, and perhaps generally among the Teutonic nations, came at first probably to be limited to those who were *ealdors*, or *ealdormen*, by office—that is to say, to those who were appointed to be at once governors and judges over a certain district, and to whom, according to Kemble (*Saxons in England*, ii. p. 126), the titles of *dur*, *princeps*, and *comes* are indiscriminately applied by the Latin writers, the same officer being sometimes called by the one title, and sometimes by the other. Being thus limited to those who held the office of *ealdors*, the social not unnaturally came to be confounded with the official title, and hence the general error of tracing the word *earl* not to *eorl*, a noble, but to *ealdorman*, a title which Mr. Kemble prefers to translate by duke. The early relation which subsisted between the duke and the count has been explained under the former title.

In Europe generally, it was not till the count came to be recognized as a subordinate officer to the duke, governing a district of the province committed to the latter, that the earl assumed the position of the governor of a county, by the name of which he was commonly known. The title of duke, if it had ever existed, early disappeared in England, and was not revived till the time of Edward III. After the Norman Conquest, the French term count was substituted for earl; but it held its place only for a short time as the title of the officer, though it has continued ever since to give a name to the district over which he presided, and a title to his wife. William the Conqueror, after the battle of Hastings, recompensed his chief captains by granting to them the lands and offices of the Saxon nobles; but by making the title of earl hereditary, he took, unintentionally perhaps, the first step towards changing it from a title of office to a title of dignity, and thus depriving it of substantial power. Deputies, *vice-comites*, or sheriffs, came necessarily to be appointed in all cases in which the earl was a minor, or otherwise incapacitated from discharging the duties of the office, till gradually the office itself passed to the deputy; the dignity alone, with the hereditary privilege of sitting as a legislator in the House of Lords, remaining with the principal. The form of creation of an earl formerly was by the king girding on his sword, and placing his coronet on his head, and his mantle on his shoulders; but earls are now created by letters-patent; and it is not unusual for them to depart so far from the old notion of their being territorial officers, as to take as their titles their own names, with the prefix earl—e. g., Earl Grey, Earl Spencer, Earl Russell, &c. At present, the number of earls, including the peerages of Scotland and Ireland, exceeds 200. See **PEER**.



Earl's Coronet.

The **EARL'S CORONET** is a circle of gold, rising at intervals into eight pyramidal points, or spikes, on the tops of which are placed as many pearls, and which alternate with strawberry-leaves. See **CROWN**.

EARLMA'RSHAL, an office of great antiquity, and formerly of importance. There seems reason to believe that the Marshal of England, afterwards the earl marshal, was a distinct officer from the Marshal of the King's House, but the point is not altogether clear, and there is, consequently, some difficulty in determining which of the offices was held by the Marshalls, Earls of Pembroke. For many generations, the office has been hereditary in the family of the Dukes of Norfolk, though the earls marshal having, to an unusual extent, had the fate to die either childless or without heirs-male, the line of descent has been by no means a direct one. The last grant is by King Charles II., and bears date 19th October 1672. The earl marshal presided jointly with the constable over the Court of Chivalry (q. v.) the last proceedings of which are said to have taken place in 1631. He is the head of the College of Arms (q. v.), which has jurisdiction in descents and pedigrees; determines all rival claims to arms; and he grants armorial-bearings, through the medium of the kings-of-arms, to parties not possessed of hereditary arms. The office of the Lyon in Scotland is generally supposed to correspond to that of the earl marshal in England, but not quite correctly. The Lyon

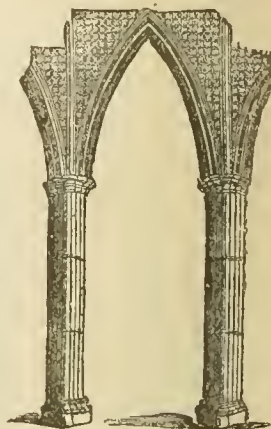
having been subordinate to the Marshal and Constable of Scotland, his office was more nearly that of the kings-of-arms in England; with this difference, that it extended to the whole kingdom.

EA'RLOM, RICHARD, an engraver, whose works in mezzotinto, published during the end of last and beginning of this century, are well known as amongst the best at the period when that kind of engraving was practised without the admixture of etching, adopted at the present time. His works after Reynolds, his plates from pictures in the Houghton Gallery and the *Liber Veritatis*, consisting of imitations of the celebrated drawings by Claude, in the possession of the Duke of Devonshire, are standard works in their various departments. He died in 1822, having some time previously retired from his profession.

EARL'S PENNY, an English corruption for Arles Penny. See **EARNEST**.

EA'RLSTON, or **ER'CILDOUNE**, a village in the south-west of Berwickshire, on the Leader, a north branch of the Tweed, 30 miles west-south-west of Berwick. Pop. (1881) 1010. E. has been and still is famed for its manufacture of gingham; it has also a factory for the manufacture of blankets, tweeds, &c. On the left bank of the Leader are the ruins of a building called 'Rhymer's Tower,' as having been the residence of Thomas the Rhymer (q. v.), so famed in Scottish tradition. A mile south of E. is Cowdenknowes, which is celebrated in song for its 'bonny, bonny broom.'

EARLY ENGLISH, the term generally applied to the form of Gothic in which the pointed arch was first employed in this country. The Early English succeeded the Norman towards the end of the 12th c., and merged into the Decorated (q. v.) at the end of the 13th. Its characteristics are beautiful and peculiar. Retaining much of the strength and solidity of the earlier style, it exhibited the graceful forms, without the redundancy of ornament which latterly degenerated into a fault in that which followed. Generally, it may be said to bear to the decorated something like the relation which an expanding rosebud bears to a full-blown rose. The windows are long and narrow, and when gathered into a group, are frequently surmounted by a large arch, which springs from the extreme moulding of the window on each side. The space between this arch and the tops of the windows is often pierced with circles, or with trefoils or quatrefoils, which constituted the earliest form of tracery. Each window, however, is generally destitute of any tracery in itself. 'The mouldings,' says Parker, 'in general consist of alternate rounds and deeply-cut hollows, with a small admixture of fillets, producing a strong effect of light and shadow.'—*Gloss. of Architecture*. From the same work we borrow the accompanying illustration of two very beautiful piers, surmounted by a lancet-shaped arch, and decorated in the manner peculiar to the style. They are from Westminster Abbey.



Early English Piers and Arch.

Circular windows, however, still continued to be used, and trifoliate archways over doors are also to be found, as at Salisbury Cathedral. By far the most characteristic feature of the style is the Tooth-ornament (q. v.), which is often used in great profusion. Where foliage is used, it is cut with great boldness, so as to throw deep shadows, and produce a very fine effect. The under-cutting is often so deep as to leave nothing to connect the leaves with the mouldings but the stalks, and occasionally the edge or point of a leaf. The term Early English is said, by Parker, to have been introduced by Mr. Millers in 1805. It corresponds to *Ogiva primitive* of French writers, and is very often known as the first-pointed or lancet-arched amongst ourselves. See **GOTHIC ARCHITECTURE**.

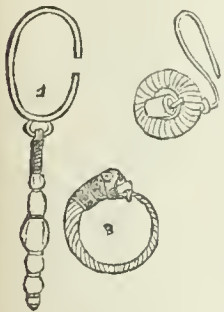
EARN, a river and loch in the south of Perthshire, in the finely-wooded beautiful valley of Strathearn. Loch E. lies to the north of Ben Volrich; its eastern extremity is 24 miles west of Perth. It is 7 miles long from east to west, 1 mile broad, and 100 fathoms deep, and is surrounded by bold and rugged hills. The river E. flows east from the loch 40 miles through the strath, past Comrie, Crieff, and Bridge of Earn, into the estuary of the Tay, 7 miles south-east of Perth. Along the river, near Abernethy, under a thick bed of clay, is a peat-bed 2 or 3 feet thick, supposed to be a continuation of the submarine forest at Flisk.—The Bridge of Earn, a much frequented village, stands on the right bank of the

river, 6 miles south-south-west of Perth, and near the saline springs of Piteathly.

EARNST, or **ARLES**, as it is called in Scotland, from the civil law word *arra*, is a small sum of money which is given, or a simple ceremony, such as shaking hands, which is performed in proof of the existence of that mutual consent which constitutes a contract. In the first case, the earnest is said to be pecuniary; in the second, symbolical. It is not the earnest, but the consent, i.e., the agreement to a certain price, that is the root of the bargain; and the earnest thus becomes a mere adjuvant of evidence, which may be dispensed with even in cases in which it is exacted by custom, if the parties choose to preserve other evidence of the completion of their bargain. The contracts in which earnest have been most frequently given both in this country and elsewhere, are sale and service. In the case of sale, it usually consists of a small sum paid by the buyer, by the acceptance of which the seller is held to bind himself to the sale; in the case of service, it is a small sum given by the master, in accepting which the servant becomes bound to serve. The question as to whether the earnest shall count as part of the price or wage depends on the intention of the parties, which, in the absence of direct evidence, will be inferred from the proportion which it bears to the whole sum. 'If a shilling be given,' as Mr. Erskine says, 'in the purchase of a ship or of a box of diamonds, it is presumed to be given merely in evidence of the bargain, or, in the common way of speaking, is dead earnest; but if the sum be more considerable, it is reckoned up in the price.'—*Institutes*, b. iii. tit. iii. s. 5.

The original view of earnest in England was, that it was a payment of a small portion of the price or wage, in token of the conclusion of the contract (*Story on Sales*, p. 216); and as this view seems to have been adhered to, the sum, however small, would probably there be counted as a part payment. There is only one decision under the 17th section of the statute of Frauds (29 Ch. 11. c. 3), which provides that 'no contract for the sale of any goods, wares, and merchandises, for the price of £10 sterling, or upwards, shall be allowed to be good, except the buyer shall accept part of the goods so sold; and actually receive the same, or give something in earnest to bind the bargain, or in part payment.' The case referred to 'related to the purchase of a horse, where the purchaser produced a shilling from his pocket, and drew it across the hand of the seller's servant, and then returned it to his own pocket; and it was held that this act (which is a custom in the North of England, and is called striking a bargain) was not sufficient to satisfy the requisitions of the statute.'—*Story, ut sup.* From this decision it follows that no importance is attached in England to such fictitious ceremonies as the Jew plucking off his shoe and giving it to his neighbor, the Indian smoking his pipe, or the less poetical observance of thumb-licking, which Erskine tells us was common among the lower classes in Scotland in his day.

EARRING. A ring suspended from the ear, which is bored for the purpose. This mode of adorning the person has always enjoyed great favor amongst Orientals. By Persians, Babylonians, Lydians, Libyans, and Carthaginians, earrings were worn by both sexes. In the classical nations of antiquity, their use was confined to women. In the *Iliad* (xiv. 182, 183), Juno is represented as adorning herself with earrings made with three drops resembling mulberries. From this period down to the latest, the practice prevailed in Greece, and we find the ears of the Venus de Medici pierced for the reception of earrings. Pliny says (xi. 50) that there was no part of dress on which greater expense was lavished amongst the Romans; and Seneca mentions an earring, of which a drawing, copied in our illustration (fig. 1), is given in Smith's *Dictionary*, which he says was worth a patrimony. It has four pearls, two above and two below the precious stone in the center. In the more valuable of the antique earrings, pearls were almost always used; and they were valued for the completeness of their form as well as for their whiteness. In place of a ring, the ornament was often attached to the ear with a hook (see fig. 2), a custom which still prevails in Italy. Many Egyptian earrings of very beautiful design have been preserved, of which fig. 3 is an example. These antique designs have been imitated in modern times, and if the use of an ornament which seems fitter for a South Sea islander than an English gentlewoman is to be continued, it can scarcely be made to assume a more graceful form than was often given to it by the ancients. See **RING**. During the reigns of Elizabeth and James I., earrings were worn in England by men; a custom which is still continued by many sailors. Master Matthew, in *Every Man in his Humor*, says to Brainworm: 'I will pawn this jewel in my ear;'



Ancient Earrings.

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and Hall, in his *Satires* (B. vi. Sat. 1), speaks of the 'ringed ear' of the new-come traveler; and many similar passages to the like effect might be quoted.

At the present day in England, earrings are worn only by women. The ears are bored usually at about seven years of age. The boring, which produces a temporary inflammation, acts as a counter-irritant in cases of sore eyes; and this is sometimes given as a reason for putting rings in the ears.

EARS, a term in Organ-building, given to small projecting pieces of metal on the sides of the mouths of metal pipes, put on for the purpose of assisting the pipes to speak promptly, especially when the organ is of small scale. The German name of 'beard' is fully more appropriate.

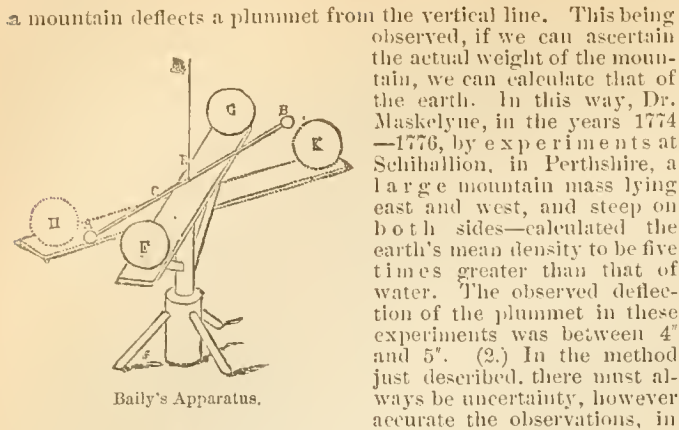
EARTH, **THE**, the globe on which we live, being the third planet in order from the sun, and the largest within the belt of the Planetoids. We proceed to consider briefly the points of chief interest connected with it, and which do not fall to be treated under separate heads, viz., 1. Its form and magnitude; 2. Its mass and density; 3. Its motions; 4. Its temperature.

1. *The Form and Magnitude of the Earth*.—To a spectator so placed as to have an unobstructed view all round, it appears a circular plain, on whose circumference the vault of heaven seems to rest. Accordingly, in ancient times, even philosophers long looked upon the earth as a flat disc swimming upon the water, but many appearances were soon observed to be at variance with this idea, and even in antiquity, the spherical form of the earth began to be suspected by individuals. It is only by assuming the earth to be spherical, that we can explain how our circle of vision becomes wider as our position is more elevated; and how the tops of towers, mountains, masts of ships, and the like come first into view as we approach them. There are many other proofs that the earth is a globe. Thus, as we advance from the poles towards the equator, new stars, formerly invisible, come gradually into view; the shadow of the earth upon the moon during an eclipse is always round; the same momentary appearance in the heavens is seen at different hours of the day in different places on the earth's surface; and lastly, the earth, since 1519, has been circumnavigated innumerable times. The objection to this view that readily arises from our unthinking impressions of up and down, which immediately suggest the picture of the inhabitants of the opposite side of the earth—our *antipodes*—with their heads downwards, is easily got over by considering that on all parts of the earth's surface down is towards the earth's center.

It is not, however, strictly true that the earth is a sphere; it is slightly flattened or compressed at two opposite points—the poles—as has been proved by actual measurement of degrees of latitude, and by observations of the pendulum. It is found that a degree of a meridian is not everywhere of the same length (see **DEGREE OF LATITUDE**), as it would be if the earth were a perfect sphere, but increases from the equator to the poles; from which it is rightly inferred that the earth is flattened there. A pendulum, again, of a given length is found to move faster when carried towards the poles, and slower when carried towards the equator, which shows that the force of gravity is less at the equator than at the poles, or, in other words, that the center, the seat of gravity, is more distant at the former than at the latter.

The diminished force of gravity at the equator has, it is true, another cause, namely, the centrifugal force arising from the rotation of the earth, which acts counter to gravitation, and is necessarily greatest at the equator, and gradually lessens as we move northwards or southwards, till at the poles it is nothing. But the diminution of the force of gravity at the equator arising from the centrifugal force amounts to only $\frac{1}{289}$ of the whole force; with the diminution indicated by the pendulum is $\frac{1}{234}$. The difference, or $\frac{1}{560}$ nearly, remains assignable to the greater distance of the surface from the center at the equator than at the poles. From the most accurate measurements of degrees that have been made, the flattening or ellipticity of the earth has been determined by Bessel at $\frac{1}{230.778}$, or $\frac{1}{230}$ nearly; or, the equatorial radius is to the polar as 300 to 299. These measurements of degrees determine not only the shape but the size of the earth. Bessel's calculations give a geographical mile, or the 60th part of a mean degree of the meridian, at 951.807 toises (2029 yards, thus making the whole circumference 43,526,400 yards), and the equatorial and polar diameters at 6875.6 and 6852.4 geographical miles (7925.6 and 7899.14 English imperial miles). The surface of the earth contains nearly 150 millions of square geographical miles.

2. *The Mass and Density of the Earth*.—We have now seen that the earth is a sphere slightly flattened at its poles—what is called by geometers an elliptical spheroid—of a mean radius of somewhat less than 4000 miles. We have next to consider its mass and density. Nothing astonishes the young student more than the idea of weighing the earth; but there are several ways of doing it; and unless we could do it, we never could know its density. (1.) The first method is by observing how much the attraction of



a mountain deflects a plummet from the vertical line. This being observed, if we can ascertain the actual weight of the mountain, we can calculate that of the earth. In this way, Dr. Maskelyne, in the years 1774—1776, by experiments at Schiellallion, in Perthshire, a large mountain mass lying east and west, and steep on both sides—calculated the earth's mean density to be five times greater than that of water. The observed deflection of the plummet in these experiments was between 4" and 5". (2.) In the method just described, there must always be uncertainty, however accurate the observations, in

regard to the mass or weight of the mountain. The method known as *Cavendish's experiment* is much freer from liability to error. This experiment was first made by Henry Cavendish on the suggestion of Michel, and has since been repeated by Reich of Freyberg, and Mr. Francis Baily. The apparatus used by Mr. Baily is represented in the annexed figure. Two small balls at the extremities of a fine rod AB, are suspended by a wire DE, and their position carefully observed by the aid of a telescope. Large balls of lead, G, F, placed on a turning-frame, are then brought near them in such a way that they can affect them only by the force of their attraction. On the large balls being so placed, the small ones move towards them through a small space, which is carefully measured. The position of the large balls is then reversed (they are brought into the positions K, H), and the change of position of the small balls is again observed. Many observations are made, till the exact amount of the deviation of the small balls is ascertained beyond doubt. Then by calculation the amount of attraction of the large balls to produce this deviation is easily obtained. Having reached this, the next question is, what would their attraction be if they were as large as the earth? This is easily answered, and hence, as we know the attractive force of the earth, we can at once compare its mean density with that of lead. Mr. Baily's experiments lead to the result that the earth's mean density is 5.67 times that of water. (3.) A third mode has lately been adopted by the Astronomer-royal, by comparison of two invariable pendulums, one at the earth's surface, the other at the bottom of a pit at Harton Colliery, near Newcastle, 1260 feet below the surface. The density of the earth, as ascertained from this experiment, is between 6 and 7 times that of water; but for various reasons this result is not to be accepted as against that of the Cavendish experiment, and it is said that the Astronomer royal was himself dissatisfied with it, and meant to repeat the experiment with new precautions. The density of the earth being known, its mass is easily calculated, and made a unit of mass for measuring that of the other bodies in the system. It is found that the mass of the earth compared with that of the sun, is $\frac{1}{332,946}$.

3. *The Motions of the Earth.*—The earth, as a member of the solar system, moves along with the other planets round the sun from west to east. This is contrary to our sensible impressions, according to which the sun seems to move round the earth; and it was not till a few centuries ago that men were able to get over this illusion. See *COPERNICAN SYSTEM*. This journey round the sun is performed in about 365 $\frac{1}{4}$ days, which we call a year (solar year). The earth's path or orbit is not strictly a circle, but an ellipse of small eccentricity, in one of the foci of which is the sun. It follows that the earth is not equally distant from the sun at all times of the year; it is nearest, or in perihelion, at the beginning of the year, or when the northern hemisphere has winter; and at its greatest distance, or aphelion, about the middle of the year, or during the summer of the northern hemisphere. The difference of distance, however, is comparatively too small to exercise any perceptible influence on the heat derived from the sun, and the variation of the seasons has a quite different cause. If the mean distance be taken as unity, the greatest and least are respectively 1.01679 and 0.98321. Till lately, the mean distance was stated at 95,000,000; but determinations obtained from the transit of Venus in 1874 fix it at 92,400,000 miles. The earth therefore yearly describes a path of upwards of 580 millions of miles; and its velocity in its orbit is about 18 miles in a second. (Other calculations give 93,321,000 miles as the mean distance).

Besides its annual motion round the sun, the earth has a daily motion or rotation on its axis, or shorter diameter, which is performed from west to east, and occupies exactly 23 hours, 56 minutes, 4 seconds of mean time. On this motion depend the rising and setting of the sun, or the vicissitudes of day and night.

The relative lengths of day and night depend upon the angle formed by the earth's axis with the plane of its orbit. If the axis were perpendicular to the plane of the orbit, day and night would be equal during the whole year over all the earth, and there would be no change of seasons; but the axis makes with the orbit an angle of 23 $\frac{1}{2}$ °, and the consequence of this is all that variety of seasons and of climates that we find on the earth's surface; for it is only for a small strip (theoretically, for a mere line) lying under the equator that the days and nights are equal all the year; at all other places, this equality only occurs on the two days in each year when the sun seems to pass through the celestial equator, i. e., about the 21st of March and the 23d of September. From March 21, the sun departs from the equator towards the north, till, about June 21, he has reached a north declination of 23 $\frac{1}{2}$ °, when he again approaches the equator, which he reaches about September 23. He then advances southward, and about December 21 has reached a south declination of 23 $\frac{1}{2}$ °, when he turns once more towards the equator, at which he arrives, March 21. The 21st of June is the longest day in the northern hemisphere, and the shortest in the southern; with the 21st of December it is the reverse.

The velocity of the earth's rotation on its axis evidently increases gradually from the poles to the equator, where it is about equal to that of a musket-ball, being at the rate of 24,840 miles a day, or about 1440 feet in a second.

A direct proof of the rotation of the earth is furnished by its compression at the poles. There are indubitable indications that the earth was originally fluid, or at least soft; and in that condition it must have assumed the spherical shape. The only cause, then, that can be assigned for the fact that it has not done so, is its rotation on its axis. Calculation also shows that the amount of compression which the earth actually has, corresponds exactly to what its known velocity and mass must have produced. Experiments with the pendulum, too, show a decrease of the force of gravity from the poles towards the equator; and though a part of this decrease is owing to the want of perfect sphericity, the greatest part arises from the centrifugal force caused by the motion of rotation. Another direct proof of the same hypothesis may be drawn from the observation, that bodies dropped from a considerable height deviate towards the east from the vertical line. This fact has been established by the experiments of Benzenberg and others. In former times, it was believed that if the earth actually revolved in the direction of east, a stone dropped from the top of a tower would fall, not exactly at the foot of the tower, but to the west of it. Now, as experience, it was argued, shows that this is not the case—that the stone, in fact, does fall at the bottom—we have here a proof that the pretended rotation of the earth does not take place. Even Tycho Brahe and Riccioli held this objection to the doctrine to be unanswerable. But the facts of the case were just the reverse. Newton, with his wonted clearness of vision, saw that, in consequence of the earth's motion from west to east, bodies descending from a height must decline from the perpendicular, not westward, but eastward; since, by their greater distance from the earth's center, they acquire at the top a greater eastward velocity than the surface of the earth has at the bottom, and retain that velocity during their descent.

He therefore proposed that more exact observations should be made to ascertain the fact; but it was not till more than a century afterwards that experiments of sufficient delicacy were made to bring out the expected result satisfactorily. It is difficult to find an elevation sufficiently great for the purpose, as several hundred feet give merely a slight deviation, which it requires great accuracy to observe. If a height of 10,000 feet could be made available, the deviation would be not less than 7 $\frac{1}{2}$ feet. The analogy of our earth to the other planets may also be adduced, the rotation of which, with the exception of the smallest and the most distant, is distinctly discernible. Finally, an additional proof of the earth's rotation was lately given by Léon Foucault's striking experiment with the pendulum. The principle of the experiment is this: that a pendulum once set in motion, and swinging freely, continues to swing in the same plane, while at any place at a distance from the equator the plane of the meridian continues to change its position relative to this fixed plane.—The objection taken to the doctrine of rotation from the fact that we are unconscious of any motion, has little weight. The movement of a vessel in smooth water is not felt, though far less uniform than that of the earth; and as the atmosphere accompanies the earth in its motion, there is no feeling of cutting through it to break the illusion of rest.

If the turning of the earth on its axis is thus proved to be the cause of the apparent daily motion of the heavens, it is an easy step to consider the annual motion of the sun through the constellations of the zodiac as also apparent, and arising from a revolution of the earth about the sun in the same direction of west to east. If we consider that the mass of the sun is about 359,000 times greater than that of the earth, and that by the laws of

mechanics, two bodies that revolve round each other, must revolve about their common center of gravity, the idea of the sun revolving about the earth is seen to be simply impossible. The common center of gravity of the two bodies being distant from the center of each inversely as their respective masses, is calculated to be only 267 miles from the center of the sun, and therefore far within his body, which has a diameter of 882,000 miles. But by help of a figure, it is easy to show that the apparent motion of the sun on the ecliptic naturally arises from a motion of the earth about the sun. The motions of the planets also, that appear so complicated and irregular as seen by us, can only be satisfactorily explained by assuming that they too revolve round the sun in the same direction as the earth. See PRECESSION and NUTATION for an account of a small periodic motion of the earth's axis and its effects.

4. *The Earth's Temperature.* See METEOROLOGY and TERRESTRIAL TEMPERATURE as to the phenomena of heat on the earth's surface. As we go below the surface, we reach a depth beyond which the interior of the earth seems to have no sympathy with the external causes of heat or cold, and its heat appears to be its own, and to increase according to a fixed law the deeper we descend. The average rate of observed increase is 1° F. for a descent of 64 feet (average). If this law were universal—which we do not know it to be—at a depth of less than 30 miles the heat would be such as to hold in fusion all known substances, and the earth would have to be regarded as a very thin crust or shell full of molten liquid. This theory of a molten interior obtained at one time extensive currency among philosophers being endorsed with the names of Fourier and Humboldt; but it has since been shown to be inconsistent with the rigidity which astronomical observations prove the earth to possess. A liquid nucleus would be subject to tides like the ocean, and the crust would partake of the motion. Granting the increase of heat to be constant, we do not know what effect the increasing pressure may have in preventing fusion.

EARTHEN-WARE. See POTTERY.

EARTH-HOUSES, EIRD-HOUSES, or YIRD-HOUSES, the name which seems to have been generally given throughout Scotland to the under-ground buildings, which in some places are called also, 'PICTS' HOUSES' (q. v.), and in others, it would appear 'Weems,' or caves. Martin, in his Description of the Western Islands, printed in 1703, when their use would appear to have been still remembered, speaks of them as 'little stone-houses, built under ground, called earth-houses, which served to hide a few people and their goods in time of war.' The earth-house in its simplest form, is a single irregularly shaped chamber, from four to ten feet in width, from twenty to sixty feet in length, and from four to seven feet in height, built of unhewn and uncemented stones, roofed by unhewn flags, and entered from near the top by a rude doorway, so low and narrow that only one man can slide down through it at a time. When the chamber is unusually wide, the side-walls converge, one stone overlapping another, until the space at the top can be spanned by stones of four or five feet in length. In its more advanced form, the earth-house shows two or more chambers, communicating with one another by a narrow passage. There are instances in which one of the chambers has the circular shape and dome-roof to which archaeologists have given the name of the 'BEEHIVE-HOUSE' (q. v.). Occasionally, as many as forty or fifty earth-houses are found in the same spot, as the moor of Clova, not far from Kildrumny, in Aberdeenshire. They appear to have been almost invariably built in dry places, such as gravelly knolls, steep banks of rivers, and hill-sides.

They are generally so near the surface of the ground, that the plough strikes upon the flagstones of the roof, and thus leads to their discovery. The object most frequently found in them is a stone quern, or hand mill, not differing from that which continued to be used in remote corners of Scotland within the memory of living men. Along with the quern are generally found ashes, bones, and deer's horns; and more rarely small round plates of stone or slate, earthen vessels, cups and implements of bone, stone celts, bronze swords, gold rings, and the like. Occasionally, the surface of the ground beside the earth-house shows vestiges of what are supposed to have been rude dwelling-houses, and folds or enclosures for cattle. This, with other things, would indicate that the earth-houses of Scotland and Ireland (for they are found also in that island) were put to the same purpose as the caves which, as Tacitus (writing in the 2d c.) tells us, the Germans of his day dug in the earth, as store-houses for their corn, and as places of retreat for themselves during winter, or in time of war.

EARTH-NUT, a popular name of the tubers of certain umbelliferous plants, particularly *Bunium bulbocastanum* and *B. flexuosum*, which are common in most parts of Europe. Names of the same signification are given to them in a number of European languages. *Arnut*, *Yernut*, and *Jurnut*, Scotch and English pro-

vincial names, are corruptions of earth-nut. PIG-NUT is another common English name, pigs being very fond of these tubers, grubbing up the ground in quest of them, and soon becoming fat upon them. They are also called *earth-chestnut*, from their resemblance in taste and qualities to chestnuts, perhaps also from their resemblance in size, and their being black or very dark brown externally, and white within. By some they are preferred to chestnuts, and they are much used for food in different parts of Europe, and occasionally in some parts of England, either roasted or in soups. They are wholesome and nutritious; they form an article of trade in Sweden, and have sometimes been recommended as worthy of an attention which they have never yet received in Britain. The two species are very similar in general appearance, although *B. bulbocastanum* has by some botanists been referred to the genus *Carum* (Caraway), because its carpels have single vitta between the ribs, whilst *B. flexuosum* has three. The former is also a plant of stouter habit. Both have umbels of small white flowers, much divided leaves with very narrow segments, and a single roundish tuber at the root of each plant. *B. flexuosum* is common in woods, pastures, waysides, &c., in most parts of Britain. *B. bulbocastanum* is found only in some of the chalk districts of England, but is abundant in many parts of Europe. *B. ferulaceum* likewise affords tubers, which are used as food in Greece.—The somewhat similar tubers of another umbelliferous plant, *Oenanthe pimpinelloides*, which grows in the pastures of some parts of the south of England, are sometimes also used for food, notwithstanding the very poisonous qualities of some of its congeners. See WATER-DROP-WORT.—A Himalayan umbelliferous plant (*Charophyllum tuberosum*), a species of Chervil (q. v.), yields edible tubers or *earth-nuts*.—The name E. is sometimes extended to other small tuberous roots of similar quality, although produced by plants widely remote in the botanical system, as *Apios tuberosa* and *Lathyrus tuberosus*. See APIOS and LATHYRUS.

EARTHQUAKE, the term applied to any tremor or shaking of the solid crust of the earth. The frequent occurrence of earthquakes, their destruction of life and property, their influence upon the solid surface of the earth, and the mysteriousness of their cause, force them upon our attention. It is estimated that 12 or 13 earthquakes, destructive more or less of life and property, occur every year, and it is well known that the surface of the globe is never free from sensible evidence of the continued operation of earthquake agency—that in some quarter or another tremors or slight shakings are always taking place. When these are of a serious nature, whole cities have been destroyed; fertile districts, with all their fruits and grain, have been laid waste; and enormous masses of human beings have lost their lives. No less than 60,000 perished in the great Lisbon earthquake; while in that of Calabria, in the end of last century, 40,000 were destroyed. It is estimated that as many as 13,000,000 of the human race have thus perished! The great changes which earthquakes produce on the earth's surface deserve the careful attention of the geologist. They disclose to him an agency which seems to have been at work during every period of the earth's history, and which has altered the earth's surface to an extent that can scarcely be imagined. The observed results of earthquakes which more immediately demand his attention are such as these: the new lakes and river-courses which they form, at the same time obliterating the old ones; the new valleys due to subsidences; the fissures of various sizes they form; and the immense landslips they frequently produce. But the mysterious nature of the producing cause of earthquakes is also a strong incentive to their study. It is unfortunately true, that the most popular scientific inquiries are those in which the imagination has large play: dry inductions from observed phenomena are not suited to the genius of popular modern science. Consequently, earthquakes, where every attempt at explaining their origin is theoretical, from the impossibility of obtaining direct observation, affording as they do a wide field for the play of the poetic faculty, find plenty of students.

No portion of the earth's surface is exempt from the influence of earthquakes. Egypt has been less visited than perhaps any other country, but even here we have the record of one which took place in 1740 A.D.; and Holland, with its loose alluvial deposits, has also felt their power. Nor is the bed of the ocean exempt; records of many subaqueous earthquakes exist, taken by vessels at sea, sometimes passing over the point of greatest disturbance at the moment of the shock. In like manner earthquakes have been active at every period of the earth's existence, breaking up its solid crust, elevating or depressing its surface, and doing as much as any other single agent to bring it into its present condition. They have been probably at some periods more active than at others, just as we find that some districts are now more liable than others to their visitation. So well defined, indeed, are the localities where earthquakes occur, that it is easy to exhibit their limits on a map. They are most frequent around the present lines or centers of volcanic action (see VOLCANO); and their frequency

and violence seem to bear some relation to the activity and intensity of the associated volcanoes.

Observers of volcanic phenomena have noticed that every great eruption, in whatever part of the world observed, and whether from a volcanic vent on land or beneath the ocean, is accompanied by earthquake shocks of greater or less violence and duration; while, on the other hand, those observing earthquakes speak of them as accompanied by volcanic eruptions, and of their often being stopped on the opening of volcanic vents. It is, however, an important fact that, although regions of active volcanic action are those of most frequent earthquake movements, yet the most violent earthquakes do not appear to have occurred in these regions, but, on the contrary, in districts lying some degrees away from the nearest volcanic action, as, for instance, in the famous earthquake of Lisbon. Districts in which there are extinct volcanoes are not more liable to such visitations than non-volcanic regions.

The phenomena connected with earthquakes have been variously described. Many writers refer to appearances in the heavens, or changes in the atmosphere, which to them seems to have some connection with the catastrophes they narrate. They tell of irregularities in the seasons preceding or following the shock, of sudden gusts of wind interrupted by sudden calms, of violent rains at unusual seasons, or in countries where such phenomena are almost unknown, of a reddening of the sun's disc, of a haziness in the air often continued for months, and similar phenomena. But these are so irregular in their appearance, and have been so seldom observed associated with more than a single earthquake, that, in the absence of any decided reason to the contrary, there seem good grounds for believing they have no real connection with the earthquake. It is different with underground noises, which frequently precede, accompany, or succeed the occurrence of earthquakes, or some of the shocks of them. They are undoubtedly intimately connected with the shock, yet earthquakes occur, even of the greatest violence, which are unaccompanied by any sound whatever. Different descriptions have been given of these subterranean noises. In some earthquakes, they are likened to chains pulled about, increasing to thunder; in others, the sound is like the rumbling of carriages, growing gradually louder, until it equals the loudest artillery; or like heavy wagons running away upon a road; or distant thunder; or like the hissing produced by the quenching of masses of red-hot iron in water; or like the rush of wind underground. As there have been earthquakes without subterranean noises, so there are frequently, in South America and elsewhere, underground sounds which are not followed by earthquakes.

The more intimate earthquake-phenomena are more uniform. Sometimes there is nothing else felt than a trembling or gentle motion of the surface, without producing any injury. In severe earthquakes, the almost invariable succession of phenomena is first a trembling, then a severe shock, or a succession of shocks, and then a trembling, gradually becoming insensible. The violent shocks are instantaneous, and very few in number, sometimes only one, usually not more than three or four. In the intervals between these, smaller shocks or tremblings take place. The severe shocks do the mischief.

At the point or line of greatest disturbance, the shock has a distinctly vertical direction, coming from below upwards. As we leave this point, the direction of the motion becomes more and more horizontal, gradually also decreasing in intensity until it becomes insensible. This progressive movement is produced by an earth-wave or true undulation of the solid crust of the earth. The whole mass of the area is not moved at once, but only the wave-crest. In the case of the earthquake at Lisbon, the progress of the wave was roughly calculated; it was shown to have had a very great velocity, and to have lasted only for an instant at any one spot. The area affected on this occasion was very extensive. The shock was felt on the one side as far as the southern shores of Finland, and on the other it reached beyond the St. Lawrence in Canada, and was observed in some of the West India Islands—an area of no less than 7,500,000 square miles. The force required to move this must have been enormous, for, suppose the thickness of the earth's crust moved to have been no more than 20 miles, then 150,000,000 cubic miles of solid matter was moved. The influence of this earth-wave is communicated to the sea, when the earthquake is near the shore, or on the bed of the ocean. The sea swells, and slightly retires from the beach, and then a great wave rolls in upon the shore. At the Lisbon earthquake, this wave rose to a height of 60 feet at Cadiz. It carries with it sea-spoil, scattering it over the surface of the earth, far beyond the ordinary reach of the sea.

Of the various theories as to the nature of earthquakes, we can only refer to the most important. All theorists are agreed as to the connection between volcanoes and earthquakes; that they are produced by the same subterranean agency. The existence of molten matter in the interior of the earth, is the starting-point in all except the chemical theory propounded by Davy, which theory

is now being confirmed by the researches of Judd and others. When Davy discovered the metallic bases of the earths and alkalis, he threw out the idea that those metals might abound in an unoxidized state in the subterranean regions, to which water must occasionally penetrate. When this occurred, gaseous matter would be set free, sufficient to produce the earthquake, the metals would combine with the oxygen of the water, and heat enough would be evolved to melt the surrounding rocks.

Mr. Mallet, in an elaborate report on the subject presented to the British Association, proposed an ingenious theory. He assumes that volcanoes, and the centers of earthquake disturbances, are near the sea, or other large supplies of water; and he says that when an eruption of igneous matter takes place beneath the seabottom, the first action must be to open up large fissures in its rocky material, or to lift and remove its incoherent portions, such as sand, mud, gravel, &c. The water on meeting the heated surfaces assumes the spheroidal state; while in this condition, the intestine motion may be great, but little steam is generated; but no sooner have the surfaces cooled, than the water comes into close contact with them, and a vast volume of steam is evolved explosively, and blown off into the deep and cold water of the sea, where it is condensed, and thus a blow of the most tremendous sort is given at the volcanic focus, and being transferred outwardly in all directions, is transmitted as the earthquake shock.

The surfaces of the ignited material, however, now cooled down below the point at which steam can be generated rapidly, merely keep up a gentle ebullition, which is transmitted as the trembling after the shock. On the surfaces again becoming heated by conduction from the molten mass, the various phases are again repeated. This he considers the chief cause of earthquakes, but he supposes they may also be due to the evolution of steam through fissures, and its irregular and *per saltum* condensation under pressure of sea-water; or to great fractures and dislocations in the rocky crust, suddenly produced by pressure acting on it from beneath, or in any other direction.

The old assumption that the earth consists of a molten fluid core with a cooled and hardened rind floating upon it, is inconsistent with the rigidity that astronomers have proved the earth to possess. But although the earth must be mainly solid, it is yet believed to be of a honey-combed structure, and that the cavities contain in many places lakes of molten rock, between which and the surface volcanoes are orifices of communication. Into these cavities, water sinking down through crevices from the ocean or the land must be constantly finding its way; and the steam thus generated exerts such enormous pressure as to force the molten matter to the surface, itself mingling and escaping along with it. When a mass of water is suddenly precipitated into a hot cavern, the explosion of steam will cause an earthquake concussion, and where there is no vent, may be sufficient to convulse and rend the superincumbent strata. See Prof. Judd's *Volcanoes*.

EARTHS, in Chemistry, are a class of substances regarded by the alchemists and older chemists as elementary, and which are insoluble in water. The earths *proper* are now known to be compounds, consisting of a metal in combination with oxygen. The list includes Alumina, Glucina, Zirconia, Thoria, Didymia, Lantana, Ceria, Yttria, Terbia, Erbium. They do not alter vegetable colors, are soluble in acids, and are precipitated from their solutions by ammonia, potash, or soda. The *Alkaline Earths* have already been noticed. See ALKALIES.

EARTHWORKS, in Fortification, is a general name for all military constructions, whether for attack or defence, in which the material employed is chiefly earth. The word *earthwork*, however, has lately received a new importance, in reference to a discussion among military engineers, whether earthwork defences generally are better or worse than those of masonry. The subject cannot be discussed here, but its general character may be indicated. The fracture of the Russian granite fortifications at Bomarsund, and the obstinate defence made within the earthen defences at Sebastopol, led many writers, about the year 1855, to express a preference for earthworks instead of stoneworks. Mr. J. Fergusson (*Portsmouth Protected*, 1856) has especially distinguished himself by his advocacy of this view. The reasons urged are—that masses of earth can be more quickly and cheaply put up than masses of masonry; that in most places earth is more readily obtained than stone; that if an earthwork be knocked to ruin by balls and shells, it can be repaired in a very short time; and that the defenders are not exposed to so much injury as in masonry-works, where splinters of stone fly about in a perilous way.

The late Sir John Burgoyne, the leading military engineer in England of his day, combated these views. He contended, among other things, that as a given amount of cannonading will make a much larger breach in earthwork than in stonework, the latter is best fitted to prevent capture by assault. He insisted that earthworks should be regarded rather as temporary expedients than as purposed and permanent constructions; and he claimed the au-

thority of continental engineers in support of this opinion. See further under FORTIFICATION.

EARTHWORM (*Lumbricus*), a genus of *Annelida* (q. v.) of the order *Terriolæ*. There are many species, all of them pretty closely resembling in characters and habits the common E. or Dew-Worm (*L. terrestris*), which is everywhere plentiful in Britain and throughout Europe, and is familiar to everybody. It has no head distinct from the body, no eyes, no antennæ, nor any organs external to the rings of which its body is composed, except minute bristles pointing backwards, of which each ring bears four



Earthworm (*Lumbricus terrestris*):

a, earthworm; b, anterior extremity, showing the mouth (the bristles are also shown); c, egg, containing two young; d, young escaping from the egg.

pair, and which are of use in its locomotion. It sometimes attains to nearly a foot in length, and more than 120 rings have been counted in its body. The end at which the mouth is situated is pointed, and the tail is flattened, whilst the general form is cylindrical. The mouth consists merely of two lips, the upper lip elongated; there are no teeth nor tentacles, and the worm subsists by swallowing fine particles of the soil, from which its digestive organs extract the digestible matter, the rest being voided often in little intestine shaped heaps, called *worm-casts*, on the surface of the ground. The locomotion of the E. is effected by means of two sets of muscles, which enable it to contract and dilate its rings; its bristles preventing motion backwards, and the whole muscular effort thus resulting in progress; whilst the expansion of the rings, as it contracts the anterior segments, and draws forward the hinder parts, widens a passage for it through earth whose particles were close together before. Earthworms are thus of very great use, their multitudes continually stirring and loosening the soil through which they work their way; and moles, pursuing them to feed on them, stir and loosen it still more; whilst worm-casts gradually accumulate on the surface to form a layer of the very finest soil, to which it is supposed that the best old pastures in a great measure owe their high value.

Earthworms do not often visit the surface of the ground, except during night, and when the ground is moist. In the evening, during or after rain, or in the morning when the dew is abundant, they may sometimes be seen traveling about in great numbers. Both drought and cold cause them to retreat more deeply into the earth.—Their respiration is effected by means of little sacs, which communicate by minute pores with the external air. They are hermaphrodite, but mutual fecundation takes place by means of the thickened knot (*clitellum*) which is situated before the middle of their body. Their eggs often contain two embryos, and the young worms escape by a sort of valvular opening at the end.

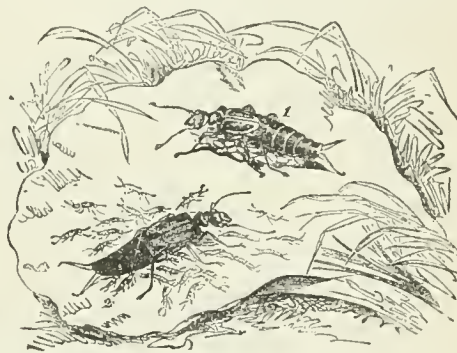
Besides their usefulness in the improvement of the soil, earthworms are of importance as food for birds, fishes, &c. Their value as bait for fishes is well known to every angler. The instinct which prompts them to hasten to the surface, when, in quest of bait, the angler shakes the soil with a spade or fork, is probably to be referred to the similar shaking on the approach of their constant enemy, the mole.

An E. of great size is common in the East Indies, wherever the climate is moist, from the Himalaya to Ceylon and Java. It is *Lithophis glutinosus*. Much interesting light was thrown on earthworms in Mr. Darwin's work, *The Formation of Vegetable Mould through the Action of Worms* (1881).

EAR-TRUMPET, a contrivance for improving the hearing of the partially deaf. For this purpose, many ingenious instruments have been devised. The principle in them all is the same: to collect the sonorous vibrations, and to convey them in an intensified form to the deeper parts of the ear. In this way, the hand placed behind the external ear constitutes the simplest form of ear-trumpet. Though, in a great number of cases of impaired hearing, there can be no doubt that much assistance and comfort are obtained from the use of one or other of the varieties of the ear-trumpet, still they must not be used indiscriminately, for in unsuitable cases they often do much mischief, both by increasing the deafness, and aggravating the noises in the head from which deaf persons often suffer so much. They are of most use, perhaps, in advanced cases of nervous deafness, though injurious in the early stages of this complaint; they are hurtful also in all acute diseases of the organ, and of little or no use in those cases of great thickening of the contents of the middle ear, where the adapting power of the organ has been lost. There are many varieties of trumpet in common use. By far the most useful and comfortable are those which are worn on the head, which go by the name of ear-cornets or acoustic aricles. They can be concealed under the hair or cap, and may be adapted to one or both

ears by means of a spring over the head. The apparatus most commonly in use requires to be held in the hand, and consists of a narrow portion inserted into the ear-passage, and which gradually expands into a wide mouth; or the extremity of the instrument may be turned downwards, as in that form which passes by the name of Miss Martineau's trumpet. Another variety, applicable to the more severe cases of deafness, consists of an elastic tube, one end of which is tipped with ivory, and is placed in the ear of the patient; the other is held in the hand of the speaker who applies his mouth to the open extremity. With this instrument, only one voice can be heard at a time. With the first-mentioned variety, general conversation can be heard often quite well. Ear-trumpets are generally made of some thin metallic substance, such as tin. Gutta-percha, vulcanite, and other substances, are also frequently used.

EARWIG (*Forficula*), a genus of orthopterous insects, recently subdivided into a number of genera, and forming the family *Forficulidæ*, which many entomologists constitute into a distinct order, *Dermaptera* (Gr. leather-winged). These insects indeed connect the true *Orthoptera* with the *Coloptera*. Their legs are formed for running, and not for leaping; their wing-covers (*elytra*)—which are very small, and hide only a small part of the abdomen—are of firmer substance than in the other *Orthoptera*; the wings, of which there are two sets—hind and fore wings—are curiously folded under them, both longitudinally, in a fanlike manner, and transversely; the organs of the mouth resemble those of the true *Orthoptera*, with which also earwigs agree in the important character of *semi-complete metamorphosis*; the larvæ and pupæ much resembling the perfect insect, running about and feeding in the same manner, but the larvæ being destitute of wings and wing-covers, the pupæ having them only in a rudimentary state. Earwigs have the body narrow, and of nearly equal breadth throughout, the head exposed, the mandibles very strong and horny, the antennæ long and thread-shaped. The abdomen bears at its extremity a large pair of forceps, apparently of use as an instrument of defence. Earwigs abound in moist situations, as under the decayed



Earwig:

1, female sitting on her eggs: 2, young just emerged from eggs.

bark of trees, under stones, among decaying straw, &c. They feed both on animal and vegetable food; the COMMON E. (*F. auricularia*), very abundant in Britain and in most parts of Europe, is troublesome to gardeners by eating the leaves of plants and the petals of fine flowers; but the injury which it does is probably more than compensated, particularly as to field-crops, by the destruction of multitudes of smaller insects, as *thrips*, *aphis*, &c. The appearance of this insect is by no means agreeable, and its mantibles and forceps are suggestive of unpleasant possibilities, which however, would seem never to be realized, although it is a very frequent visitor of houses, particularly those of which the walls are covered with foliage. It is curious how extensively prevalent the notion is that earwigs creep into the ear. To this they owe their English name (E. from *ear*, and Sax. *wiega*, a worm or grub), and their names in many languages, as the French *Perceoreille*, the German *Ohrwurm*, &c. Newman, in his *Introduction to the History of Insects*, says: 'The shape of these wings (the hind ones), when fully opened, is nearly that of the human ear; and from this circumstance it seems highly probable that the original name of this insect was earwing.' The hind wing is here figured. It is agreeable to the general habits of the E. to creep into holes, yet there is apparently no authenticated instance of an E. entering the ear of a human being. Of their habit of creeping into holes, particularly to hide during the day, gardeners take advantage to make earwig-traps of different descriptions.



Hind Wing of Earwig, magnified.

An interesting peculiarity in the habits of these insects remains to be noticed. The female E. sits upon her eggs and hatches them like a hen; she also gathers her young ones around her and under

her in the most affectionate manner. The observations of De Geer on this point have been confirmed by Mr. Spence and others.

EASDALE, a small isle on the west coast of Argyleshire, in the Firth of Lorn, ten miles S.S.W. of Oban. It contains one and a half sq. miles, and is situated in Kilbrandon parish. It is noted for its primary or metamorphic slate-quarries belonging to the Marquis of Breadalbane, and wrought for more than 150 years. The sea having broken into the quarries in 1881, and stopped the working, a new quarry was opened in the adjoining larger island.

EASEL. This structure, the object of which is to support the canvas or panel of the artist at a convenient height for work, has been used for ages pretty much in its present form.

EASEMENT, in English law has been defined to be 'a privilege without profit, which the owner of one neighboring tenement hath of another, existing in respect of their several tenements, by which the servient owner is obliged "to suffer or not to do" something on his own land for the advantage of a dominant owner.'—Gale on *Easements*. The rights comprehended under the title of easements are of a very important kind; they include rights of water, rights of way, rights to light and air, rights to support from a neighboring soil or house, rights to carry on an offensive trade, &c. An easement is an incorporeal Hereditament (q. v.), and corresponds in many respects with a Servitude (q. v.) in Scotch law. But an easement is more limited than a servitude, inasmuch as it comprehends those rights only which carry no title to the profit of the soil. These latter rights are in England known as *Profits a prendre* (q. v.). An easement cannot exist apart from an estate in land, it being necessary that there should be two tenements, the one enjoying the right (dominant), the other over which it is enjoyed (servient). An easement must be constituted by deed or by Prescription (q. v.). It may be extinguished by an actual or implied release. When a party entitled to the enjoyment of an easement is disturbed in that enjoyment, he may enforce his right by action at law, or he may enter upon the servient tenement, and abate the nuisance himself. The American law on the subject of easement is regulated by the same principles that prevail in England. See Kent's *Commentaries on American Law*.

EAST (Ger. *Ost*; allied probably to Greek *eos*, the morning, and Lat. *oriens*, the rising, i. e., sun) is, vaguely speaking, that quarter of the horizon where the sun rises, or which a person with his face to the south has on his left hand. It is only at the equinoxes that the sun rises exactly in the east point. A line at right angles to the meridian of a place points exactly east and west. See **MERIDIAN** and **HORIZON**.

From very early times, the east has been invested with a certain sacred character, or at least held in respect over other points of the compass. It was the practice of the ancient pagans to fix their altar in the eastern part of their temples, so that they might sacrifice towards the rising sun, which in itself was an object of worship.

The custom of venerating the east was perpetuated by the early Christian church from various circumstances mentioned in the sacred record. For example: 'The glory of the God of Israel came from the way of the east.'—Ezek. xliii. 2. 'There came wise men from the east to Jerusalem.'—Matt. ii. 1. 'And lo, the star, which they saw in the east, went before them.'—Matt. ii. 9. Tradition heightened respect for the east. It was said that Christ had been placed in the tomb with his feet towards the east, and that at the day of judgment he should come from the eastward in the heavens. Looking towards the sun in the east in praying or repeating the creed, was thought to put worshipers in remembrance that Christ is the son of righteousness, and such an attitude was accordingly adopted as an aid to devotion. From these various circumstances, the building of churches with the Chancel (q. v.) to the east, bowing to the east on uttering the name of Jesus, and burying with the feet to the east, were introduced as customs in the church. In recent times, there has been a general disregard to the practice of turning formally with the face to the east on repeating the creed, and, as is well known, the attempt to revive it by a party in the English church has caused considerable dispeace. It is a curious instance of the inveteracy of popular custom, that in Scotland, where everything that savored of ancient usage was set aside as popish by the reformers, the practice of burying with the feet to the east was maintained in the old church.

yards, nor is it uncommon still to set down churches with a scrupulous regard to east and west. In modern cemeteries in England and Scotland, no attention appears to be paid to the old punctilio of interring with the feet to the east, the nature of the ground alone being considered in the disposition of graves.

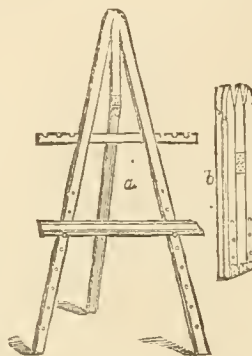
EAST CAPE, the name of the most easterly headlands of the island of Madagascar, of the North Island of New Zealand, and of Siberia or Asiatic Russia. The *first* is in lat. 15° 20' S., and long. 50° 15' E.; the *second* in lat 37° 40' S., and long. 178° 40' E., being almost precisely the antipodes of Carthage in Spain; and the *third* is that extremity of the Old World which is nearest to the New, being separated by Behring's Strait (q. v.) from Cape Prince of Wales in America. It is in lat. 66° 6' N., and long. 169° 38' W.; or rather, to follow the natural reckoning, 190° 22' E.

EAST INDIA ARMY. When the first East India Company (q. v.) first sent factors or agents to India, an army was not thought of. Military forces arose out of the exigencies of the times. Some of the first troops in the Company's pay were mere adventurers; some were liberated convicts; some deserters from European armies. Gradually, organization was introduced, and improved arms furnished. As the power of the Company increased, natives entered the battalions; until at length most of the troops were Hindus or Mohammedans, drilled by non-commissioned officers sent out from England. A few regiments were raised in England; a much larger number were raised in India; but all alike were officered by the Company's favored English officers, largely paid, and having many opportunities for making rapid fortunes. The ranks were filled by enlistment; the Company never compelled the natives to become soldiers; the pay offered was always such as to induce a sufficient number of men to enter. Their periods of leave of absence were liberal; and after a certain number of years' service, they retired on a pension sufficient to support them for the remainder of their days.

At the period immediately preceding the outbreak of the Revolt in 1857, the army in the pay of the Company comprised about 24,000 royal troops (lent to, and paid for by, the Company); 18,000 European troops, raised and drilled by the Company in England; 180,000 native regulars; and 60,000 native irregular horse—making about 280,000 in all. This large force was irrespective of 40,000 contingents furnished by dependent native princes, and of the native armies belonging to the independent and semi-dependent princes. The Company's troops formed three distinct armies, each under its own commander-in-chief, and each stationed in one particular presidency. In these three armies, three kinds of troops—Europeans, native regulars, and native irregulars—had their own special organization. In order to secure unity of action when necessary, it was customary to give the commander-in-chief of the Bengal army precedence over those of Madras and Bombay; he was, in effect, commander-in-chief of the whole of the Company's forces. There were too few English officers with the native regiments, and these, in most cases, knew too little of the men under their command. This was not the *cause* of the Revolt in 1857, but it was one of the circumstances that led to the rapid spread of the Revolt when once begun. To what extent this fine army melted away during 1857 and the two following years, is described under **INDIA**. Speaking generally, it may be said that the armies of the Madras and Bombay presidencies remained faithful, especially the infantry. It was in the Bengal army that the disruption chiefly occurred. The irregulars, both cavalry and infantry, raised amongst the Sikhs and Punjabees, were in almost every case faithful.

In August 1858, the act which transferred the government of India from the Company to the crown received the royal assent. The army was transferred as well as the political power. As the Sikhs had behaved well, most of the regiments from the Punjab were retained, as well as most of the native regiments in the Bombay and Madras presidencies; but it was not deemed expedient to restore the native regiments of Bengal proper, which had proved so treacherous. In that year, at the suggestion of Earl Canning, a committee was appointed to inquire into the whole circumstances relating to the reorganization of the army. The Company originated the inquiry, but the commissioners did not make their Report till after the transfer of the Company's powers to the crown. Although the commissioners' Report was presented in the summer of 1859, very little was effected during the remainder of that year, or in 1860, to reorganize the Indian army; matters were kept together in a provisional way. Meanwhile, when the European troops of the Company's army were turned over to the crown, a disturbance, amounting almost to a mutiny, occurred. The men claimed that, as they had enlisted into the Company's service, they ought not to be transferred without their own consent asked, or without receiving a bonus on re-enlisting. To prevent a dangerous excitement, the government allowed such as chose to retire.

In 1861, an act was passed reorganizing the Indian army. The British portion of it now forms part of the Queen's army gener-



Easel:
Of modern construction.
a, easel open for use; b, easel folded up.

ally, with certain honorary distinctions, and takes its turn at home and in the colonies like the rest; but the expenses are paid out of Indian, not imperial revenues. The *native* portion is managed wholly in India. During the Eastern crisis, a force of native Indian troops was sent to Malta; and in the Egyptian war of 1882, Indian troops fought with distinction along with their English fellow-subjects. On the reorganization of the Indian army in 1861, the 19th, 20th, and 21st Hussars, with the 101st to the 109th Regiments of Foot, were formed from the European troops previously in the service of the East India Company.

EAST INDIA COMPANY. On the 31st December 1600, a charter was granted by Queen Elizabeth to a number of London merchants, under the title of 'The Governor and Company of Merchants of London trading to the East Indies.' From the time when Vasco de Gama effected the eastern passage to India, by doubling the Cape of Good Hope, in 1497, the Portuguese carried on an extensive trade with that country, unaffected by rivals until nearly a century afterwards, when the Dutch and the English began to compete with them. This competition became formidable when two 'East India Companies' were established, one at Amsterdam, and one in London. It is of the latter of these that we here treat. The charter was exclusive, as is usual in such cases; prohibiting the rest of the community from trading within the limits assigned to the Company. Those limits were enormous, comprising the whole space, land and sea, from the Cape of Good Hope eastward to Cape Horn—i. e., the whole of the Indian and Pacific Oceans. The charter was for fifteen years. The Company speedily sent out ships to Java and Sumatra, which returned with calicoes, silk, indigo, and spices. It was then determined to make some kind of settlements on the coast of Hindustan itself; and about 1612, the Company obtained permission from the native princes to establish factories or agencies at Surat, Ahmedabad, Cambay, and Gogo.

The Company's charter was renewed from time to time, with various modifications, but not without much contention and difficulty. Gradually establishments were formed in Java, Sumatra, Borneo, Celebes, Malacca, Siam, the Banda Islands, and other places in the East; as well as on the Coromandel and Malabar coasts of India itself. The first beginning of Madras dates in 1640, of Calcutta in 1645, and of Bombay in 1665, as chief establishments of the Company. In 1662, Charles II. gave them permission 'to make war and peace on the native princes'—a privilege of which they largely availed themselves for nearly 200 years.

In 1698, the crown granted a charter to a *new* E. I. C., who offered a loan of £2,000,000 to the state; but this naturally led to wranglings, and the two companies were united into one by an act of parliament passed in 1702. The constitution then established was maintained with little alteration as long as the Company existed. Every shareholder who held £500 of the Company's stock became a member of the Court of Proprietors; and this court had legislative functions in all that related to the Company's affairs. The proprietors annually chose 24 to form a Court of Directors, from those of their number who held not less than £200 of stock.

Six of the directors went out of office every year; they retired in rotation; so that each had four years of office. It was a general custom with the proprietors to elect the same persons as directors over and over again. The Court of Proprietors was to meet once a year, or oftener if necessary; the Court of Directors as often as the directors chose, provided 13 were present. Theoretically, the constitution of the Company was very democratic; but practically the affairs were in the hands of the directors; for the proprietors took little other interest than in receiving their half-yearly dividends. The proprietors had from one to four votes each, according to the amount of stock held by them. The Board of Control, of later formation, bore relation to the governmental affairs of India.

Properly speaking, the Company were only merchants: sending out bullion, lead, quicksilver, woollens, hardware, and other goods to India; and bringing home calicoes, silk, diamonds, tea, porcelain, pepper, drugs, saltpetre, &c., from thence. Not merely with India, but with China and other parts of the East, the trade was monopolized by the Company; and hence arose their great trade in China, tea, porcelain, and silk. By degrees, avarice and ambition led the Company, or their agents in India, to take part in the quarrels among the native princes; this course gave them power and influence at the native courts, from whence arose the acquisition of sovereign powers over vast regions. India thus became valued by the Company, not only as commercially profitable, but as affording to the friends and relations of the directors opportunities of making vast fortunes by political or military enterprises. It is not the purpose of the present article to trace the political affairs of the Company or the rise of a British empire in India; that will be done under **INDIA, BRITISH**; it will suffice here merely to state that no *national* or *patriotic* motive marked the beginning of this course.

In 1744, the Company obtained a renewal of their charter till 1780, but not without a loan of £1,000,000 to government; for the

monopoly was distasteful to the nation at large. France, too, had an E. I. C., and the struggle between the two companies for power in the southern part of India, led to constant warfare between them during the remainder of the century. Other loans to government were the means of obtaining further renewals of the charter in later years. In 1833, the legislature took away all the *trading* privileges of the Company. The dividends to proprietors of East India stock were thence forward to be paid out of taxes imposed by the Company on the people of India, in such provinces as were under British dominion. From that year the Company's powers became anomalous; the Company could not *trade*, and could not *govern*, without the sanction and continued interference of the imperial government. The wars in India, since that year, have been waged by England as a nation, rather than by the Company; and England practically, though not nominally, became responsible for the enormous cost of those wars. In 1853, the charter was again renewed, with a further lessening of the power of the Company, and an increase of that of the Crown.

Had not the Indian Revolt occurred in 1857, the last charter would have remained in force until 1873; but that gigantic calamity led to the resolution—a resolution the wisdom of which was disputed by many of the best judges of Indian affairs—of concentrating the power in the hands of the imperial government. In spite of a strenuous resistance, in 1858, the Company were forced to cede their powers, by an act which received the royal assent on the 2d of August. The charter of 1853 had provided that £6,000,000 of India stock should have 10½ per cent. dividend *guaranteed* by England out of the revenues of India; and that parliament should redeem this stock at cent. per cent. premium any time after the year 1873. The act of 1858, therefore, contained due clauses for carrying out these provisions, and transferred the whole of the Company's powers to the Crown.

The Company continued to exist, but for little other purpose than that of receiving and distributing dividends. Most of the distinguished men, military and political, till then in the Company's service, accepted office under the Crown, to assist the government by their general knowledge of Indian affairs. These affairs are now managed by a Secretary in Council at the new India office. The valuable Library and Museum of the Company have passed over to the Crown; and an Act of Parliament (1873) provides for the paying off of the India stock, and the final extinction of the once-famous East India Company.

EAST INDIES, as distinguished from *West Indies*, include not merely the two great peninsulas of Southern Asia, but likewise all the adjacent islands from the delta of the Indus to the northern extremity of the Philippines. They thus extend, to use round numbers, in latitude from 35° N. to 10° S., and in E. long. from 65° to 130°. At one time, the name of India had, towards the east, a still wider application, occasionally comprising Japan, nay, everything in that direction except China alone. See **INDIA**.

EAST MAIN, formerly a portion of the Hudson Bay Territories, now incorporated in the Dominion of Canada, is bounded north by Hudson's Strait, and west by Hudson's Bay down to its southern extremity, meeting Labrador on the east, and Canada on the south. This immense region, thrice as large as Great Britain, is generally bleak and sterile, yielding little to commerce but fish-oil and a few furs.—A river of the same name, otherwise called the *Glade*, crosses its southern section, entering Hudson's Bay, here known as James's Bay, about lat. 52° 15' N., after a course of 400 miles.

EAST RIVER, the strait between Long Island Sound and New York Harbor. It is 20 miles long, separating New York City on the west from its suburbs, Williamsburg and Brooklyn, on the east. Its narrowest part is the Hurigate or Hellgate, which is about the middle of its course. Here the rocks, which once obstructed the passage, have been removed by blasting. The name—clearly a misnomer for an arm of the sea—is convenient as contrasted with the North River, or Hudson, and may have arisen from the river-like action of the tides—an action so powerful as to have here and there materially deepened the channel.

EASTBOURNE, a rising watering-place in the south-east of Sussex. It lies in a chasm, between two cliffs, one of which, 3 miles to the south-south-east, forms Beachy-Head. In the vicinity are fine drives and walks; and the town has a theater, ball-room and library. The church is very fine. Pop. of parish (1881), 24,977. Remains of a Roman villa, bath, and tessellated pavements have been found here.

EASTER (Ger. *ostern*, Fr. *paque*, Scot. *pasch*, from Gr. *pascha*, the passover), the festival of the resurrection of Jesus Christ, derives probably its Teutonic name from the festival of the goddess Ostara, in Ang.-Sax. Eastre, which the Saxons of old were wont to celebrate about the same season at which the Christian festival of Easter occurs. In the ancient church, the celebration of Easter lasted eight days. After the 11th c., however, it was limited to three, and in later times, generally to two days. It was formerly the favorite time for performing the rite of baptism. The courts of

justice were closed, and alms dispensed to the poor and needy, who were even feasted in the churches—a custom which led to much disorder. Slaves also received their freedom at that season; and as the austerities of Lent were over, the people gave themselves up to enjoyment; hence the day was called the 'Sunday of joy' (*Dominica gaudii*). To the popular sports and dances were added farcical exhibitions, in which even the clergy joined in some places, reciting from the pulpits stories and legends, with a view to stir the hearers to laughter (*risus paschalis*). Against this indecency, the Reformers of the 16th c. loudly and successfully raised their voices. During the whole week before Easter—that is, in the interval between Palm Sunday and the beginning of the Easter festival—daily services were held. See PASSION WEEK and GOOD FRIDAY.

On Easter day, the people saluted each other with the Eastern kiss, and the exclamation *Surrexit* (He is risen); to which the reply was *Vere surrexit* (He is risen indeed). The chief solemnity always consisted of the celebration of the Lord's Supper.

The proper time for the celebration of Easter has occasioned no little controversy. In the 2d c., a dispute arose on this point between the Eastern and Western Churches. The great mass of the Eastern Christians celebrated Easter on the 14th day of the first Jewish month or moon, considering it to be equivalent to the Jewish Passover. The Western churches celebrated it on the Sunday after the 14th day, holding that it was the commemoration of the resurrection of Jesus. The Council of Nice (325 A.D.) decided in favor of the Western usage, branding the Eastern usage with the name of the 'quartodeciman' heresy. This, however, only settled the point that Easter was to be held, not upon a certain day of the month or moon, but on a Sunday.

The proper astronomical cycle for calculating the occurrence of the Easter moon was not determined by this council. It appears, however, that the Metonic Cycle (q. v.) was already in use in the west for this purpose; and it was on this cycle that the Gregorian Calendar, introduced in 1582, was arranged. The method on which this calendar is constructed is too complex for description here. An elaborate account of the whole matter was published by Professor De Morgan, in the *Companion to the British Almanac* in 1845, and to this the reader is referred. The time of Easter being the most ancient and important of all the movable feasts of the Christian Church, determines all the rest. It was debated, at the time of the introduction of the Gregorian Calendar, whether Easter should continue to be movable, or whether a fixed Sunday, after the 21st of March, should not be adopted. It was deference to ancient custom that led the ecclesiastical authorities to adhere to the method of determination by the moon. It must be remembered, however, that it is not the actual moon in the heavens, nor even the mean moon of astronomers, that regulates the time of Easter, but an altogether imaginary moon, whose periods are so contrived that the new (calendar) moon always follows the real new moon (sometimes by two, or even three days). The effect of this is, that the 14th of the calendar moon—which had from the times of Moses, been considered 'full moon' for ecclesiastical purposes—falls generally on the 15th or 16th of the real moon, and thus after the real full moon, which is generally on the 14th or 15th day. With this explanation, then, of what is meant by 'full moon,' viz., that it is the 14th day of the calendar moon, the rule is, that Easter Day is always the first Sunday after the paschal full moon, i. e., the full moon which happens upon or next after the 21st of March (the beginning of the ecclesiastical year); and if the full moon happens upon a Sunday, Easter Day is the Sunday after. For any given year, the day on which the paschal full moon falls, and then Easter Day, are found by the following table and rule—

Days of the Month.	Dom. Letter.	Golden Number.	Days of the Month.	Dom. Letter.	Golden Number.
March 21	C	14	April 9	A	15
" 22	D	3	" 10	B	4
" 23	E	..	" 11	C	..
" 24	F	11	" 12	D	12
" 25	G	..	" 13	E	1
" 26	A	19	" 14	F	..
" 27	B	8	" 15	G	9
" 28	C	..	" 16	A	..
" 29	D	16	" 17	B	17
" 30	E	5	" 18	C	6
" 31	F	..	" 19	D	..
April 1	G	13	" 20	E	..
" 2	A	2	" 21	F	..
" 3	B	..	" 22	G	..
" 4	C	10	" 23	A	..
" 5	D	..	" 24	B	..
" 6	E	18	" 25	C	..
" 7	F	7			
" 8	G	..			

First ascertain the Dominical Letter (q. v.)—taking the second, where there are two—and the Golden Number (see EPACT); look for the golden number in the third column of the table, and opposite to it stands the day of the full moon; then look for the dominical letter, next after the day of full moon, and the day standing opposite the dominical letter is Easter Day.

It sometimes happens that Easter Day, as thus determined, is different from what it would be if by 'full moon' were understood the astronomical full moon. Thus, in 1818, Easter Day, by the calendar, fell, and was celebrated on the 22d of March, the earliest possible day, although the full moon was on that day; and in 1845, it again fell on the day of the actual full moon (the 23d March).

One object in arranging the calendar moon was, that Easter might never fall on the same day as the Jewish Passover. They did occur together, however, in 1805, on the 14th of April; and in 1825, on the 3d April; and will do so again in 1903, on the 12th April; in 1923, on the 1st April; in 1927, on the 17th April; and in 1981, on the 19th April. The Jewish festival usually occurs in Passion week, and never before the 26th of March, or after the 25th of April (new style). On the other hand, the Christian festival is never before the 22d of March, or after the 25th of April. In 1761 and 1818, Easter fell on the 22d of March; but neither in this nor the following century will such be the case again. In 1913, it will fall on the 23d of March, as it did in 1845 and 1856. The latest Easters in this century and the following, occur in 1886 and 1943, on the 25th of April. In 1848, Easter fell on the 23d of April; and in 1859, on the 24th of April.

Popular Observances.—Many of the popular observances connected with Easter are clearly of pagan origin. The goddess Ostara or Eastre seems to have been the personification of the morning or east, (q. v.), and also of the opening year or spring. The Anglo-Saxon name of April was *Estormonth*; and it is still known in Germany as *Ostermonath*. The worship of this being seems to have struck deep root in Northern Germany, and was brought into England by the Saxons. It continued to be celebrated in many parts in the north of Germany down to the beginning of the present century, by the kindling of bonfires and numerous other rites. See BELTEIN. Like the May observances of England, it was especially a festival of joy. With her usual policy, the Church endeavored to give a Christian significance to such of the rites as could not be rooted out; and in this case the conversion was particularly easy. Joy at the rising of the natural sun, and at the awaking of nature from the death of winter, became joy at the rising of the Sun of Righteousness—at the resurrection of Christ from the grave. The bonfires can be traced in the great 'paschal tapers,' sometimes weighing 300 lbs., with which the churches were lighted on Easter Eve. In the ancient church disbursements of St. Mary-at-Hill, in the city of London, there is even an entry 'For a quarter of coles for the hallowed fire on Easter Eve, 6d.'

The most characteristic Easter rite, and the one most widely diffused, is the use of *Pasch* (i. e., Easter) eggs. They are usually stained of various colors with dye-woods or herbs, and people mutually make presents of them; sometimes they are kept as amulets, sometimes eaten; games are also played by striking them against one another. In some moorland parts of Scotland, it used to be the custom for young people to go out early on 'Pasch Sunday' and search for wild-fowls' eggs for breakfast, and it was thought lucky to find them.

There can be little doubt that the use of eggs at this season was originally symbolical of the revivification of nature—the springing forth of life in spring. The practice is not confined to Christians; the Jews used eggs in the feast of the Passover; and we are told that the Persians, when they keep the festival of the solar new year (in March), mutually present each other with colored eggs.

From the Christian point of view, this 'Feast of Eggs' has been usually considered as emblematic of the resurrection and of a future life.

EAST SAGINAW, a city of Michigan, U.S., 17 miles from the mouth of the Saginaw River. It has trade in lumber and salt. Pop. (1880) 19,016.

EASTER ISLAND, originally DAVIS'S LAND, is a detached spot on the Pacific, in lat. 27° 20' S., and long. 109° 30' W. It is of volcanic origin, rising 1200 feet above the sea; and it is moderately fertile, but almost destitute of water. It belongs to the Polynesian archipelago, of which it forms the south-easterly extremity. On this island, of thirty miles' circumference, and inhabited by less than 2000 wretched savages, there exists multitudes of rude stone statues, some of them of colossal size, and standing on long platforms of Cyclopean masonry. The present inhabitants, whose language is radically the same as that of Tahiti, have no tradition of the race that made them. The existence of these sculptures is thought to strengthen the conclusion, arrived at on other grounds, that the Polynesian islands are relics of a submerged continent.

EASTER OFFERINGS, or **EASTER DUES**, small sums paid to the parochial clergy in England by their parishioners at Easter, as a compensation for personal tithes, or the tithe for personal labor.

EASTER TERM, LEGAL. For a general history of the law terms in England, see **LAW TERMS**. Easter Term was formerly dependent upon the movable feast of Easter, and was hence called a movable term. It commenced on the Wednesday fortnight after Easter Sunday, and lasted till the following Monday three weeks. But by 11 Geo. IV. and 1 Wil. IV. c. 70, amended by 1 Wil. IV. c. 3, Easter Term now begins on 15th April and ends on 8th May. If any of the days between the Thursday before and the Wednesday after Easter fall within term, no sitting in Banc (q. v.) are held on those days, and the term is prolonged a corresponding number of days.

EASTLAKE, SIR CHARLES LOCK, President of the Royal Academy of London, was born at Plymouth in 1795, educated at the Charter house in London, and entered as a student at the Royal Academy. Subsequently, he went to Paris, where he studied and copied the great paintings then collected in the Louvre. The return of Napoleon from Elba compelled him to leave France. He went back to his native town, and supported himself by portrait-painting. When the *Bellerophon*, with Napoleon on board, appeared in the port of Plymouth, E. profited by the opportunity, and produced his first important picture, 'Napoleon at the Gangway of the *Bellerophon*, attended by some of his Officers.' In 1817, Sir Charles visited Italy and Greece, sketching assiduously in both countries. During a residence of several years in Rome, he executed his 'Girl of Albano leading a Blind Woman to Mass,' 'Isidas the Spartan,' 'Pilgrims arriving in Sight of Rome,' and many others, illustrative of Italian customs and scenery.

In 1827 he was elected an Associate, and in 1830 a full member of the Royal Academy. His 'Greek Fugitives Prisoners to Banditti,' &c., added to his already great reputation; and in 1841 appeared what many conceive to be his master-piece, 'Christ lamenting over Jerusalem.' It was immensely admired, the duplicate painted for Mr. Vernon being reckoned one of the most valuable pictures in the Vernon Gallery. 'Hagar and Ishmael' was exhibited in 1844; 'Heloise' in 1845; 'The Escape of Francesco Novello di Carrara with Taddea d'Este, his Wife, from the Duke of Milan,' in 1850; 'Beatrice' in 1855, &c. In 1850, he was elected President of the Royal Academy, when he received the honor of knighthood. Subsequently, he was appointed Director of the National Gallery, in which capacity his services were of the highest importance; for besides its improved arrangement, many of the most valuable specimens of the best schools were added to the collection. Sir Charles also acquired a high reputation as a writer on art. In 1847, he published *Materials for the History of Oil Painting*, a work of great learning and research. He contributed several articles to the *Penny Cyclopædia* on subjects belonging to his profession, and executed a translation of Goethe's *Farbenlehre*. In 1853, he received the title of D.C.L. from the university of Oxford. He died December 1865.—**LADY EASTLAKE** (born Elizabeth Rigby) is an artist of no mean power, and also has distinguished herself as an authoress by her *Letters from the Baltic, Livonian Tales*, and her articles on subjects connected with art in the *Quarterly Review*.

EASTON, a flourishing town of Pennsylvania, in the United States, stands in the fork between the rivers Delaware on the east and Lehigh on the west, about 20 miles above the head of navigation on the united streams. Though the place is thus far cut off from the sea, yet, for internal trade, it clearly occupies a commanding position. Its natural advantages, too, have been largely improved. To say nothing of railways, E. is the common terminus of three canals—one of 60 m., down on the right side of the Delaware as far as Bristol; another of 84 m., along the Lehigh, into the great coal-field of the state; and the third of 102 m., leading across the country to Jersey City. Within the immediate neighborhood, likewise, iron ore and limestone abound. Having an unlimited supply of water-power, the town possesses extensive manufactories. It is the seat of Lafayette College, founded in 1832. Pop. (1880) 11,924.

EASTPORT, a garrison-town of Maine, in the United States, is situated on one of the small islands of Passamaquoddy Bay, which receives the St. Croix, the international boundary during its whole course between the United States and British America. On the coast, therefore, E. may be said to be the frontier town of the Union towards the north-east. Its harbor is deep enough for the largest vessels. The tide rises within it to a height of 25 feet—a height far exceeded in many other parts of the Bay of Fundy, of which Passamaquoddy Bay is an inlet. The place is largely engaged in the fisheries and in ship-building. Pop. (1870) 3738.

EAU CRÉOLE, a very fine liqueur, made in Martinique, by distilling the flowers of the Mammea Apple (*Mammea Americana*) with spirit of wine.

EAU DE COLOGNE, a celebrated perfume, invented long ago by the Farina family in Cologne, and since manufactured chiefly by members of the same family. It is also made in France. It consists principally of spirits of wine, along with numerous essential oils harmoniously mingled together so as to produce a refreshing and grateful scent. The recipe said to be followed in the manufactories at Cologne is twelve drops of each of the essential oils neroli, citron, bergamot, orange, and rosemary, along with one drachm of Malabar cardamoms, and one gallon rectified spirit. The whole is distilled together, and the condensed liquid constitutes Eau de Cologne.

EAU DE JAVELLE is a solution of hypochlorite of potash, which, when administered to man, is stated to act powerfully on the nervous system, and to give rise to general rigidity, and even to cause tetanic spasms.

EAU DE LUCE is the name given to a preparation which was formerly a very popular stimulant, and is still occasionally used. It is a mixture of oil of amber with alcohol and ammonia, and has a milky appearance. It had a great reputation in cases of snake-bites.

EAU DE VIE. See **BRANDY**.

EAUX BONNES a fashionable watering-place of France in the department of Basses-Pyrenees, is situated 20 miles south-south-east of Oloron. It stands in a narrow gorge surrounded with rocks, and consists of a street of about 30 large and well-built hotels and lodging-houses. On the opposite side of the street there is an open space laid out as a shrubbery, and planted with trees; it is called the Jardin Anglais. E. B. is much frequented on account of its hot sulphureous springs, which are four in number, and are used for bathing purposes. Their temperature does not exceed 91° F. There is also a cold spring here, which is used for drinking. The springs are said to be very valuable, on account of their power of checking the progress of incipient consumption, and of curing various affections of the lungs and chest. The season of the E. B. lasts from June to October, and during that time it is crowded with visitors and patients.

EAUX CHAUDES, LES, three miles south-west of the preceding, is a similar place of resort. Its springs have the same properties as those of the Eaux Bonnes.

EAVES, in Architecture, the edge of a sloping roof which overhangs the wall, for the purpose of throwing off the water. When there is no concealed gutter at the margin to conduct the water to spouts or pipes, but the water is allowed to run from the roof to the ground, they are called *Dripping Eaves*.

EAVESDRIP, or **EAVESDROP** (Ang.-Sax. *yfesdryspe*). 'The owner of a private estate,' says Kemble (*Saxons in England*, vol. i. p. 45), 'was not allowed to build or cultivate to the extremity of his own possession, but must leave a space for eaves. The name for this custom was yfesdryspe.' The space was regulated by the charter by which the property was held. In a charter of 868 A.D., it is limited to two feet. This Saxon custom corresponded to the well-known urban servitude of the Romans called *stillicidium* (*stillicidium*). The eavesdrop was the water which dropped from the projecting roof, and in this sense is opposed to the water collected in a spout, to which the Romans gave the name of *flumen*. Similar regulations existed in Greece, and have probably existed in all countries.

EAVES-DROPPERS 'are such as listen under walls or windows, or the eaves of houses, to hearken after discourse, and thereupon to frame slanderous or mischievous tales.'—Blackstone's *Comm.* iv. 168. Such persons are, by the law of England, regarded as common nuisances: they may be indicted at the sessions, and on conviction, are punishable by fine. Persons who by their conduct expose themselves to suspicion of an intention to commit this offence, may be brought before a magistrate, and required to give security for their good behavior; 34 Edw. III. c. 1. See Hawk., P. C., l. 62, sec. 4.

EBB AND FLOW. See **TIDES**.

EBENACEÆ, a natural order of exogenous plants, consisting of trees and shrubs, with alternate leathery leaves, and axillary flowers, which are monopetalous, somewhat leathery, and generally unisexual; the fruit fleshy. They have not a milky juice. They are regarded as allied to *Aquifoliaceæ* (Holly, &c.), *Apocynaceæ*, and *Oleaceæ*. About 160 species are known, mostly tropical, but a few are natives of Europe, and other temperate countries. The wood is in general remarkable for its hardness, as the different kinds of Ebony (q. v.) and other species of *Diospyros*; and on account of this quality, even that of species which never attain the ordinary size of timber trees is sometimes accounted valuable, as of *Royena lucida*, the African Bladder-nut or Zwart-bast, at the Cape of Good Hope; where also that of *Euclea undulata*, a hard

brown wood, is esteemed for cabinet-work. The fruit of many species is eatable. See DATE PLUM. The fruit of *Embryopteris gelatinifera* contains a viscid juice, and is used in all parts of India for paying boats.

EBERHARD, AUG. GOTTLÖB, a well-known German author, was born at Belzig in 1769, studied at Leipsic and Halle, and first attracted attention by his contributions to a periodical devoted to *belles-lettres*, entitled *Ida's Blumenkörbchen* (Ida's Flower-basket). Among his numerous works may be mentioned *List um List, oder was ein Kuss nicht vermag* (Trick for Trick, or what could not a Kiss do); *Ysop Lafleur's Sämmtliche Werke* (Ysop Lafleur's Collected Works); *Ferdinand Werner, der Arme Flötenspieler* (Ferdinand Werner, the poor Flute-player); and *Ischarioth Krall's Lehren und Thaten* (Ischariot Krall's Doctrines and Doings); *Hänschen und die Küchlein* (Jennie and the Chickens), a narrative poem in ten parts, which has gone through many editions, and been often translated into other languages; and *Der erste Mensch und die Erde* (The First Man and the Earth), a poem marked by simple dignity and lively representation. E., after a life of hard literary work, died at Dresden, 13th May 1845.

EBERHARD, JOHANN AUGUST, a philosophical writer of Germany, was born at Halberstadt, 31st August 1739; studied theology at Halle, 1756—1759; and after spending several years as a preacher in Berlin and Charlottenburg, became Professor of Philosophy at Halle in 1778, and Doctor of Theology in 1808. He died 6th January 1809. E.'s first work was his *Neue Apologie des Sokrates* (New Apology of Socrates), 2 vols., Berlin, 1772; a work in which the rights of common sense are vindicated against the accusations of a narrow theology. It was received with much applause both in Germany and in other countries.

Among his other writings may be mentioned, *Sittenlehre der Vernunft* (Ethics of the Reason), Berlin, 1781; *Theorie der schönen Künste und Wissenschaften* (Theory of the Fine Arts and Sciences), Halle, 1783; *Allgemeine Geschichte der Philosophie* (Universal History of Philosophy), Halle, 1788; *Handbuch der Aesthetik* (Manual of Aesthetics), 4 vols., Halle, 1803—1805; and *Versuch einer allgemeinen Deutschen Synonymik* (An Attempt towards a Complete Work on German Synonyms), 6 vols., Halle, 1795—1802, a work which was enriched and improved by Maas, 1818—1821, and again by Gruber, 1826—1830, but which was, at the time of its appearance, the best thing of the kind in the German language. Towards the close of his life, E. struggled, but without success, against the speculative excesses of the new schools of philosophy headed by Kant and Fichte. E. was a clear and sensible thinker, as well as an agreeable and interesting writer.

EBERNBURG, a small town in the Bavarian Palatinate, is situated about 20 miles south-west of Mayence, at the junction of the Alsenz with the Nahe. It is notable on account of the ruins of its castle, which formerly belonged to the famous knight Franz von Sickingen, who was a devoted friend of the early reformers. His stronghold, which was once considered almost impregnable, afforded a secure retreat from danger and persecution to Melancthon, Bucer, Ecolampadius, and Ulrich von Hutten, the last of whom composed several of his works here. After the death of Sickingen, the castle of Ebernburg was besieged and dismantled by the Electors of Hesse and of Treves. Pop. about 500.

EBERS, GEORGE MORITZ, a distinguished Egyptologist and novelist, was born 1st March 1837 at Berlin, and studied law at Göttingen. He afterwards took up the subject of Egyptology at Berlin, and recovering from a long illness, established himself as a lecturer at Jena, where in 1868 he was made Professor. Next year he made a long journey to the East, and in 1870 was called to Leipzig. His best known work is *Eine Aegyptische Königstochter* ('An Egyptian Princess'), in which a very interesting novel-plot is made the framework for the communication of much profound and accurate Egyptological lore. He has written other Egyptian novels (as *Uarda, Homo Sum*), and some on German subjects. Other learned works are: *Aegypten und die Bücher Moses*; *Durch Gosen zum Sinai*; *Papyrus Ebers*; and a work translated on *Egypt, Historical and Descriptive*.

EBERT, KARL EGON, a Bohemian poet, was born at Prague, 5th June 1801; was educated there and at Vienna; and after filling several situations, settled in Prague. The honor of knighthood was conferred on him in 1871. His chief works are his *Dichtungen* (2 vols., 1824; 3d ed., 1845); *Wlasta, ein Böhmisches nationales Heldengedicht in drei Büchern* (Wlasta, a Bohemian National Heroic Poem, in three Books), Prag, 1829; and *Das Kloster, idyllische Erzählung in fünf Gesängen* (The Cloister, a Narrative Idyll, in five cantos), Stutt. 1833. These poems, especially the last two, are marked by lyrical vehemence, and elegance of language. They were received with applause, particularly in Bohemia, whose national traditions form their groundwork. E.'s compositions show a happy union of the German and Czech characteristics. He has also written a number of dramas, of which *Das Gelübde* (The Vow) (1864) was received with public favor at Prague. He has also published some meritorious lyrical poetry.

E'BIONITES (Heb. *ebion*, poor), a name probably given originally by the hierarchical or influential party among the Jews, to those of their countrymen who professed the Christian faith, and who generally belonged to the poorer and more ignorant class (John, chap. vii., verses 48, 49). Subsequently, it would seem, the Gentile Christians, who were ignorant of Hebrew, employed it in a distinctive sense to designate their Jewish co-religionists, who, in addition to their belief of Christianity, observed the Mosaic law. Irenæus is the first writer who makes use of the name. It is highly probable that the E. first became an organized body or sect at Pella, a city in Peraea, on the eastern side of the Jordan, whither they had betaken themselves on the breaking out of the Roman-Jewish war in the time of Hadrian. Here, indeed, a strictly Jewish-Christian church continued to exist down to the 5th century. Among the E., however, there was by no means a unanimity of religious feeling, or uniformity of opinion. Two great divergent parties are clearly recognizable—the E. proper, and the Ebionitic Nazarenes. The former were little different from Jews: their conceptions of the Saviour were meagre and unspiritual. They believed that Jesus was simply a man distinguished above all others for legal piety—pre-eminently a Jew, and selected as the Messiah because of his superior Judaism. Of course they denied his supernatural birth, yet not his resurrection; for they lived in expectation of his speedy return to restore this city of God (Jerusalem), and to re-establish the theocracy there in surpassing splendor.—Neander. They were the genuine descendants of those Judaizers who plagued the church in the time of the Apostle Paul. The Ebionitic Nazarenes, on the other hand (who at the close of the 4th c. seem to have dwelt chiefly about Berea in Lower Syria, but at an earlier period may have been more widely diffused), were Jewish Christians, in the better sense of the term. They conceived it to be their own duty still to circumcise, keep the Sabbath, &c., but they had no wish to impose the peculiarities of Judaism on the Gentile Christians. They did not believe that Christianity was merely a glorification of Judaism, but a new life come into the world, in which the Gentile might at once participate, without undergoing a Mosaic ordeal. Like the stricter E., they used a *Gospel of Matthew*; but it contained what the other did not—an account of the supernatural conception and birth of the Saviour. According to Neander, who has very thoroughly investigated this question, there were a great many varieties of opinion among the E., springing out of the differences above spoken of, which it would be tedious to record. It is sufficient to say that *Essenism* (q. v.) modified Ebionism greatly, through the introduction of a Jewish mysticism, which recognized in Moses and Christ an inward identity of doctrine, and regarded them as revealers of the 'primal religion,' whose teaching, however, had been sadly corrupted. It is extremely probable that an Essenic Ebionite wrote the *Clementine Homilies*. See CLEMENS.

E'BOLI (ancient *Eburi*), a small town of Southern Italy, in the Principato Citeriore, about 16 miles east-south-east from Salerno, is picturesquely situated at a considerable elevation above sea-level. The climate, which does not become too cold in winter, notwithstanding the position of the town, is very unhealthy in summer, owing to the number of streams in the neighborhood. There is an annual fair at E., which lasts 12 days. Pop. 7300.

E'BONY (Lat. *ebenum*; but originally from the Eastern name), a wood remarkable for its hardness, heaviness, and deep black color, is the heart-wood of different species of *Diospyros*, of the natural order *Ebenaceæ*, the same genus which produces the Date Plum (q. v.), Kaki, and other fruits. The best E., excelling in uniformity and intensity of color, is the produce of *D. Ebenum*, which grows in great abundance in some of the flat parts of Ceylon, and is a tree of such magnitude, that logs of its heart-



Ebony (*Diospyros Ebenum*).

in length, are easily procured. *D. melanoxylon*, the E. tree of Coromandel, yields E. of good quality; *D. tomentosa*, *D. Roylei*, and other Indian species, also yield it. In Mauritius and Madagascar, E. of very good quality is produced by *D. reticulata*. Other species of *Diospyros* are much valued for their beautiful timber, very different in color from E., as Calamander Wood (q. v.) and Cadooberia (*Diospyros Ebenaster*). The last-named species is found in India and Ceylon. The prevailing black of the wood is beautifully striped with a rich yellowish-brown; but in density and

durability it is far inferior to ebony.—E. is chiefly used by cabinet-makers for veneering. The ancient Greeks and Romans were acquainted with it; and it is supposed that they obtained it either from India or Madagascar. They frequently inlaid it with ivory, for contrast of color. It is mentioned by Ezekiel (xxvii. 15) as an article of Tyrian commerce. It was at one time used in medicine, as a laxative and sudorific; it has a somewhat pungent taste.—The name E. is sometimes given to the black wood of trees very different from those of the genus *Diospyros*. An Abyssinian tree called Mozzungia (*Fornasinia*), of the order *Leguminosæ*, produces a black heavy wood, much resembling ebony.—WEST INDIAN E. or AMERICAN E., is produced by *Brya ebenus*, also of the natural order *Leguminosæ*, but the wood is of a greenish-brown rather than a black color. It receives a good polish, is very hard and durable, and much sought after by musical instrument-makers. It is one of the articles of export from the West Indies to Britain. But the tree is of small size, seldom more than 12 feet high, and the trunk only a few inches in diameter.

E' BRO (Lat. *Iberus*), an important river of Spain, rises in the province of Santander, at a point greatly elevated above the level of the sea, about 12 miles north-west of Reynosa, flows south-east for about 25 miles; then east past Frias, after which it maintains a general south-east course, passing Miranda, Haro, Logroño, Tudela, and Zaragoza, when it turns north, passes Mequinenza, flows south-east to the Mediterranean, into which it falls after a course of about 540 miles. Its mouth is choked up with sand, and, to render it navigable, a canal called the San Carlos has been carried through the delta. Its principal affluents are the Najerilla, Jiloca, and Guadalupe from the right, and the Aragon, Gallego, and Segre from the left. The course of the E. is chiefly through narrow, and sometimes rocky valleys; and its bed is characterized by many shoals and rapids which interrupt the navigation. This is partly remedied, however, by means of the Imperial Canal, which extends from the vicinity of Tudela to a point 40 miles below Zaragoza.

ECBATANA (Agbatana, Achmēta, Hagmatana), the ancient capital of Media, situated at a distance of 12 stadia (about 1½ mile) from Mount Orites, the modern Elwend. Its foundation was attributed by popular belief to Solomon or Semiramis, while the book of Judith ascribes it to Arphaxad (Phraortes?), and Herodotus to Deioeces (728 B.C.). It lay upon a conical hill, crowned by a temple of the Sun, and was enclosed by seven concentric walls, the innermost of which was gilded, and the next plated with silver; while the rest, in their order outwards, were painted orange, blue, scarlet, black, and white, respectively. As they rose in gradation towards the center, all the battlements with their gorgeous hues—probably representing, in Sabeian fashion, the seven planetary spheres or the seven climes—were visible at once. The city is reported to have been 250 stadia in circumference. Its principal buildings were the citadel—a stronghold of enormous dimensions, where also the archives were kept, in which Darius found the edict of Cyrus the Great concerning the rebuilding of the temple in Jerusalem—and the royal palace. Cedar and cypress only were used for the workwork, and the ceilings, beams, and rafters were overlaid with gold and silver. The mild climate and the magnificence of its structure singled out E. as the favorite summer residence, first of the Median, then of the Persian, and, lastly, of the Parthian monarchs. After the battle of Arbela (331 B.C.), Alexander followed Darius thither, and secured an immense booty. It was again pillaged by the Seleucidae; but such were the riches of this place, that Antiochus the Great still found 4000 talents' worth of silver to carry away. E. subsequently fell into the hands of the Parthians; and it has since so utterly sunk into decay, that notwithstanding the frequent mention that is made of it both in the Bible and in classical writings, its very site can no longer be fixed with certainty. Gibbon and Jones tried to identify it with Tabriz or Tauriz; Williams, with Ispahan; while recent explorers, such as Rennell, Mannert, Kinneir, Morier, and Ker Porter, generally agree that the present Hamadan, with the supposed tombs of Mordechai and Esther (see HAMADAN), occupies the site of ancient Ecbatana.

Sir Henry Rawlinson assumes two Ecbatanas, one the present Hamadan, the other the present Takhti-Suleiman, 36° 25' N. lat., 47° 10' W. long. Both the orthography of the scriptural Achmēta, and the cuneiform Hagmatana in the Behistun Inscriptions, which, by changing the *m* into *b*, became Agbatana in Greek, seem to point to Hamadan. Broken columns, a few cuneiform inscriptions, coins, medals, and a fragmentary stone lion, placed there, according to the Eastern legend, by the sorcerer Apollonius of Thyane, at the command of Nebuchadnezzar, in order to guard the town from excessive cold and snow—all dug out near Hamadan—are all that now remains of that once most royal of cities.—There was another ECBATANA in Persis, which was given to the Magi; and a third in Syria, at the foot of Carmel, the present Kaiffa, where Cambyses, the son of Cyrus, suddenly died, 520 B.C.

ECCE HOMO (Lat. 'Behold the man') the name usually given by artists to paintings representing Christ bound and crowned with thorns previous to his being led forth to crucifixion. On this exalted subject the highest efforts of art have been employed.

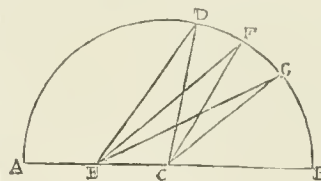


Ecce Homo.

The finest 'Ecce Homo' is that of Correggio, in the National Gallery, London; the whole conception of this remarkable picture being of the first order of genius. Other conceptions have been painted, such as that of Guido, a copy of which is given in the annexed illustration. See Dr. Waagen's *Art and Artists in England*.

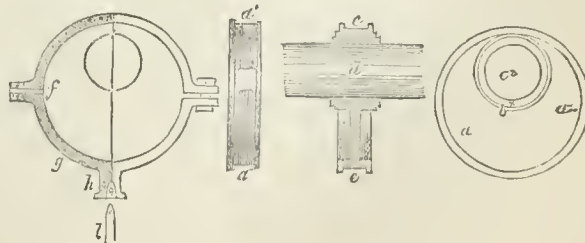
ECCENTRIC, or ECCENTRIC CIRCLE (in the Ptolemaic Astronomy). It was a fundamental doctrine with the ancient astronomers, that every heavenly body moved in a circle (the perfect figure), and at a uniform rate. To move otherwise than uniformly and in the perfect figure, would have been unbecoming a heavenly body! But some of them appeared to misbehave by moving unsteadily, and in other figures than circles. Of course this was a mere deceptive appearance; but then, to save the fundamental doctrine, it must be explained. To explain it, they invented the *eccentric circle*.

Suppose a body, such as the sun, to move in a circle ADB at a uniform rate, and a spectator to observe it, not from C, the center of the circle, but from E. Then, if the sun's movement in a given time be from D to F, and in an equal interval thereafter be from F to G, a spectator at C would observe these movements as being circular and made in equal times, because at C, DF and FG, being equal, subtend equal angles. But if the spectator, instead of being at C, be at E, then, as the angles



DEF, FEG are unequal, the sun's motion will not appear to be uniform, nor will his path appear to be circular. If, then, the earth, instead of being at the center of the sun's orbit, be in a position away from it, the want of regularity in his movements will be explained. He will appear to describe unequal spaces in equal times. Accordingly, to reconcile the observed fact with the fundamental doctrine, the ancients placed the earth at E, a point away from the center of the sun's supposed orbit. Hence this orbit was called the *Eccentric*, in respect that its center did not coincide with that of the earth, which was considered as the center of the universe.

ECCENTRIC, in Machinery, is a contrivance for taking an



alternating rectilinear motion from a revolving shaft. It consists

or a circular disc or pulley, fixed on a shaft or axis which does not pass through the center of the disc. The right-hand figure of the cut represents a side-plan of an eccentric; *aa* the disc, the center of which is at *b*; the inner circle is the shaft, with its center at *c*; *ee* is a section along the axis of the shaft *d*; and *a'a'* an edge-view. A hoop, *gf*, embraces the groove *a'a'*, allowing the disc to turn within it. As the eccentric revolves with the axis, the hoop is alternately raised and lowered, and with it the rod *l*, which is keyed into it at *h*. The extent of the rise and fall of the rod is equal to twice *eb*, the distance between the centers. The eccentric is chiefly used where a subsidiary motion of small power is required; as for working the force-pump that supplies the boiler of a steam-engine (q. v.).

ECCENTRICITY. See fig. to art. **ECCENTRIC CIRCLE.** In such a figure as the eccentric circle, the eccentricity is the ratio of EC to the radius. In the ellipse and Hyperbola (q. v.), the eccentricity is the ratio of half the distance between the foci to the semi-major axis. In older mathematical works, eccentricity is sometimes used as the name of half the distance between the foci of an ellipse or hyperbola.

ECCHYMOSIS (Gr. from *ek*, out of, and *chymos*, juice), a discoloration of the surface, produced by blood effused below, or in the texture of, the skin. It is usually attended by swelling to a greater or less extent, and is the result of injury. The presence of ecchymosis is sometimes adduced in courts of law as a proof of violent injuries having been inflicted during life, or very shortly after death. A question with respect to this was raised in the celebrated case of Burke and Hare, the West Port murderers in Edinburgh. Ecchymosis may sometimes be diminished by applying cold cloths or a bladder of ice to the surface, in the case of injuries quite recently inflicted.

ECCLESFIELD, a township in the West Riding of Yorkshire, five miles north of Sheffield. Pop. (1881) 21,158. The chief manufacture is cutlery, but flax, linen, and nails are also branches of industry. There are coal and iron mines in the vicinity.

ECCLESIASTES (Eng. the Preacher), the title (taken from the Septuagint) of a canonical book of the Old Testament; its Hebrew name is *Kohleth*, which signifies nearly the same. The inscription with which it commences is: 'The words of Kohleth, the son of David, king in Jerusalem.' Its authorship is commonly ascribed to Solomon. In support of this opinion, however, there is not a vestige of internal evidence except what arises from the dramatic use of his name, an expedient in all probability resorted to by the writer to give force and emphasis to his own reflections, inasmuch as Solomon was held by the Jews to be the perfection of human wisdom. The first who doubted the Solomonian authorship of the book was Grotius. Later critics have advanced further than Grotius. The actual writer probably flourished, according to Dr. Davidson, in the later period of the Persian government, not long after the time of Malachi, i. e., 350—340 B.C. Such is also substantially the opinion of Rosenmüller, Knobel, Ewald, and DeWette. Hengstenberg, unquestionably the ablest critic of the orthodox German school, considers that the contents of the book may best be explained by supposing the author to have lived in a period like that of Malachi, in which there prevailed a pharisaical self-righteousness, and melancholy murmurings against the providence of God. The dates assigned to it by Hartmann (viz., the period of the Maccabees) and by Hitzig (204 B.C.) cannot well be sustained, as there is no trace in the book either of Grecian philosophy or language.

The chief arguments against the Solomonian authorship are three. 1. The writer indicates unconsciously his own posteriority in point of time by making Solomon say: 'I was king over Israel in Jerusalem' (chap. i. verse 12); a thing which Solomon could not have said during his life, for he was king to the end of it. 2. The condition of the country in the time of the writer, the oppression, judicial injustice, the elevation of fools and slaves to high offices, &c., do not fit the reign of Solomon at all, nor any preceding period. 3. The language is post-exilic. Ewald, the greatest of recent Orientalists, asserts that 'the Hebrew is so strongly penetrated with Aramean, that not only single often-recurring words are entirely Aramean, but the foreign influence is infused into the finest veins of the language.'—(Dr. Davidson in vol. ii. of Horne's *Introduction to the Holy Scripture*.)

It is extremely difficult to ascertain the standpoint of the author. He is deeply convinced that 'all is vanity and vexation of spirit,' but whether this conviction springs wholly from a religious view of life, or is in part caused by personal disappointments, we have not sufficient internal evidence to determine. There is much in E. that, if it stood by itself, might be thought to be a mere product of cynical epicureanism, but it is mixed up with so much that is nobler, with a faith in God that rises high above the crushing considerations of the vanity of all mortal life, and the book terminates so grandly, that it seems more reasonable to believe that the aim or intention of the writer was moral and religious, and not cynical; that he painted the folly, weakness, and helplessness of men in

such strong colors, only that he might destroy their self-righteousness, and cure them of that inability to read the laws of God, which self-righteousness always produces. For what is the conclusion of the whole matter? 'Fear God, and keep his commandments: for this is the whole duty of man.'

ECCLESIASTICAL COMMISSIONERS FOR ENGLAND, 'are a corporation with perpetual succession and a common seal, and with power to take, purchase, and hold real estate, notwithstanding the statutes of mortmain.'—Burns's *Eccles. Law by Philimore*. The Ecclesiastical Commissioners consist of all the Bishops of England and Wales, the Deans of Canterbury, St. Paul's, and Westminster, five cabinet ministers, three judges, and twelve eminent laymen, mostly appointed by the Crown, but partly by the Archbishop of Canterbury. (Till the changes consequent on the Judicature Act, the Chief Justice of the Common Pleas, Chief Baron of Exchequer, and other judges sat *ex officio*.) The lay commissioners, including all the judges, to be members of the United Church of England and Ireland. The Queen is empowered to appoint two paid members, and the Archbishop of Canterbury one (lay members of the Church of England), by the title of Church Estates Commissioners. The Ecclesiastical Commission thus constituted is the result of certain reports made by commissioners previously appointed by the Crown. The object of the existing Commission is best explained by a reference to the instructions given to the original commissioners. 'To consider the state of the several dioceses of England and Wales, with reference to the amount of their revenues and the more equal distribution of episcopal duties, and the prevention of the necessity of attaching by commendam to bishoprics benefices with cure of souls; to consider also the state of the several cathedral and collegiate churches in England and Wales, with a view to the suggestion of such measures as may render them more conducive to the efficiency of the Established Church; and to devise the best mode of providing for the cure of souls, with special reference to the residence of the clergy on their respective benefices.' The Ecclesiastical Commission was permanently established in the year 1835. In order that it should be provided with a fund to enable it to carry out such schemes as should appear to it desirable, the seven best endowed sees were laid under a contribution amounting in all to the annual sum of £22,800. In addition to the income thus provided, several canonries in the various cathedrals are abolished, and other ecclesiastical preferments are extinguished, and the emoluments of the whole are vested in the commissioners. The Ecclesiastical Commissioners are required to lay before her Majesty in council such schemes as appear to them best adapted for carrying out the purposes of the act.

It is provided that no proceeding which requires the common seal of the corporation is to be finally concluded, nor is the seal to be affixed to any deed, unless two at least of the episcopal commissioners are present, and consenting. Notice of every scheme is to be given to any corporation, aggregate or sole, affected thereby; and the objections, if any, are to be laid before her Majesty in council, together with the scheme. The scheme, if it receive the royal assent, is to be gazetted, and thereupon acquires the power of an act of parliament. By 19 and 20 Vic. c. 55, the duties of the Church Building Commissioners have been transferred to the Ecclesiastical Commissioners. The latter body have now, therefore, in addition to their previous powers, authority to divide or to unite existing parishes, and to create new districts. Such are, very briefly, the powers of the Ecclesiastical Commissioners. The policy which led to the appointment of that Commission is not a subject for our consideration. But it is easy to see that the influence for good and evil of so powerful an institution, over the Church of England, is enormous; and it cannot be matter of surprise that its proceedings are watched with scrupulous jealousy. As a result of its deliberations during twenty-five years of its existence, two new bishoprics had been created and endowed, and a considerable number of small livings had been augmented.

On the other hand, it must be observed that much indignation has been excited by the expenditure of very large sums on the purchase and improvement of episcopal residences. It is, no doubt, fitting that the episcopal office should be furnished with appliances suitable to the position and dignity of a bishop; but the peculiar character of the revenues of the Ecclesiastical Commissioners must be borne in mind in applying those revenues. The funds of which they are composed have been violently diverted from the original purpose of the donors. Public necessity only can justify such an act. The plea put forward is the inequality of the revenues of the clergy, and the insufficient amount of the incomes of many benefices. But it may fairly be questioned whether it is a proper application of those funds to promote the convenience and luxury of those who are already liberally endowed.

ECCLESIASTICAL CORPORATION. The holder of an ecclesiastical benefice is, by the law of England, regarded as a corporation. Ecclesiastical corporations are divided into aggregate

and sole. The former consist of several persons, as the head and fellows of a college, the dean and chapter of a cathedral, and are kept up by a continual succession of members. An ecclesiastical corporation sole consists of a single person and his successors in the benefice, as a bishop, a rector, a parson, or a vicar. The object of the common law, in thus regarding the incumbent of the benefice as a corporation sole, is to preserve the temporalities which are vested in him, and which would otherwise descend to his right heirs. The right of a rector or other corporation sole to the church and glebe, though said to be a freehold, is in fact little more than a tenancy for life. He is entitled to the full enjoyment of the benefice during his life, but he cannot sell it, and he is even punishable for waste. He may work mines or pits which he finds in use, but he is not entitled to open fresh mines. His right to timber is confined to felling it for repairs, but he is not entitled to sell it. See CORPORATION.

ECCLESIASTICAL COURTS are courts specially devoted to the consideration of matters relating to the clergy and to religion. For the origin of these courts we must go back to the first days of Christianity, when the early Christians, acting upon the injunction of St. Paul—'Dare any of you having a matter against another go to law before the unbelievers and not before the saints'—had established courts, apart from those provided by the heathen governors, for the settlement of their own disputes. These courts were presided over by the bishops, who took cognizance of all matters, temporal as well as spiritual, arising among the brethren. As Christianity advanced, and was acknowledged as the revelation of the Almighty, these bishops' courts acquired an independent position, and were suffered to exist concurrently with courts of civil jurisdiction (Code lib. i. tit. 4, *de episc. aud.*), and gradually special matters were assigned as the subjects of their peculiar jurisdiction—viz., questions of tithes, and matrimonial and testamentary causes.

All writers on the early constitution of England are agreed in the opinion that, in this kingdom, there existed no separate ecclesiastical courts before the Norman Conquest. Previous to that time, all matters, civil and spiritual, were in use to be heard before the county court, in which the bishop and the earl sat together. But by a charter of William I. a distinction was made for the first time between courts civil and ecclesiastical. By this charter, authority was given to the bishops to hear causes ecclesiastical according to the canon law. The bishops' courts having been thus established in England, they became a fruitful source of dispute between the crown and the see of Rome, the latter claiming supreme jurisdiction in appeal in all causes ecclesiastical. This claim was from time to time conceded by the weakness or necessity of individual sovereigns, to be as frequently retracted when the emergency was past; in particular, by 27 Ed. III. c. 1, and 16 Rich. II. c. 5, all persons were prohibited, under penalty of *Premunire* (q. v.), from resorting to the court of Rome or elsewhere. At the Reformation, by 24 Hen. VIII. c. 12, on the recital that the king is, under God, the head of the Church, and again, by 25 Hen. VIII. c. 21, the authority of the pope in matters ecclesiastical was finally excluded. In Bacon's Abridgment of the Law, there are enumerated ten ecclesiastical courts—viz., Convocation, the Court of Arches, the Prerogative Court, the Court of Audience, the Court of Faculties, the Court of Peculiars, the Consistory Court, the Archdeacon's Court, the Court of Delegates, and the Court of Commissions of Review. (For a full account of these courts, reference is made to the several heads, and also to the article DOCTORS' COMMONS). Under the Regulation of Public Worship Act of 1874, a new ecclesiastical judicature was called into existence, with cognizance mainly of offences in the matter of ritual.

The chief ecclesiastical courts which have at various times existed in Scotland are the General Assembly, the Commissary Court, and the Court of Teinds. The former is the tribunal for the consideration of questions of doctrine and discipline according to the Presbyterian usage, and has existed since the Reformation. See ASSEMBLY, GENERAL; COMMISSARY, TEINDS.

ECCLESIASTICAL LAW. See CANON LAW.

ECCLESIASTICAL TITLES ASSUMPTION ACT (14 and 15 Vict. c. 60). In 1850, a ferment of Protestant zeal was awakened in this country by an edict issued by the court of Rome dividing Great Britain into territorial bishoprics, under an Archbishop of Westminster. The brief was immediately followed by a Pastoral by the newly appointed archbishop (Cardinal Wiseman) 'given out of the Flaminian Gate.' At the commencement of the parliamentary session of 1851, the subject of 'papal aggression,' and of the measures to be adopted to counteract it, superseded all other topics of interest. It was in these circumstances that Lord John Russell introduced the Ecclesiastical Titles Bill. By the Act 10 Geo. IV. c. 7, it had been provided that the right and title of archbishops to their respective provinces, of bishops to their sees, and of deans to their deaneries, as well in England as in Ireland, having been settled and established by law, any person

other than the person thereto entitled who should assume or use the name, style, or title of archbishop of any province, bishop of any bishopric, or dean of any deanery, in England or Ireland, should for every such offence forfeit £100. By the Roman Catholic party it was alleged that this enactment struck only at the titles to existing provinces and dioceses, and that though the pope could not create an Archbishop of Canterbury, nor could his nominee assume that title without violating the law, there was no prohibition against the creation of an Archbishop of Westminster. To meet this allegation, and remove the doubt which existed, the Ecclesiastical Titles Act was passed, its object being to prohibit the assumption of such titles 'in respect of any places within the United Kingdom.' The penalty of £100 for every contravention of the act is to be recovered in accordance with the provisions of the former act, or at the suit of any person in one of her Majesty's superior courts of law, with the consent of the Attorney-general in England, or of the Lord Advocate in Scotland. The third section saves the episcopal bishops in Scotland from the operation of the act, providing, however, that 'nothing herein contained shall be taken to give any right to any such bishop to assume or use any name, style, or title which he is not now by law entitled to assume or use.' The act allayed the fears of the country; and no prosecution under it took place.

The Roman Catholic party having always considered the penal clauses of this act as a grievance, an arrangement was made for the repeal of the act. This was accomplished by the Act 34 and 35 Vict. c. 53, which, after declaring that 'no ecclesiastical title of honor or dignity derived from any see, province, diocese, or deanery recognized by law, or from any city, town, place, or territory within this realm, can be validly created,' and that no 'pre-eminence or coercive power can be conferred otherwise than under the authority of her Majesty,' repeals the Ecclesiastical Titles Assumption Act (14 and 15 Vict. c. 60) as inexpedient. The result is, that while no prosecution can now take place for assuming such titles, their assumption is still treated by the law as an illegal act. No opposition was made to the recent constitution of a Roman Catholic hierarchy in Scotland (1878), with territorial titles.

ECCLESIASTICAL YEAR. See YEAR; also DATE.

ECCLESIASTICUS, the title of an apocryphal work, called in the Septuagint *The Wisdom of Jesus, the Son of Sirach*. It obtained the title of E., not because the writer was a priest (for regarding his profession nothing is known), but because it was, in the opinion of the fathers, the chief of those apocryphal works which they designated *ecclesiastici libri* (i. e., books not inspired, but which might be read in church for the edification of the people), to distinguish them from the canonical scriptures of the Old Testament. E. was originally composed in Aramaic; and the original text was apparently extant in the time of Jerome, who states that he had seen the Hebrew, but it is now lost. The author calls himself Jesus, the son of Sirach of Jerusalem; but when he flourished is not known. His book was translated into Greek, with an introduction by his grandson, who is usually, but not correctly supposed to have had the same name as his grandfather. The date of the translation has been fixed as low as 130 B.C., and as high as 230 B.C. The former is the more probable. The contents of the work are not systematically arranged, so that we can only guess at what may be called the method and purpose of thinking. The view taken of the mercy of God as extending to all mankind, indicates that the Jewish notions were breaking up; but still there is little to show that any great spirituality was taking its place. Its tone resembles that of the book of Proverbs. Exhortations to cheerfulness are constant; medicine, agriculture, &c., are highly praised; life is regarded from an ethical rather than from a religious point of view, and consequently 'wisdom' is represented as the source of human happiness. The style of the writer is at times noble, and even sublime; and, to use the language of Addison, 'it would be regarded by our modern wits as one of the most shining tracts of morality that are extant, if it appeared under the name of Confucius or of any celebrated Grecian philosopher.'

ECCLESIOLOGY, a word of recent use, is the name which has been given in the British Islands to the study of church architecture and decoration.

Besides discriminating the various styles of ecclesiastical architecture, ecclesiology takes account of the ground-plan and dimensions of a church; of its orientation, or the deviation of its line from the true east; of its apse, or circular or polygonal east end; of its altar or communion table, whether fixed or movable, stone or wood; of its reredos, dossal, or altar-screen; of its piscina, or basin and drain for pouring away the water in which the chalice was rinsed, or the priest washed his hands; of the sedilia, or seats for the priest, deacon, and subdeacon, during the celebration of the eucharist; of the aumbrye, or locker, for the preservation of the communion vessels and elements; of the 'Easter sepulchre,' or recess for the reception of the host from Good Friday till Easter Day; of the altar-candlesticks; of the altar-steps; of the

altar-rails; of the credence table, or shelf on which to place the communion elements before they were put upon the altar; of the 'misereres,' or elbowed stalls; of seats within and without the chancel walls; of the height of the chancel as compared with the nave; of the chancel arch; of the rood-screen, rood-staircase, rood-door, and rood-loft; of the piers or columns; of the triforium or blind-story; of the clerestory; of the windows; of the parvise-turret, or outside turret leading to the parvise; of the roof or groining; of the eagle-desks and letter-nis; of the pulpit; of the hour-glass stand, by which the preacher was warned not to weary the patience of the flock; of the reading pew; of the benches, pews, and galleries; of the aisles; of the shrine, fentour, or reliquary; of the benatura, or holy-water stoup; of the corbels, with special reference to the head-dress figured on them; of the pavement; of the belfry; of the baptismal font, with its accessories, the baptistery, the steps, the kneeling-stone, the chrismatory, the cover, and the desk; of the tower, with its lantern, parapet, pinnacles, louvres, windows, buttresses, and bells; of the porch and doors, with their niches and seats; of the parvise, or priest's chamber above the porch; of the mouldings; of the pinnacle crosses; of the gargoyles, or rain-spouts; of the churchyard or village cross; of the churchyard yew; of the lych-gate, or corpse-gate, where the corpse was met by the priest; of the crypt; of the confessional; of the hagioscope, or opening in the chancel arch through which the elevation of the host might be seen; of the lychnoscope, or low window in the side-wall of the chancel, the use of which is uncertain; of the chest for alms; of the table of the ten commandments; of the church-plate; of the faldstool, or litany stool; of the embroidered work; of the images of saints; of the church well; of the sepulchral monuments and brasses, with their inscriptions; of the chapels or sacristies; of the vestry; of the dedication crosses. Ecclesiology has a literature of its own, represented by such works as the *Handbook of English Ecclesiology* (Lond. 1847) of the 'Ecclesiological Society'; Walcott's *Sacred Archaeology*; Bourassé's *Dictionnaire d'Archéologie Sacrée*, and the like.

ÉCHELON (from the French *échelle*, ladder) is such a formation or arrangement of troops that, if viewed from a height, they would present some analogy to the successive steps of a ladder or staircase. The several divisions of the force, although parallel, are no two on the same alignment. Each has its front clear of that in advance, so that, by marching directly forward, it can form line with it. There are two kinds of echelon, *direct* and *oblique*. *Direct* echelon is adapted for attack and retreat; while *oblique* echelon (oblique in reference to the original front of the line) is adapted for changing position, or for getting on the enemy's flank.

The word echelon is also used in reference to nautical manœuvres. A fleet is sometimes said to be arranged *en échelon*; at which time it is compared by Sir Howard Douglas to a body of infantry in a square having its diagonal parallel with the front. In other words, it presents a wedge-form towards the enemy. Under this arrangement, the bow-guns and broadsides of the several ships can mutually defend each other; the stronger parts of one ship defending the weaker parts of some other.

ECHIDNA, a genus of quadrupeds peculiar to Australia, and belonging to the order *Monotremata*. Two species have been described, differing in the scantiness and abundance of the hair, but it seems not improbable that they are mere states of the same



Echidna Hystrix.

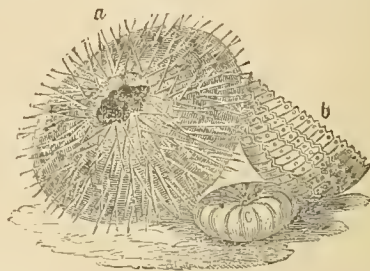
species, perhaps depending on the seasons or on age. The *E.* is about the size of a hedgehog, and, like that animal, is covered with spines; which, however, are much larger and stronger, and are placed among soft silky chestnut-colored hair. Its head is small, the muzzle much elongated, and slender, terminating in a small mouth, which is destitute of teeth, but furnished with several rows of small spines upon the palate, directed backwards. The tongue is extensile, and is used, like that of ant-eaters, for catching ants, the ordinary food of the animal. The tail is very short. The legs

are also very short, each foot furnished with five large broad claws, fit for digging and burrowing, the claws of the hind feet being concave, and directed backwards and outwards, so as to form very efficient shovels for throwing out the earth. The *E.* burrows with great rapidity, being possessed of strength perhaps greater in proportion to its size than that of any other quadruped. When it cannot more completely disappear under the earth, it enters itself so far as to present only its spiny back to an assailant. The *E.* is capable of very long abstinence, and confines itself to its burrow during droughts. In confinement, it may be fed on milk, hard-boiled eggs, &c.

ECHIMYD (*Echimy*), a genus of rodent quadrupeds, in some of their characters agreeing with dormice, but differing from them in having the tail scaly, and the fur coarse and mingled with flattened spines. They are all South American. Some of them are known as spiny rats. They display considerable beauty of color. One species excavates long burrows in the ground.

ECHINEIS. See REMORA.

ECHINIDÆ, a family of *Echinodermata*, the species of which are popularly known as Sea-urchins, Sea-eggs, &c. They have the body covered with a calcareous crust or shell, of an extremely porous structure (and thus differing very widely from the shells of molluscs), in polygonal plates nicely adapted to each other, and increasing by additions to the edges of each plate, so that the shell may enlarge with the enlargement of the animal, whilst new plates are also added around the superior orifice. The shell is



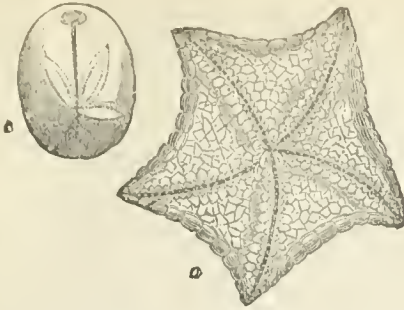
a, *Echinus Esculentus*; *b*, portion with spines removed; *c*, mouth.

pierced with rows of holes for the Ambulacra (q. v.), and is externally covered in a living state with a membrane—sometimes very delicate, sometimes thick and spongy—which communicates by many delicate processes with the interior, and unites the bases of all the spines. The spines differ very much in the different genera and species, in their length, strength, number, and arrangement; they are attached to the tubercles on the surface of the shell, by cup-like bases capable of working upon the tubercles, in the manner of a ball-and-socket joint; and they are moved by means of the connecting membrane so as to be employed in locomotion. In some species, they seem to be the principal organs of locomotion; in others, the ambulacra are so. By means of the spines, some, in which they are few and strong, can walk even on dry ground; others, in which they are minute and very numerous, employ them in burying themselves in the sand. The mouth of the *E.* is situated at the lower orifice of the shell, and is generally furnished with five flat calcareous teeth, moved by a very complex apparatus of bony sockets and muscles—'a very powerful mill' for grinding down their food, which is supposed to consist of small crustaceans and molluscs. The intestine is long and spiral; the vent, in the *E.* of most regular form, is at the upper end of the shell, exactly opposite the mouth; in others, in which there is a departure from the characteristic orbicular form, it is more or less lateral. The *E.* abound in all seas, and seem to have abounded still more in former geological periods. 'Of all the *Radiata*, they are most perfectly preserved in a fossil state,' and the knowledge of their habits and organization is necessary to the geologist, 'in order to understand the relations and associations of the numerous species which abound in many of the earth's strata.'—Forbes.

ECHINOCOCCUS. See TAPE-WORM.

ECHINODERMATA (Gr. spiny-skinned), one of the great groups or sub-kingdoms of animals (see ZOOLOGY), formerly included in the *Radiata* (q. v.). They have a digestive and a vascular system; for the former, however, there is in many of them only a single orifice; a circular and radiating nervous system has been observed in many; they are especially characterized by their well-organized skin, which in many is strengthened by calcareous plates, and in some also has the additional protection of numerous long spines. *Echinida* (Sea-urchins) exhibit these characteristics in greatest perfection. *Asteriada* (Star-fishes), *Ophiurida* (Brittle-stars), *Cyrioidea*, *Holothuriada* (Sea-slugs, Sea-cucumbers, &c.), and *Sipunculida*, are also ranked among the *E.*, and have been variously arranged in orders by different naturalists. Spines are wanting in most of them; in some (*Holothurida* and *Sipunculida*), there

are not even calcareous plates, and there is no inconsiderable departure from the ordinary and perfect radiate form, an approach being made to the forms of molluscs and worms, whilst yet the



a, *Asterias Tessellata* (Asteriadae); b, *Spatangus* (Echinida), or sea-egg.

accordance with the other E. is very perfect in other parts of the organization. Almost all the E. are free, moving about at the bottom of the sea; some of them—at least in an immature state—are stalked and fixed. They are provided with 'an apparatus for water circulation,' a peculiar characteristic of radiate animals, and which 'can scarcely be said to exist in any of the other types.' By means of this it is that they fill and fit for use the suckers of



a, *Euryale Palmifera* (Ophiurida), front view; b, disc and part of arm, front view; c, disc and part of arm, back view.

Ambulacra (q. v.) with which most of them are provided, but of which the *Sipunculida* are destitute. The spines as well as the ambulacra of the E. are used by those which possess them (*Echinida* and *Ophiurida*) as organs of locomotion.—The British E. are described by Edward Forbes in an interesting work, entitled *A History of British Star-fishes, and other Animals of the Class Echinodermata* (Lond. 1841).

ECHINUS, of Vitruvius, is a classical moulding in the form of a series of eggs, whence it is also called the ovolo or egg-moulding. The eggs are sometimes divided by an anchor or dart, as in the accompanying example. The type of this ornament is sometimes said to have been the chestnut and shell.



Echinus, or Egg and Anchor Moulding.

E'CHIUM. See VIPER'S BUGLOSS.

E'CHIO (Gr. *sound*). Sound is produced by waves or pulses of the air; when such a wave comes against a wall or other opposing surface, it is reflected like a light, and proceeds in another direction, and the sound so heard is an echo. Even the surface of a cloud suffices to reflect sound, as may be observed during thunder and the discharge of cannon. That the echo of a sound may return to the point where the sound originated, the reflecting surface must be at right angles to a line drawn to it from that point. Oblique walls send the echoes of a person's voice off in another direction, so that they may be heard by others, though not by him. In order to echo words distinctly, the reflecting surface must on the whole be even, or so curved as to resemble a concave mirror. This last form is necessary for returning a distinct sound when the distance is considerable. A great degree of evenness, however, is not essential, as it is so uncommon thing for the edge of a wood to return an echo. The distance of the reflecting surface must also be such as to allow a sufficient time to elapse between the sound and the return of the echo for the ear to distinguish them; when they succeed too closely, they merge into one. An interval of about $\frac{1}{3}$ of a second is necessary to discriminate two successive sounds; so that if we assume 1125 feet as the distance traversed by sound in a second, $\frac{1}{3}$ of 1125, or 62 feet, will be the least distance at which an echo can be heard, as the sound will go

that distance and return in $\frac{1}{3}$ of a second. If the distance is less, the echo only clouds the original sound, but is not heard distinct. It is these indistinct echoes that interfere with hearing in churches and other large buildings (see ACOUSTICS); hence anything that breaks the evenness and continuity of the reflecting surfaces is an improvement in this respect. The number of syllables that any particular echo will repeat, depends upon how many can be uttered in the time that the sound takes to go and return from the reflecting surface. The echo at the tomb of Metella, in the Campagna, near Rome, of which Cassendi speaks as repeating a hexameter line requiring a $2\frac{1}{2}$ seconds to utter it, must therefore come from a distance of about 1500 feet. Such echoes are rare, as the various conditions are seldom all fulfilled. When there happen to be several reflecting surfaces at different distances in the direction of the sound, with a sufficient interval between them, each gives a separate and distinct echo. A similar effect is produced when two surfaces are inclined to each other in such a way as to give repeated reflections of the sound from the one to the other like the mirrors of a kaleidoscope, thus multiplying echoes of echoes. To this multiple and repeating class belong the famous echoes of Killarney, and that produced between the wings of the castle of Simonetta, near Milan which repeats the report of a pistol 60 times.

ECHO, in Music, is the repetition of a melodic phrase, frequently written for the organ, on account of the facility with which it can be produced by the stops.

E'CIJA, a city of Spain, Andalusia, in the province of Seville, and 45 miles east-north-east of the town of that name, is situated on the left bank of the Jenil, in lat. $37^{\circ} 33' N.$, long. $5^{\circ} 8' W.$ It is surrounded by gardens, and stands in the center of a district fertile in corn and oil. E. is a well-built and prosperous town. On account of the heat of the climate, this town is called by the Spaniards the Oven of Andalusia. E. has many pleasant alamedas (public promenades), shaded by trees, and adorned with statues and fountains; the principal promenade is that which stretches along the banks of the river. Pop. 24,000. E. was called in ancient times *Astigis*, and was one of the chief cities of the Roman province of Hispania Bætica; its origin is unknown. It is said to have been visited by the Apostle Paul, a gilt statue of whom may be seen in the city. E. was called *Colonia Augusta Firma* by the Romans, and abounds in Roman antiquities. It also presents several specimens of Moorish architecture in the shape of gates and massive towers.

ECK, JOHANN MAYR VON, the well-known adversary of Luther, was born in 1486 at Eck, a village in Swabia, where his father, Michael Mayr, was a peasant, and afterwards a bailiff. Endowed with considerable ability, young Eck commenced at an early period the study of the Church Fathers and the Scholastics, and acquired a great skill in the theological disputation. In 1518, when his *Obelisci* appeared in opposition to Luther's *Theses*, he was Doctor of Theology, Canon of Eichstätt, and prochancellor of the university of Ingolstadt. The publication of his *Obelisci* involved him in a disputation with Karlstadt, which lasted from the 27th June to the 16th July 1519. The only effect of the disputation on the people was to make them wonder at E.'s volubility; but having impugned some of Luther's views in the course of his disputation, he was assailed by the great Reformer, and by Melancthon. Eck nicknamed his opponents *Lutherans*, and instigated partly by personal hatred, and partly by Fugger (q. v.), went to Rome in 1520, to induce the pope to take strong measures against Luther. He returned with a papal bull of condemnation in his pocket, but the people in many places stood by Luther; and at Leipsic, in particular, Eck was so roughly received, that he had to take refuge in the monastery of St. Paul's. Later we find him at the Augsburg Diet of 1530, where he let slip out the memorable statement, that 'with the Church Fathers, he would venture to oppose the Augsburg Confession, but not with the Scriptures.' In the religious convocations held at Worms in 1540, and at Ratisbon in 1541, he also took part. He died in 1543. A desire to shine and to play an important part in the affairs of men, coupled with a strong love of lucre, were the leading features of his character. Though an extremely learned ecclesiastic, he had no great talent, but was loud, boisterous, and full of assurance.

E'CKERMANN, JOHANN PETER, well known to the literary world through his intercourse with Goethe, was born in 1792, at Winsen on the Lube, in Hanover, studied, 1821—1823, at Göttingen, and afterwards went to Weimar, where he took part in the *redaction* of the last volume of Goethe's *Sämmtliche Werke*. At the same time, he commenced to contribute articles to the *Morgenblatt*, on Art and Antiquity. In 1827, the university of Jena conferred on him the degree of Ph. D. Two years later, he was appointed to superintend the studies of the heir to the grand duchy of Weimar, in the German and English languages and literature. In 1830, he traveled with Goethe's son in Italy, and on the death of the patriarch of German literature, he edited his posthumous writings. During the years 1839—1840, he edited a new edition

proportion $OT:TB::TS:SC$. Now, we know that TS , the (mean) distance of the sun, is equal to about 24,000 times TB ; also, from the construction $AC=TB$; and we know that $SA=112$ times TB , whence it follows that $SC=111$ TB . The above proportion, then, gives $OT=216$ times TB , since $\frac{24000}{111}=216$ nearly. But the moon's average distance is only 60 times TB (the earth's radius). Hence it appears that the length of the earth's shadow is almost four times the average distance of the moon, and that the moon can enter it. Further, it is clear that, should it do so, it may be totally obscured; for it must enter at a point much nearer T than half the distance OT , which is 108 times TB ; and everywhere within that distance it might be shown the breadth of the shadow is much greater than the moon's disc. But one consideration now remains to be stated to complete the proof of the theory of lunar eclipses. It was mentioned that they only occur at full moon, and we know that to be the only time when the earth is between the sun and moon, and so has a chance of throwing her shadow upon it. Why they do not occur every full moon, will be explained in treating of the prediction of eclipses.

In the foregoing explanation, we proceeded on the assumption that the earth has no atmosphere. If the assumption were correct, the earth's shadow would be darker and narrower than it is, and the phenomena of eclipses shorter in duration, but more striking. The effect of the atmospheric refraction (see REFRACTION) is to bend the rays which are incident on the atmosphere in towards the axis of the cone of the earth's shadow, those which pass through the lowest strata of the air being most refracted, and converging to a point in the line OT (see fig. 1), at a distance equal 42 radii of the earth from the earth's center. Accordingly, the moon, which, as we have seen, crosses the shadow at a distance of about 60 radii, never enters that part of it which is completely dark; thus, she never loses her light entirely, but appears of a distant reddish color resembling tarnished copper—an appearance caused by the atmospheric refraction, in the same way as the ruddy color of the clouds at sunset. There is another reason why the phenomena of a lunar eclipse are less striking than, from the explanation given relative to fig. 1, might be expected. Every shadow cast by the sun's rays necessarily has a penumbra, or envelope, on both sides of the half-shadow. In the case before us (fig. 2), suppose a cone having its apex O' between the sun and earth, and enveloping each of them respectively in its opposite halves, $CO'C'$ and $AO'A'$ (fig. 2). It is clear that from every point in the shaded part of the cone $CO'C'$, and without the shadow

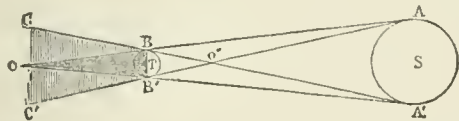


Fig. 2.

BOB' , a portion of the sun will be visible—and a portion only—the portion increasing as the point approaches either of the lines $CB, C'B$; and diminishing as it approaches the lines $BO, B'O$. In other words, the illumination from the sun's rays is only partial within the space referred to, and diminishes from its extreme boundary lines towards the lines $BO, B'O$. When, then, the moon is about to suffer eclipse, it first loses brightness on entering this penumbra; so that when it enters the real shadow, the contrast is not between one part of it in shade and the other in full brilliancy, but between a part in shade and a part in partial shade. On its emersion, the same contrast is presented between the part in the umbra and the part in the penumbra. What we should expect on this geometric view of the earth's shadow, actually happens. From the breadth of the penumbra, it happens that the moon may fall wholly within it before immersion in the umbra commences; and so softly do the degrees of light shade into one another, that it is impossible to tell when any remarkable point on the moon's surface leaves the penumbra to pass into the umbra, or the reverse.

2. Prediction of Lunar Eclipses.—We said that lunar eclipses only happen at full moon. They do not happen every full moon, because the moon's orbit is inclined to the ecliptic, on which the center of the earth's shadow moves at an angle of $5^{\circ} 9'$ nearly. Of course, if the moon moved on the ecliptic, there would be an eclipse every full moon; but from the magnitude of the angle of inclination of her orbit to the ecliptic, an eclipse can only occur on a full moon happening when the moon is at or near one of her nodes, or the points where her orbit intersects the ecliptic. An eclipse clearly can happen only when the centers of the circle of the earth's shadow and of the moon's disc approach within a distance less than the sum of their apparent semi-diameters; and this sum is very small; so that except when near the nodes, the moon, on whichever side of the ecliptic she may be, may pass above or below the shadow without entering it in the least. The moon's average diameter is known to be $31' 25'' \cdot 7$, and from the *Nautical*

Almanac we may ascertain its exact amount for any hour—its variations all taking place between the values $29' 22''$ and $33' 28''$. As for the diameter of the circle of the shadow, it is easily found by geometric construction and calculation, and is shown to vary between $1^{\circ} 15' 32''$ and $1^{\circ} 31' 36''$; and its value for any time may be found from the *Nautical Almanac*, to which value astronomers usually add $1'$ as a correction for its calculation proceeding on the assumption that the earth has no atmosphere. Starting from these elements, it is a simple problem in spherical trigonometry—which may be solved approximately by plane trigonometry by supposing the moon and the earth's shadow to move for a short time near the node in straight lines—to fix the limits within which the shadow and moon must concur to allow of an eclipse. Recollecting that the earth's shadow on the ecliptic is at the opposite end of the diameter from the sun, and that therefore as it nears one node the sun must approach the other—the sun and shadow being always equi-distant from the opposite nodes—we find, from the solution of the above problem: 1. That if, at the time of full moon, the distance of the sun's center from the nearest node be greater than $12^{\circ} 3'$, there cannot be an eclipse. 2. If at that time the distance of the sun's center from the nearest node be less than $9^{\circ} 31'$, there will certainly be an eclipse. 3. If the distance of the sun's center from a node be between these values, it is doubtful whether there will be an eclipse, and a detailed calculation must be resorted to, to ascertain whether there will be one or not. Into the nature of that calculation we shall not attempt here to enter; suffice it to say that, knowing from the *Nautical Almanac* the true time of the sun and moon being in opposition, the true distance of the moon from the node at the time of mean opposition, with the true place of the sun at that time, as well as the moon's latitude, we may, by means of these elements, combined with the obliquity of the moon's path and her motion relative to that of the sun, not only fix whether there shall be an eclipse or not, but predict its exact magnitude, duration, and phases.

It may here be mentioned, that before the laws of the solar and lunar motions were discovered with anything like accuracy, the ancients were able to predict lunar eclipses with tolerable correctness by means of the lunar cycle (see SOLAR CYCLE) of 18 Julian years and 11 days. Their power of doing so turned on this, that in 223 lunations the moon returns almost exactly to the same position in the heavens. If she did return to exactly the same position, then, by simply observing the eclipses which occurred during the 223 lunations, we should know the order in which they would recur in all time coming.

All lunar eclipses are universal or visible in all parts of the earth which have the moon above their horizon, and are everywhere of the same magnitude with the same beginning and end; and this universality of lunar eclipses is the reason why it is popularly thought, contrary to the fact, that they are more frequent occurrence than solar eclipses. The eastern side of the moon, or left-hand side as we look towards her from the north, is that which first immerges and emerges again. The reason of this is, that the proper motion of the moon is swifter than that of the earth's shadow, so that she overtakes it with her east side foremost, passes through it, and leaves it behind to the west. It will be readily understood, from the explanations above given, that total eclipses and those of the longest duration happen in the very nodes of the ecliptic. But from this circumstance of the circle of the shadow being much greater than the moon's disc, total eclipses may happen within a small distance of the nodes, in which case, however, their duration is the less. The further the moon is from her node at the time, the more partial the eclipse is, till, in the limiting case, she just touches the shadow, and passes on unobserved.

3. Eclipses of the Sun, so called, are caused, as we have stated, by the interposition of the moon between the earth and sun, through which a greater or less portion of the sun is necessarily hid from view. In one sense, a solar eclipse might more properly be called an eclipse of the earth, caused by the moon's shadow falling upon it.

By a process similar to that used in ascertaining the length of the earth's shadow, it can be shown that the greatest value of the length of the moon's shadow is 59.73 semi-diameters of the earth; at the same time, we know that the least distance of the moon from the earth is about 55.95 semi-diameters. It follows that when a conjunction of the sun and moon happens at a time when the length of the shadow and the distance of the moon from the earth are, or are nearly, equal to the values above stated, the moon's shadow extends to the earth and beyond it. Should the shadow in these circumstances fall upon the earth, there will be a total eclipse of the sun at all places within it or over which it moves (fig. 3). If L be the moon, T the earth, and abL the moon's shadow cast by the sun, there will be a total eclipse of the sun at every point that is completely within the portion ab of the earth's surface. Again, the smallest value of the length of the moon's shadow may be shown to be 57.76 semi-diameters of the

earth, and the greatest distance of the moon from the earth is 63.82 semi-diameters.

Suppose the moon interposed between the earth and sun when these values concur, it is clear that the moon's shadow will fall short of the earth. In this case, the sun cannot be altogether hid from any point of the earth's surface; but this case, or one approximate to it, is that in which there will occur an annular eclipse.



Fig. 3.

In the figure, suppose O to be the apex of the shadow which falls short of the earth, and conceive the cone of the shadow produced earthwards beyond O into a second cone Ocd; then from every point within the section *ed* of the earth's surface, the moon will be seen projected as a black disc on the middle of the disc of the sun, the portion unobscured forming a ring or annulus of light. While in the two cases just described the eclipse is total or annular at places within *ab* or *cd*, it will be partial at other places; the moon will appear projected against a portion of the sun's disc, making a circular indentation. To ascertain the places at which the eclipse will be partial, we have merely to form the cone of the penumbra of the moon's shadow in the manner explained in treating of lunar eclipses: at all places on the earth's surface within that cone there will be a partial eclipse. A simple calculation shows what is the observed fact, that the cone of the penumbra is



Fig. 4.

not nearly large enough to embrace the whole of the face of the earth directed to the sun; in other words, solar eclipses are not universal, like those of the moon, i. e. they are not seen from all places that have the sun above their horizon at the time of the eclipse, which is the reason that though they are of more frequent occurrence than lunar eclipses, the latter are commonly supposed to occur more frequently.

If one could take up a position in space from which he could command a view of the whole face of the earth turned to the sun during a lunar eclipse, the phenomena which he would observe would be somewhat as follows. Marking the point of the earth first touched by the penumbra of the moon's shadow, he would observe the obscuration spreading therefrom over a wide and wider area as the penumbra advanced, till at last, supposing him to be viewing the case of a total eclipse, there appeared the umbral cone marking the earth with a dark spot. By and by, the whole penumbral shadow would be on the earth. The black spot would then appear to travel onwards with the motion of the shadow, and in its center, in a course determined by the composition of the proper motion of the shadow or moon, and the motion of rotation of the earth. Part of the globe would be free from the affection, and, in the course of time, the umbral spot would progress over different portions of the earth in succession, till at last it passed off the earth's surface, drawing after it the penumbral shadow. Could the spectator mark on the globe the various places affected by the shadow, with their degrees of shading, he would have a perfect chart of the course of the eclipse.

The small belt of the globe traversed by the umbra would mark all places at which the eclipse would be total, while the degrees of shading over places adjoining that belt on both sides would indicate the magnitude of the partial eclipse as seen from them. The breadth of the belt traversed by the umbra, when the sun's distance is greatest and the moon's least, is estimated at about 180 miles; and in the same case the penumbra is estimated to cover a circular space of 4900 miles in diameter, the eclipse happening exactly at the node. If the eclipse does not happen at the node, it is clear that the axis of the shadow must be inclined to the plane of the ecliptic, that the shadow will be cut obliquely, and therefore that the part of the earth in shade will be oval. It may here be stated that astronomers usually calculate beforehand the motion of the shadow over the earth's surface, and prepare charts to exhibit its motion. Such a chart an observer from a position outside the earth would have it in his power to make from observation.

Of the commoner phenomena attending an eclipse of the sun, as regards the appearance of that luminary, nothing need be said; they are perfectly analogous to those of lunar eclipses, except in the case of the eclipse being annular. There are other

appearances, however, attending an eclipse of the sun, especially when it is total, that are very remarkable. The almost instantaneous darkening of the orb of day, more particularly when it is unlooked for, is calculated to impress a spectator with vague terror; even when expected, it fills the mind with awe, as a demonstration of the forces and motions of the mechanism of the universe. The sudden darkness, too, is impressive from its *strangeness* as much as from occurring by day; it resembles neither the darkness of night nor the gloom of twilight. The cone of the moon's shadow, though it completely envelops the spectator, does not, as we have explained, enclose the whole atmosphere above his horizon. The mass of unenclosed air accordingly catches the sunlight, and reflects it into the region of the total eclipse, making there a peculiar twilight. Stars and planets appear, and all animals are dismayed by the dismal aspect of nature.—See Mahoud-Bey's Report of the Total Eclipse of July 1860. Mr. Warren de la Rue, who was one of an expedition of scientific men who went to Spain to witness the same eclipse, gives the following account of the aspects of nature near the time of totality: 'When the sun was reduced to a small crescent, the shadows of all objects were depicted with great sharpness and blackness, reminding one of the effects of illumination with the electric light. The sky at this period assumed an indigo tint, and the landscape was tinged with a bronze hue.'—*Athenaeum*, 1860, vol. ii. page 259. At totality, there was still light enough to enable the observer to draw without the aid of his lamp, while the sky near the sun presented a deep indigo, and thence passed through a sepia tint to red and brilliant orange near the horizon.

It must be said, however, that the strange appearance here recorded is exceptional, and probably not such as could ever occur in our latitude. There is one set of phenomena attending total eclipses of the sun, which are at once strange and invariable, and the causes of which cannot be said to be yet fully understood. As long as the total eclipse lasts, there appears round the sun and moon a luminous corona, as in fig. 5, while at its base, and projecting beyond the dark edge of the moon, appear very brilliant prominences, generally of a red color. These prominences were first observed during the total eclipse of 8th July 1842; but they are found to be constant attendants on eclipses, and methods have been invented of rendering them visible at any time without the interposition of the moon. The spectroscope reveals them to consist mainly of hydrogen gas in an incandescent state, and a comparatively narrow belt of the same color and substance runs round the whole circumference of the sun. The prominences are sometimes seen to shoot up like flames, in wild fantastic shapes, with incredible velocity, and to the height of tens of thousands of miles.

In the eclipse of 1860, the light of the corona was a silvery white, and it extended beyond the moon's limb about eight-

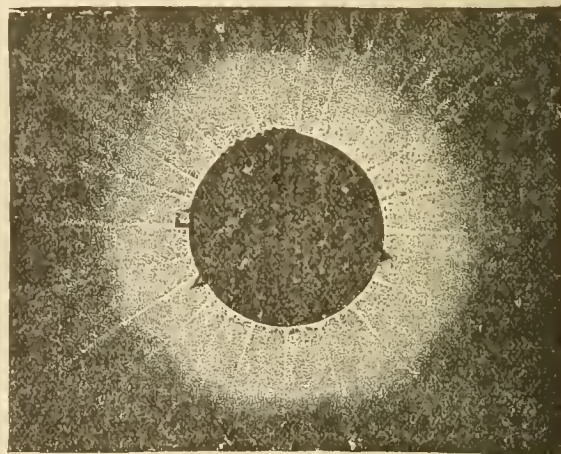


Fig. 5.—Appearance round the Sun during Total Eclipse.

tenths of her diameter. The corona consisted first of a bright ring of about 2' wide, and then an exterior and fainter ring of about 3', beyond which, for a mean distance of about 2', extended a glory of small rays—the whole corona extending to 7' beyond the moon's limb. From the corona, at intervals, projected individual rays of remarkable size, and five in number: one of 9' length; another of 14', and shaped like the point of a star; a third, saber-shaped, and extending 28'; a fourth, 28'; and a fifth, 10'. These individual rays are very differently described by different observers of the same eclipse, and are not well accounted for. The diffused light of the corona is believed to be caused by an immense extension of the gases forming the red envelope, only in a cooler and rarer condition.

4. *Prediction of Solar Eclipses.*—The period of 18 Julian years 11 days, referred to in treating of the prediction of lunar eclipses, applies equally to solar eclipses with lunar; but the ancients, who understood that fact, could find no law of recurrence of solar eclipses within that period, so as to predict them. The reason of the failure is obvious; for though solar eclipses recur in a fixed order within the cycle, they are not visible at the same places on their recurrence as when first observed.

By modern methods, however, eclipses of the sun may be predicted, with all their circumstances of time and places of observation, with the most perfect certainty. We shall not, however, attempt to explain what these methods are; suffice it that they resemble those already generally described as applied in the case of lunar eclipses. At the time of a solar eclipse, the sun and moon are in conjunction; they are also in or near the same node; and no eclipse can happen if they are further than 17° from the node, or if the latitude of the moon, viewed from the earth, exceeds the sum of the apparent semi-diameters of the sun and moon. When within these limits, it is a problem of numbers and of spherical trigonometry to ascertain the nature of the eclipse, if any, which will happen.

The number of eclipses of the sun and moon together in a year cannot be less than two, or more than seven; the most usual number is four, and it is rare to have more than six. The explanation of the limitation of the number of eclipses is connected with the fact, that the sun passes by both nodes but once in a year, except in the case of his passing one early in the year, in which case, owing to the recession of the moon's nodes, he will again pass it a little before the end of the year. From the smallness of the cone of the moon's shadow, total solar eclipses are extremely unfrequent in any one place, compared with the frequency of their actual occurrence. At Paris, there was only one total eclipse of the sun in the 18th c., that of 1724, and there will not be another till near the close of the 19th century. In London, not one total eclipse was witnessed during the 575 years, 1140 to 1715.

ECLIPSES OF THE SATELLITES. See SATELLITES.

ECLIPTIC is the name given to the great circle of the heavens round which the sun *seems* to travel, from west to east, in the course of a year. It took its name from the early observed fact, that eclipses happen only when both bodies are in or near this path. A little attention about sunset or sunrise shows that the sun is constantly altering his position among the stars visible near him, leaving them every day a little further to the west; and that this motion is not exactly east and west, or parallel to the equator, becomes also evident by observing that the sun's height at mid-day is constantly altering. It is further observed that, twice a year, about March 21 and September 23, the sun is exactly on the equator. The two points of the equator on which the sun then stands are the equinoctial points, and are the intersections of the equator and ecliptic. Again, there are two days in the year on which the sun reaches his greatest and his least mid-day elevation: the first is the 21st of June, the second the 21st of December. On these days, the sun has reached his greatest distance from the equator either way, and the points in his course where he thus seems to pause or halt in his retreat from the equator are called the solstices (*solis stationes*). These four points are distant from one another by a quadrant of the circle, or 90° . Each quadrant is divided into three arcs of 30° , and thus the whole ecliptic is divided into 12 arcs of that length, called Signs of the Zodiac (q. v.). These arcs or signs have been named after constellations through which the ecliptic passes.

As the equinoctial points are not fixed, but recede yearly westwards about 50 seconds, and in a century about $1^\circ 23'$, the same constellations and signs that coincided when the division of the ecliptic took place, no longer coincide. The constellation of the Ram, for instance, which originally stood in the first arc or sign, now stands in the second, every constellation having advanced forward 30° , or a whole sign. Modern astronomers therefore pay little attention to these constellations and signs, but count longitudes from the existing spring equinoctial point from 0° to 360° .

Not only do the points change where the ecliptic and equator cross each other, but the angle of their inclination, called the obliquity of the ecliptic, is also variable. It is at present nearly $23\frac{1}{2}^\circ$, and is diminishing at the rate of about 50 seconds in a century. Were it to go on diminishing always, the ecliptic and the equator would at last coincide, and the earth would then have an everlasting spring. The decrease, however, has a limit; the obliquity oscillates between two definite bounds, which it can never pass. It has been calculated that it was at its greatest 2000 B.C., and was then nearly $23^\circ 53'$. Since then, it has been decreasing, and will continue to do so till about the year 6600 A.D., when it will be at its least, and about $22^\circ 54'$. These slight alterations cannot sensibly affect the seasons.

The physical cause of this change of the obliquity is the action

of the other planets, especially Jupiter, Mars, and Venus, on the mass of the earth. The fact of the change was known to astronomers in very ancient times; Herodotus mentions an old tradition of the Egyptians, that the ecliptic had formerly been perpendicular to the equator—a notion into which they were most probably led by observing for a long series of years, that its obliquity was constantly diminishing. There can be little doubt that the Chaldeans arrived at the epoch of 403,000 years before the entry of Alexander into Babylon, to which they proudly referred for their first astronomical observations, by computing the time when the ecliptic was perpendicular to the equator, on the supposition of its obliquity diminishing $1'$ in 100 years. Though it was not till after the discovery of the law of gravitation that the change on the obliquity could be explained, yet that it was changing was believed in by many astronomers, although some doubted whether the differences in the values at different times were not due to errors of observation. The earliest known measure of the obliquity of the ecliptic was made by Tchou Kong, the regent of China. Among the western nations, the earliest measurements were made by Pytheas and by Eratosthenes.

ÉCOLE POLYTECHNIQUE is one of the most celebrated military academies in France. In 1793, all the public establishments in Paris were in a convulsed state, owing to the Revolution. In 1791, M. Lamblardie, director of the *Ponts et Chaussées*, proposed the establishment of an *École Centrale des Travaux Publics*, to educate young men for military, naval, and civil engineering. Monge and Carnot favoring his plan, it was carried out, and a school established at the Palais Bourbon. The first list of professors comprised names which afterwards acquired European celebrity—including those of Lagrange, Prony, Monge, Hachette, Bassenfratz, Fourcroy, Vanquelin, Berthollet, Chaptal, Pelletier, Guyton-Morveau, and Berthollet. In 1795, the name was changed to É. P.; many alterations were made in the organization; artillery studies were included in the course; and the pupils were ordered to wear a uniform. When Napoleon went to Egypt, 40 pupils from the É. P. accompanied him, many of whom greatly distinguished themselves. Napoleon made the organization of the school more strictly military in 1804, to identify it more fully with the army. The school was dissolved in 1816, again in 1830, and again in 1832, on account of the impetuous way in which the pupils mixed themselves up with the political disturbances of those years; but as the school suited the military genius of the French nation, it was re-established on each occasion, after the restoration of tranquillity. Candidates can be admitted only by competitive examinations, which take place yearly. A proclamation from the War Office, made public before the 1st of April, informs intending competitors of the subjects on which they are to be examined, and the time when the examinations begin. To be eligible as a candidate, the youth must be French, and must be more than sixteen, and less than twenty years of age before the 1st of January following; but soldiers are admissible up to the age of twenty-five, provided they can give proof of two years of service in the regular army. The cost of board alone is 1000 francs (nearly £42) a year. A complete course of instruction lasts for two years; when the pupils who have satisfactorily passed the final examinations have the privilege of choosing, from among the various public services supplied from this school, the particular branch they wish to enter, such as artillery, engineers, the staff, the department of telegraphs, or some of the other government monopolies. The school was re-organized by a decree of the 15th April 1873.

ECO'NOMY, a Socialist village of Pennsylvania, in the United States, stands on the right bank of the Ohio, about 17 miles below Pittsburg. The settlement was planted in 1825 by immigrants from Germany. The inhabitants own everything in common—3500 acres of land, upwards of 100 houses, a church, a school, a museum, and manufactories of wool, cotton, and silk. Pop. of township (1870) 1324.

ECONOMY, POLITICAL. See POLITICAL ECONOMY.

ECORCHÉ. A figure in which the muscles are represented stripped of the skin, for purposes of artistic study, is called by the French an *écorché*, and from them we have borrowed the term. From a portion of the figure the upper muscles are also removed, so as to exhibit those which lie nearer to the bone. It is not uncommon to represent the *écorché* in action, in the form of the Fighting Gladiator. The first person who did so was Salvage, a French artist and anatomist. To render the studies of pupils more complete Salvage had this figure engraved in all the points of view, and more or less denuded of flesh, till at last it was little more than a skeleton, the only muscles represented being those which immediately cover the bones. Figures of this kind can now be procured both in plaster and papier-mâché.

ÉCOUTES (Fr. *écouter*, to listen), in military operations connected with siege-works, are listening-places. They are small galleries, excavated at regular distances, and going out beneath and beyond the glacis, towards the lines and batteries of the be-

siegers. Their purpose is, to enable the garrison to hear and estimate the works being carried on by the sappers and miners of the enemy.

ECRASEUR, a long steel instrument invented by M. Chas-saignac, and consisting of a fine chain which, passed round any malignant growth, gradually constricts it, and finally crushes its way through it by means of a screw or rack for tightening it, which is worked at the end of the handle. The advantage of this instrument over the knife is, that it causes little or no bleeding, the torn vessels spontaneously contracting and closing. It is specially applicable to cases of cancer of the tongue, piles, polypi, and various kinds of tumors. When a solid mass—as, for example, a considerable portion of the side of the tongue—is to be removed, the chain is sometimes pressed through the center, and made to cut two lines successively in the form of a V, in which the diseased structure is included. As the pain which is caused by this instrument is very great, the patient should be placed completely under the action of chloroform before it is applied.

E'CSTASY (Gr. *ekstasis*, a transposition, a change of situation or condition; applied to the mind in the sense of a state in which it is altered or fundamentally changed in character by some absorbing emotion), a word applied to those states of mind, which, without amounting to insanity (q. v.), in respect of the temporary character of the affection, are marked by mental alienation, and altered or diminished consciousness. A person in ecstasy may be violently moved, or completely passive; convulsed, or rigid, or flaccid in all the limbs; silent, or uttering unmeaning or excited language, or assuming the character of a prophet or inspired person; having, or not having intelligence of what is going on around him. The varieties are infinite, because this morbid state of the mind is nothing more in reality than the fixing of it in a particular attitude, as it were, in connection with an overmastering idea, emotion or sensation, which causes all other external phenomena to be disregarded.

Perhaps the most common form, or, at all events, that which is best known, is religious ecstasy, closely allied to monomania and religious delusion of every kind; often simulated, but also occurring as a real disease, as in the case of those 'struck' in revival meetings, and in the older histories of the conversions of Cambuslang, the *convulsionnaires* of St. Médard, and the epidemics of religious excitement mentioned under Dancing Mania (q. v.). It is also common to speak of the ecstasy of terror, and the expression is correct in exaggerated cases, where fear completely paralyzes both the consciousness and the power of motion and expression; so also there is an ecstasy of joy, of love, of hate, of meditation; and in some physical states as Catalepsy (q. v.), Hysteria (q. v.), Mesmerism (q. v.), a true ecstasy is one of the phenomena, inasmuch as the proper consciousness of the individual is temporarily abolished, or so much changed in character as to lead almost to the loss of the sense of personal identity. Some of the cases of presumed Double Consciousness (q. v.) are no doubt of this kind; and generally the same may be said of the state of the mind in many dreams and visions, and also in Somnambulism (q. v.). A striking picture of this form of ecstasy is the well-known sleep-walking scene in *Macbeth*, where the lady's mind is so completely preoccupied with the supposed bloodstain on her hands, that though her eyes are open, we are told that 'their sense is shut,' and the mind is also excluded from all the ordinary avenues of communication.

EC'THYMA is a pustular disease of the skin, in which the pustules often reach the size of a pea, and have a red, slightly elevated, hardish base. In the course of two or three days after the appearance of the pustule, it is replaced by a scab, which adheres firmly to the base, and is somewhat concave. On its removal a deep red mark, a new scab, an ulcer, or a healed scar remains. The disease may be acute or chronic. The acute form is ushered in by slight constitutional, not amounting to febrile, symptoms, and by a burning or prickling pain at the seat of the eruption, which is usually confined to the neck and shoulders. The disease runs its course in ten days or a fortnight. In chronic ecthyma, the pustules which follow in crops (often several months) are usually scattered over the extremities. This form of eruption indicates a low state of the system. It sometimes follows the acute disease, and not unfrequently is a tertiary symptom of syphilis. Pustules, which in no respect seem to differ from those of ecthyma, are produced by various local irritants. Thus the affection of the hands, popularly known as the *grocer's itch*, is produced by the irritation of brown sugar, perhaps by the *acari* which are so often present in it. Stone-masons are said occasionally to suffer from a similar disease. With regard to treatment, the acute form would in most cases doubtless disappear in the course of a fortnight, if left entirely to itself; but as the bowels are usually disordered, an occasional alterative aperient, as a few grains of gray powder with a little rhubarb, may be prescribed, and tepid water applied locally gives great relief. The patient should moreover, be kept on a moderately good nutritious diet. In

the chronic form of the affection, a meat diet and the use of wine or porter are essential; while tonics, such as a combination of bark and nitric acid, are called for. Tepid baths are often useful, and if there is sleeplessness, an opiate should be taken at or shortly before bedtime.

ECTOZO'IA (Gr. *ektos*, without, and *zoos*, living), a term which has been introduced, as in contradistinction to *Entozoa*, to designate those parasitic animals which live on the external parts of other animals, as lice, ticks, &c. Such also are many of the entomostaceous crustaceans, parasitic upon fishes. It is a question of much importance, yet not satisfactorily answered, if any of these creatures are the causes of diseased states, in connection with which they are sometimes found in particular abundance, or if their presence in unusual numbers is to be ascribed to disease previously existing.

ECTRO'PION (Gr. *ek*, and *trepo*, I turn out), an everted condition of an eyelid, in consequence of which it does not cover the globe of the eye. It can be remedied by a slight surgical operation.

ECTRO'TIC (from Gr. *ectroma*, abortion), a term applied to methods of treatment which aim at preventing the development of a disease.

ECTYPO'GRAPHY, a method of etching, in which the lines are raised on the plate, in place of being sunk into it. See **ETCHING**.

ECTYPUM, a cast in relief of an ornamental design, produced from a mould.

ECUADO'R, the Spanish term for *Equator*, is the name of an independent state of South America, extending from lat. 1° 40' N. to 5° 56' S.; and from long. 70° to 81° 26' W. It measures, therefore, from north to south fully 500 miles, and from east to west nearly 800, presenting an area of about 250,000 square miles. It is bounded on the north by the United States of Colombia, on the east by Brazil, on the south by Peru, and on the west by the Pacific Ocean. Toward the east it is drained by the Amazon, which receives all the rivers that fall down the eastern slopes of the Andes, while the country west of the Andes is drained chiefly by the Mira, the Esmerelda, and the Guayaquil—the last-named stream being more available for navigation than any other on the same coast of South America. The country is traversed, nearly in the line of a meridian, by the two ranges of the Andes, which, alternating between union and separation, sometimes run into what are called knots, and sometimes enclose, at great elevations, plateaus or table-lands. Among these last, ranging from south to north, the most important are those of Cuenca, Hambato, and Quito—their respective heights above the sea being, in feet, 8640, 8860, and 9543. Lofty as these plateaus or table-lands are, they are beset, nay almost shut out from the world, by pinnacles of occasionally more than equal altitude above their own level. Of these the most remarkable are Chimborazo and Cotopaxi (q. v.). In connection with these physical features, the country is subject to volcanoes and earthquakes—the latter frequently occurring, and the former numbering altogether no fewer than sixteen. The climate comprises every possible variety. Hyperborean cold marks the snow-capped mountains; a temperature at once moderate and uniform renders the upland plains so many paradises; while, on both sides of the dividing ridge, intense heat oppresses the lower valleys. The rainfall is different in different localities. In the basin of the Guayaquil, there is regularly a wet season; between it and Cape San Lorenzo, almost perpetual drought prevails; and, in the other direction, the upper tributaries of the Amazon are said to be fed by almost perpetual rains.

The population, according to the latest estimates, amounts to about 1,300,000, comprising 600,000 white descendants of Europeans, 650,000 Indians (200,000 Indian savages), 8000 Africans, and 35,000 Mestizoes. The chief cities are Quito, the capital, and Guayaquil, a great commercial emporium; and the towns of the second class are Riobamba, Puno, Cuenca, and Loxa. The government appears to have been constituted on the model of the United States of North America, having a president and vice-president, with a senate and a house of representatives. The foreign trade of E. is carried on chiefly through the port of Guayaquil, the imports of which in 1879 amounted to £1,500,000. The total exports of E. in 1880 had a value of £1,159,501 (of which £647,331 were for the United Kingdom). In 1879, 226 vessels (including 115 steamers), of a tonnage of 215,831 tons, entered the port of Guayaquil. The principal exports are cocoa, the precious metals, vegetable ivory, cascarilla, caoutchouc, coffee, straw-hats, hides, &c. The principal articles of import, in order of value, are cottons, woollens, wines, spirits, groceries, soap and candles, hardware, flour. A few cart-roads have recently been made, and a short line of railway.

ECUME'NICAL (Gr. *oikoumenikos*), i. e., universal, a term applied to ecclesiastical councils, regarded as representing the whole

Christian Church, or the church of the whole world (*oikoumene*), and to the orthodox or Catholic Church, regarded as opposed to heretical and merely local sects. The Roman Catholics claim the designation as appropriate to their own church. It is a title of patriarchs, archbishops, and ecclesiastical superintendents of provinces.

EDAM, a town in North Holland, lies 12 miles north-north-east of Amsterdam. There is an extensive trade in wood and cheese. The principal industries are ship-building, rope-spinning, sawing wood, tanning leather. Pop. (1879) 5600.

EC'ZEMA (from a Greek verb, 'to boil out'), an eruption of small vesicles on various parts of the skin, usually crowded together, with little or no inflammation around their bases, and unattended by fever.

E'DDA. There are two works which bear this title—the *Edda Sæmundar hins Froda*, or Edda of Sæmund the Wise, and the *Edda Snorra Sturlusonar*. The former and older of these is a collection of the most ancient mythological and heroic Scandinavian songs, the date of whose composition may probably be referred to different periods between the 6th and 8th centuries. These songs, which are supposed to have been collected and arranged by Sæmund Sigfusson, surnamed Frodi, an Icelandic priest, who was born in 1054, and died in 1133, were discovered and first brought before the notice of European scholars in 1643, by Brynjolf Sveinsson, bishop of Skalholt, who applied to them the name of Edda, or 'grandmother.' This collection was published entire at Stockholm, 1818, by A. A. Afzelius, after the text of Professor Rask; and at Copenhagen, in 1787—1828, with a Latin translation, glossaries, &c.

The third volume of this edition, which was completed by Professor Finn Magnussen, consists chiefly of a very learned and copious Lexicon Mythologicum by the editor. Complete editions of the text of this Edda were also published by Munch and Möbius, but all former editions have been superseded by the editions of Professor Bugge of Copenhagen (1867) and of Svend Grundtvig (1868—1874). Hildebrand's text (1876) is founded on theirs. Simrock made a German translation of both Eddas in 1851; and both Etimüller and the brothers Grimm have translated a part of Sæmund's Edda. The Snorra Edda is a prose composition, and treats of Scandinavian mythology and of the language and modes of composition of the ancient skalds. As the name implies, it is referred to Snorri Sturluson (q. v.), the learned author of the *Heimskringla*, who was born in Iceland in 1178, and died by assassination in 1241, on his return from Norway, where he had lived in the capacity of skald or court-poet. This Edda, was first published by P. J. Resen in 1665, under the title *Edda Islandorum Ant. Chr. MCCXV. Conscripita per Snorronem Sturla*, &c. A complete edition of the prose E., and the most copious of all, was published at Stockholm by Professor Rask in 1818. The trustees of the Arna-Magnæan legacy in Copenhagen have published an elaborate edition, with a Latin translation and notes; and a German edition of both Eddas, with glossary, &c., was published in 1859 by Lünig. A complete English translation of the poetical E., by Ben. Thorpe, was published in 1866. The best English translation of the mythological part of the prose E. is found in a translation of Mallet's *Northern Antiquities*, edited by Blackwall (1847).

E'DDOES. See Cocco.

E'DDYSTONE, a group of gneiss rocks, daily submerged by the tide, in the English Channel, 9 miles off the Cornish coast, and

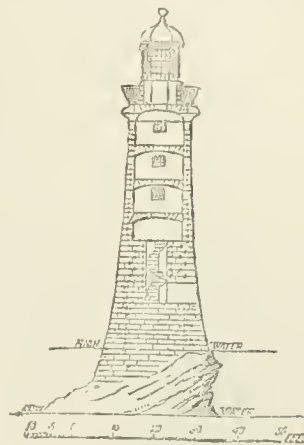


Smeaton's Eddystone Lighthouse

14 miles south-south-west of Plymouth Breakwater. The rocks lie in lat. 50° 10' 54" N., and long. 4° 15' 53" W., and have 12 to 150

fathoms water around. The frequent shipwrecks on these rocks led to the erection of a light-house on them by Mr. Winstanley, 1696—1700. It was a wooden polygon, 100 feet high, with a stone base; but a storm in 1703 completely washed it away, with the architect. Another light-house was built, 1706—1709, also of wood, with a stone base, and 92 feet high, by Mr. Rudyerd, a silk-mercer. This erection was burned in 1755.

The next, noted for its strength and the engineering skill displayed in it, was constructed by Mr. Smeaton in 1757—1759, on the model, it is said, of the trunk of the oak-tree. It was built of blocks, generally one to two tons weight, of Portland oolite, encased



Section of Smeaton's Light-house.

in granite. The granite is dove-tailed into the solid rock, and each block into its neighbors. The tower, 85 feet high, had a diameter of 26½ feet at the base, and fifteen feet at the top. The light, 72 feet above the water, was visible at a distance of 13 miles. As the rock on which this tower was built is worn and greatly weakened, the foundation of another was laid on another part of the reef in 1879. The new light-house, completed in 1882, is, like its predecessor, ingeniously dove-tailed throughout. Its dioptric apparatus gives, at an elevation of 120 feet, a light equal to 230,000 candles, and visible in clear weather to a distance of 17 miles. From the state of the foundation, it was seen to be necessary that Smeaton's light-house should be taken down and removed as soon as the new one was completed. See LIGHT-HOUSE.

EDELINCK, GERARD, a celebrated engraver, born at Antwerp 1627, died in Paris in 1707. He was patronized by Louis XIV.

E'DEN, according to the Hebrew Scriptures, the first residence of man. The description given of it in the book of Genesis is brief, obscure, and, in appearance, legendary. The allegorical theory will be noticed under FALL (q. v.). In general, however, scholars have preferred to understand the story literally, and to believe that the writer or writers of it meant it to be so understood; but they have not therefore, been unanimous as to the geographical position of Eden. Josephus and several of the Fathers conceived that Eden was a term denoting the entire region between the Ganges and Nile; Calvin, Huet, Bochart, Wells, &c., have, with slight differences of detail, concluded in favor of Kordah in Babylonia, not far from the Persian Gulf; Reland, Calmet, Hales, Faber, J. Pye Smith, in favor of Armenia, near the sources of the Tigris and Euphrates; Le Clerc, in favor of the region near Damascus; while the modern German school of biblical critics, convinced that the Hebrew account is traditional, and, in its present form, of very late composition, and impressed, besides, with the vast antiquity of the far East, have, almost without exception, turned their eyes in that direction, and sought the cradle of the human race in Bactria or Cashmere, or the region lying to the north of it, a part of which is to this day called Audyana, the 'Garden.' It may also be mentioned that the Mohammedans believe Eden to have been in one of the seven heavens—some say the moon—and that the expulsion from paradise consisted in Adam being cast down upon earth after the Fall.

It is useless seeking to identify the river-system of Eden with anything known at present. There is no river on the face of the globe of which the Euphrates and Tigris (Hiddekel) are separate 'heads' (whether this means 'sources' or 'channels'), as they are said to be in the 2d chapter of Genesis, for, as Major Rennel has shown, although the Euphrates and Tigris now unite for a short space on their way to the Persian Gulf, yet, until the time of Alexander the Great, they kept entirely distinct courses; and therefore it has been assumed that the 'Deluge' completely altered the physical character of the region denoted by the term Eden. This was Luther's notion, to which, however, it has been

objected, that the narrative in Genesis is so worded as to convey the idea that the countries and rivers spoken of were still existing in the time of the historian. Besides, the science of geology has thrown so much doubt on the universality of a Deluge so late as the period assigned to Noah, that it is hazardous to argue on the hypothesis of any extensive physical changes having taken place since the first appearance of man on the planet; at least, if that be dated only some six thousand years back. It will thus be seen that the question of the locality of Eden, or of the exact sense in which the Mosaic narrative is to be understood, is involved in inexplicable mystery; and it has become a general opinion, that the spiritual significance of this primeval story is what principally concerns Christians—an opinion which derives force from the total silence of the New Testament in reference to the subject.

EDEN, a river rising in the east of Westmoreland, in the Pennine Chain. It runs north-north-west through the east of Westmoreland and Cumberland, past Appleby and Carlisle, and ends in a fine estuary at the upper part of the Solway Firth, after a course of 65 miles.

EDENKOBEN, a town of the Bavarian Palatinate, six miles north-north-west of Landau. It is surrounded by vineyards, which produce much poor wine. There is a bathing establishment at E., also several mills. Pop. (1880) 4898.

EDENTA'TA (Lat. toothless), an order of *Mammalia* established by Cuvier, and generally received by naturalists. Cuvier remarks that 'although brought together by a purely negative character,' the E. have, nevertheless, 'some positive mutual relations, particularly in the great claws which encompass the ends of their toes, and which more or less approximate to the nature of hoofs; also in a certain slowness or want of agility, obviously arising from the peculiar organization of their limbs.' He included among them, however, the *Monotremata*, which, although so few in number, are now generally separated, on account of the very important differences of organization which characterize them. The remaining E. are divided into two tribes—1. *Tardigrada* (slow-paced), containing only the Sloths; and 2. *Effodentia* (diggers), containing Armadillos, Pangolins, Ant-eaters, &c. The ant-eaters and pangolins are the only E. that are absolutely destitute of teeth; but none of the order have any teeth in the fore-part of their jaws, and their teeth are comparatively imperfect in structure, being destitute of enamel and distinct roots. The sloths alone subsist on vegetable food, the rest chiefly on insects or on animal substances in a decaying state. The whole number of existing species of E. is not great; but they appear to have been more numerous and of much greater size in a former geological period, as the remains of the *Mylodon*, *Megatherium*, and *Megalonyx* testify.

EDE'SSA (modern name, *Urfah*, or *Orfa*), a very ancient city, on the river Daisan, in the north of Mesopotamia, 78 miles south-west of Diarbekir, although the Christian or Mohammedan legend, ascribing its foundation to Nimrod, or Khabiba, a female contemporary of Abraham, is unworthy of any credence. With the conquest of Persia by the Greeks, the history of E. first becomes clearer. Seleucus, in particular, is said to have done much for the aggrandizement of the city. Christianity was introduced into E. at an early period. In the reign of Trajan, the place was made tributary to Rome, and in 216 A.D. became a Roman military colony, under the name of *Colonia Marcia Edessanorum*. During this period, its importance in the history of the Christian Church continued to increase. More than 300 monasteries are said to have been included within its walls; it was the seat of Ephraim Syrus and his school, and played an important part in the Arian and other controversies. With the extension of the religion of Islam, E. fell into the hands of the Arabian califs. Christianity declined, and wars at home and abroad during the califate, destroyed likewise its temporal splendor and prosperity, till, in 1040, it fell into the possession of the Seljuk Turks. The Byzantine emperors succeeded in recovering E., but the viceroy contrived to make himself independent. He was, however, hard pressed by the Turks, and this rendered it easy for the crusader Baldwin, the brother of Godfrey of Bouillon, to gain possession of the city (1097 A.D.), and make it the capital of a Latin principality, and the bulwark of the kingdom of Jerusalem. Under the Frankish princes, E. held out valiantly against the Mussulmans, till at length Zengi, ruler of Mosul, succeeded in taking the town and citadel in the year 1144, when all the Christian churches were converted into mosques. An attempt made by the inhabitants to throw off the Turkish yoke, completed the ruin of E.: the Edesenes were defeated by Nur-ed-din; and all who were not massacred, were sold as slaves. After many vicissitudes, in the course of which E. fell successively into the hands of the sultans of Egypt, the Byzantines, the Mongols, Turkomans, and Persians, the city was finally conquered by the Turks, and has ever since formed a portion of the Turkish dominions. It now contains 40,000 inhabitants, of whom 2000 are Armenian Christians; the rest are Turks, Arabians, Kurds, and Jews. At present, E. has numerous

mosques and bazaars; manufactures of cotton goods, goldsmiths' wares, and morocco leather, commerce in British manufactures obtained by way of Aleppo, and a large trade in corn, &c., with Syria. E. is regarded by the Easterns as a sacred city, because they believe it to have been the residence of Abraham.

E'DFOU (Coptic, *Atbô*; Egypt. *Hut*; anc. *Apollinopolis Magna*), a town of Upper Egypt, is situated on the left bank of the Nile, in lat. 25° N., and long. 32° 45' E. It contains the remains of two temples, which are considered the finest remains of antiquity in Egypt. The larger of these temples was commenced by Ptolemaus Philometor 181 B.C., but does not appear to have been completed till the reign of Claudius. There appears, however, to have been a temple there in the reign of Thothmes III. Its length is about 400 feet, its breadth 150. Its entrance is by a gateway 50 feet high, between two immense truncated pylones, 37 feet wide at the base, and 114 feet high. These are adorned with masterly sculptures. Passing through this entrance, the court is reached; it is 161 feet long, and 140 feet wide, enclosed by a splendid colonnade of 32 pillars, each differing in design, and surrounded by walls, between which and the pillars there is a stone roof forming a covered portico. The interior of this court is to a great extent filled up with rubbish, and occupied by wretched dwellings, many of which also are built upon the roof of the temple. Within the temple, there are several chambers, one of which, about 33 feet by 17, contained the image of the deity; in it was also a zodiac. The effect of the whole is grand and imposing, impressing the mind with the harmony and perfect beauty of the design. An inscription on the outer wall recorded the endowment of the temple by Ptolemy Alexander I., and Darius, Nectanebo, and Nectanebes II. The smaller temple, erected by Physeon and Lathyrus, consists only of two chambers. Its walls are covered with hieroglyphics representing the life of *Horus*, the son of *Kneph* and *Athor*, who were worshiped in the great temple. These temples have been lately entirely cleared by Mariette. E. has at present a population of about 2000. Its manufactures are blue cotton cloths, and earthen-ware similar to the ancient Egyptian pottery.—Wilkinson, *Modern Egypt*, p. 274; Brugsch, *Reiseberichte*, p. 225; Lepsius, *Egypt and Ethiopia*, p. 117.

E'DGECUMBE.—1. A bay in the east coast of Australia, lies within the province of Queensland, near lat. 20° S., and long. 148° E. It is sheltered on every side but the north, its east barrier terminating in Cape Gloucester.—2. A mountain in what was formerly Russian America, marks the N.W. point at the mouth of Norfolk Sound, which connects the settlement of New Archangel on the island of Sitka with the open ocean. It rises from the water's edge as an almost perfect cone, which, during nearly the whole year, is capped with snow. It has been an active volcano within the recollection of some of the Russian colonists; and, even at the present day, the neighborhood presents indications of subterranean energy, such as tremblings of the earth, hot springs, and eruptions of smoke and ashes. See AMERICA.

E'DGEHILL, BATTLE OF. The first great battle of the Civil War was fought on Sunday, 23d October 1642, between the royalist forces under Charles and the parliamentarians under the Earl of Essex. It was the intention of Charles, who had been lying at Shrewsbury, to march upon London by Wolverhampton, Birmingham, and Kenilworth; and Essex, who had thrown himself into Worcester, on being informed of the king's plan, marched forward to intercept him, and entered the village of Keinton, in Warwickshire, on the evening of the 22d. On the following morning, the royalist army was discovered a little in advance, and drawn up in order of battle on the elevation of Edgehill. The king's forces had the advantage in numbers and in cavalry, as well as in position; Essex, however, had the more formidable train of artillery. Charles had commanded that hostilities should be delayed until the enemy should open fire; accordingly no movement took place till about two o'clock, when Essex commenced the fight by firing upon the royalists, who immediately replied with their cannon. The royalists then began to descend the hill, and Prince Rupert, who led the right wing, charged with his cavalry the left wing of the parliamentarians, broke it, and pursued it madly to Keinton, where his men, regardless of the main army, busied themselves in plunder. This was the fatal movement of the day. The right wing of the parliamentarians had charged and recharged with the greatest success, until, after some stubborn fighting around the royal standard, the royalists broke, and retreated toward the hill. That night 4000 men lay slain at the foot of Edgehill, and of these the greater number were royalists.

E'DGEWORTH, MARIA, the daughter of Richard Lovell Edgeworth of Edgeworthstown, county of Longford, Ireland, was born at Ilare Hatch near Reading, Berkshire, in the year 1767. In 1782, her father returned to Ireland, accompanied by his family, to whose education he earnestly devoted himself. Maria's talents quickly developed themselves. Her first literary effort was written in conjunction with her father, and was entitled *Essays on Prac-*

tical Education (1798). In 1801 appeared the *Essay on Irish Bulls*, which was also in part the work of Mr. Edgeworth. But it was in the sphere of fiction that Miss E. won her greatest triumphs. In 1801 she published *Castle Rackrent*, the first of a pretty extensive series of novels characterized in general by a quiet agreeable humor, excellent sense, and lively delineation of character and manners. It has been objected by critics, however, that some of them are too manifestly didactic to please as fiction should please. In 1803 appeared *Belinda*; in 1804, *Popular Tales*; in 1806, *Leonora*; in 1809, *Tales of Fashionable Life*; and in 1812, a second series of the same. The last of the series was 'Helen,' which was published in 1834. Among the most successful of her *Tales of Fashionable Life* were 'Ennui' and 'The Absentee.' Miss E.'s stories for children—the last of which, *Orlando*, appeared in *Chambers's Library for Young People*—are deserving of high praise. This gifted and universally respected authoress died at Edgeworthstown, 21st May 1849.

EDGINGS are indispensable to neatness in gardening, except where parterres are cut out of a lawn, but more especially to separate gravel-walks from cultivated ground. They are sometimes made of stone, or of deal; sometimes of ornamental wicker-work, and now not unfrequently of wirework; but for many purposes, the best edgings are formed of low-growing evergreen plants, and none are so common in Britain as those of dwarf box, which, when carefully trimmed, are very pleasing to the eye, and do not require renewal for a number of years. Thrift or sea-pink is another not uncommon edging, is beautiful at all times, and particularly so when in flower, but requires frequent renewal. The double daisy, often planted as an edging, also requires frequent renewal. Turf-edgings are sometimes employed for wide flower-borders.

EDIBLE BIRDS' NESTS, or EDIBLE SWALLOWS' NESTS. See NESTS, EDIBLE.

EDICT (Lat. *edictum*). The power of making edicts (*jus edicendi*) belonged generally to the higher magistrates at Rome; but it was by the curule ædiles, and more extensively still by two prætors—the prætor *urbanus* and the prætor *peregrinus*—that it was prominently exercised. In a province, the jurisdiction of the prætor passed to the *præses*. As this power was co-extensive with the possession of what were called the honors (*honores*), it was frequently spoken of as the *jus honorarium*; and from its being exercised chiefly by the prætors, it was also known as the *jus prætorium*. The edicts of the prætors are mentioned by Gaius among the sources of the Roman law; but, strictly speaking, they are to be considered as rules promulgated by the magistrates on entering on office, rather than as expressions of the will of the Roman people, either direct or indirect. The edict of one prætor was not binding on his successor, but very often edicts were adopted and confirmed, and this came gradually to constitute a very important body of law. They were frequently known by the names of their first promulgators, though they were often named with reference to the formula and the *actio* which they established. The power of promulgating edicts is supposed to have flowed down from the kings to the consuls, and through them to the prætors, and thus to have formed part of what we should call the royal prerogative. Even in Cicero's time, the study of the edict had become a regular branch of the study of the law.

In 67 B.C., the Lex Cornelia provided against the abuse of passing edicts for the decision of particular cases by requiring the prætors to decide in conformity with the edicts which they promulgated with reference to their whole tenure of office, which were known as perpetual edicts. Servius Sulpicius, the friend of Cicero, addressed to Brutus a work on the subject; and Orellius made what was probably a compilation of the various edicts, resembling the subsequent one by Julian. The object of the edict according to the Roman jurists, was to aid, supplement, and correct the civil law, and to render it more conducive to the public service, and they speak of it as 'the living voice of the civil law.' It was, in short, an indirect form of legislation, which public opinion had sanctioned for the public convenience; and there can be no doubt that it contributed what was ultimately the most valuable part of the Roman law. There were many commentators on the edicts under the emperors, amongst whom Labeo is mentioned and cited by Ulpian (*Dig.* 4, tit. 3, s. 9). Julian is supposed to have collected and arranged the edicts, and given to them a systematic form. Gaius, Ulpian, and Paulus composed treatises on the edicts of the curule ædiles; and it is chiefly from the writings of these and the other jurists excerpted in the *Digest*, that we know anything of the character of the edict, the portions of it which have been preserved being mere fragments. They have been collected by Wieling in his *Fragmenta Edicti Perpetui* (Frank. 1733).

EDICT OF NANTES. See NANTES.

EDICTAL CITATION, or INTIMATION. By the former practice of Scotland, where the party to be cited before a civil

court was out of Scotland, the citation required to be given by a messenger-at-arms making proclamation at the market-cross of Edinburgh, and at the pier and shore of Leith. The idea, of course, was, that the fact was thus more likely to reach the absent party. But the practice was altered by the so-called Judicature Act in 1826, and an act of 1850, which enacted that services against persons forth of Scotland should be done by delivery of copies at the record office of the keeper of the records of the Court of Session. Abstracts of the copies delivered to the keeper are ordered to be recorded by him, and to be printed periodically. Under the citation Amendment (Scotland) Act of 1882, summonses or warrants of citation, whether the person be a party or a witness, may be executed or served by means of a registered letter by post. In criminal cases, the old forms still remain unaltered.

EDINBURGH, the capital of Scotland, and chief town in the county of Mid Lothian, occupies a picturesque situation on a cluster of eminences, at a distance of about a mile and a half from Firth of Forth (q. v.), which is here about six miles in breadth. The outskirts extend almost to the shore, and a connection has thus been formed on the north with Leith, the ancient port; Newhaven, a fishing village; and Granton, a modern and rising port. The admirable position of E. has induced the comparison with Athens, from which, as well as its literary fame, it takes the title 'Modern Athens.' The Gaelic name of the city is 'Dinedin.'

The castle, which crowns the highest point in the city, was undoubtedly built first, a town gradually forming on the top and sides of the ridge, which slopes downwards to the east. For some centuries the city was confined entirely to this ridge or hill, and was flanked on the north by a lake or marsh called the Nor' Loch. The remaining means of defence was a wall built by the citizens about the middle of the 15th century, a few relics of which, of different eras, still exist. E. was therefore a fortified town, protected by the castle at its western extremity. When David I. was induced by his piety and munificence to found the Abbey of Holyrood in the low ground eastward of the city, he at the same time empowered the canons of this religious house to found a burgh in a westerly direction towards the city of E., and thus was built the Canongate, afterwards united to the city. The beautiful abbey itself has been a ruin since the fall of its roof in 1763. In connection with the abbey sprung up the palace, which became a favorite abode of the Scottish sovereigns. Not, however, till about the era of the murder of James I. at Perth in 1437, did E. become the recognized capital of the kingdom. Neither Perth nor Seone. Stirling nor Dunfermline, being able to offer to royalty security against the designs of the nobles, E. with its castle was thenceforth selected as the only place of safety for the royal household, the parliament, the mint, and the various important government offices. By this means rising in importance, E. became densely peopled, and the houses were built to an unusual height, that the inhabitants might keep within the walls for the sake of protection. The town then consisted of the original main way called the High Street, reaching to the Canongate, and a parallel way, narrow and confined, on the south, called the Cowgate, connected with each other by upwards of a hundred narrow cross alleys or closes, between dense clusters of houses. Most of these houses consisted of a succession of floors or flats, each being a separate dwelling, and of such floors there were seldom fewer than six, and sometimes ten or twelve, towering to an immense height, and rendered still more imposing from being built on an eminence.

The citizens remained content with these confined limits till about the middle of the 18th century. Between 1763 and 1769, the North Bridge was erected, connecting the old city with the fields on the north, on which the *New Town* was beginning to be built. Shortly afterwards, in 1788, the line of this bridge was extended southwards by twenty-two arches (the South Bridge), only one of which is seen where the structure spans the Cowgate, and thus a level way was opened to the southern suburbs, which have since rivalled the new town in rapid growth. George the Fourth's Bridge was erected over the same valley a short distance to the westward, a considerable time afterwards. The Nor' Loch was drained and partially bridged over by the Mound formed from the earth dug from the foundations of the new town, and its situation is occupied by fine public and private gardens which now lie in the center of modern E., and separate Princes Street, the southmost and most picturesque street of the new town, from the old town. Two other bridges give access to E.—the Regent's Bridge, Waterloo Place, which arches the valley between Princes Street and the Calton Hill to the east; and at the west end, the fine Dean Bridge over the Water of Leith, which is 106 feet high. Quite recently, a very handsome and commodious bridge has been completed by the railway company, near to and parallel with the North Bridge. The new town being built with much regularity in straight streets, and in squares and crescents with numerous gardens, contrasts with the crowded, though picturesque masses of the old town. The dilapidated and dangerous state of part of

the old town, and the necessities of sanitary ameliorations in the overcrowded buildings, have occasioned great changes of recent years, and several new streets have been opened up through the most crowded and ruinous localities.

Altogether built of durable sandstone from quarries in the neighborhood, the general aspect of the houses is that of great solidity. Among the most interesting features of the town are the Castle, in which are shown the ancient regalia of Scotland; the Parliament House, used by the Scottish parliament before the Union; St. Giles's Cathedral, lately restored, with a magnificent crown on the central tower; the Abbey and Palace of Holyrood (q. v.); the Bank of Scotland, recently rebuilt; the Scott Monument, designed by a native self-taught artist; Heriot's (q. v.) and Donaldson's (q. v.) Hospitals; the General Register House, where all heritable titles and state documents are recorded and preserved; the Post-office; the Royal Institution, where the Royal Society, and the Society of Antiquaries of Scotland, meet; National Gallery; the University and Museum of Science and Art; the episcopal churches (St. John's and St. Paul's); and the banks, clubs, insurance offices, and hotels of Princes Street and George Street. The unfinished National Monument on the Calton Hill is striking from its position. An Anglican cathedral and a new infirmary have been built. The country round E. is finely varied. From Arthur's Seat and Salisbury Crags, on the south-east, the eye wanders to the Braid Hills on the south, and the richly wooded Corstorphine Hill on the west, all within a mile or two of the town; while further off begin the Pentland Hills, four miles to the south-east; and to the north the Firth of Forth, and the Fife coast and hills, form a magnificent background. The climate is bracing and healthy, although the situation is exposed, not so much rain falling as on the west coast, and high winds are very prevalent.

E. is not an important manufacturing town, though it derives considerable commercial importance from its various banks and insurance offices, round which revolves no mean portion of the monetary capital of Scotland. The principal industries are brewing (two-thirds of all the ale or beer brewed in Scotland being made in or near E.), printing and publishing with the kindred arts (see BOOK-TRADE), distilling, ironfounding, tanning, and coachbuilding, manufacture of articles in india-rubber, of house furniture, and of jewelry, and the rearing of young trees in nurseries in and around the town, for which the climate is favorable.

E. is the place of residence of considerable numbers of the Scottish landed gentry, and its society is regarded as unusually polished from the predominance of the professional and literary elements in its composition. This arises partly from its being a university town, and partly from the presence of the Supreme Law Courts of Scotland (see COLLEGE OF JUSTICE), all the important legal business being attracted thither on that account; the Edinburgh lawyers have charge of most of the landed estates throughout the northern part of the kingdom, so that there is an unusual number of advocates (barristers), writers to the signet, and solicitors (attorneys and conveyancers) and accountants. Its medical practitioners—surgeons and physicians—have a high reputation. E. is much resorted to for the sake of education, for its University (q. v.) and medical schools, its High School, and its various other educational institutes. The Free Church and the United Presbyterian Church have each a well equipped Divinity Hall in E. The opening in 1869 of the Merchant Company's schools, which (by utilizing certain surplus hospital funds) provide high-class instruction at moderate charges for about 6000 male and female pupils, has added to the influx of residents desirous of availing themselves of this boon. For the poorer classes, part of the enormous funds of George Heriot's charity have been diverted for cheaper schools throughout the town. Fettes College is a foundation school on the model of Rugby and Eton, and is a handsome edifice.

E. is largely resorted to by visitors to the Highlands of Scotland, and has an unusual number of hotels. There are two theaters, and abundance of amusement, including a large open-air gymnasium. In the southern environs are fine open links or downs, where the game of Golf (q. v.) has been played from time immemorial. Excellent street cabs are to be found, and tramways are laid to the suburbs.

E. is the seat of various Scottish Boards (Poor-law Supervision, Lunacy, Fisheries, School, Northern Lighthouses, &c.); in it the Established and Free churches hold their annual assemblies and courts, as do the United Presbyterians.

E. is a royal burgh, governed by a town-council composed of 41 members. The town-council elects from its own body a Lord Provost and six bailies, who constitute the civic magistracy. E. is represented by two members in parliament.

Pop. (1821) 112,235; (1861) 167,851; (1871) 196,979; (1881) parl. 228,357, with suburbs, 236,002. Number of inhabited houses, 42,289; parliamentary and municipal constituency (1882–1883), 28,931.

EDINBURGH, THE UNIVERSITY OF, took its rise from a bequest in 1558 by Robert Reid, Bishop of Orkney, of 8000 merks; but the sum was retained for a considerable time by the Abbot of Kinloss. The magistrates of the city, on the faith of receiving the bequest, purchased in 1563 a portion of the ground on which the present university stands. Queen Mary was anxious that the proposed institution should succeed, and bestowed upon it grants of confiscated church property. The university was formally founded by King James VI. in 1582 by royal charter, in virtue of which the corporation, up till 1858, remained its patrons or governors. In 1583 the work of instruction began under Robert Rollock, the first regent. Originally, the university consisted of but one class and one regent or teacher. The regent had charge of the students from their enrolment to their laureation at the close of the fourth session of study. As the university prospered, additions were made to the staff of regents, and separate chairs for the several branches were founded. In the beginning of the 17th c., the *Senatus Academicus* consisted of a principal and four regents. The first theological chair was instituted in 1642, and the first professor of medicine was appointed in 1685. After 1688, the university of E., along with its sister universities, was subjected to a parliamentary visitation. The commission was issued in 1690, and till the close of the century the university was under its control. Under this supervision, a separate chair of Greek was established; and after 1708, the present arrangement of the Faculty of Arts came into existence. About this period, the Faculty of Law was created. During the 18th c., the professoriate rapidly increased; and in 1760, the *Senatus Academicus* contained 18 professors besides the principal. Twenty chairs have since been added. In 1858, an act of parliament was passed, by which the constitution of the university was materially changed. The government was taken out of the hands of the lord provost, magistrates, and town-council of the city, and placed in the *Senatus Academicus* and a university court; and the patronage of the chairs—from 1582 in possession of the corporation—was transferred to seven curators, three of whom are nominated by the university court, and four by the town-council. A general council was also established, consisting of graduates of the university, and all persons who, up till August 1861, could satisfy the university commissioners that they had given attendance on four complete sessions of the university, two of these sessions being in the course of study in the Faculty of Arts. The members of this body, together with the professors and university court, have the right of voting in the election of a member of parliament for the universities of Edinburgh and St. Andrews.

Matriculation, Faculties, Degrees.—Students entering any class in the university, are required to inscribe their names in the General Matriculation Album of the university, which is the legal record of attendance; and the matriculation ticket serves as a passport to the privileges of the University Library. The university consists of the Faculties of Arts, Medicine, Theology, and Law.

The Faculty of Arts comprises the chairs of Humanity, Greek, Mathematics, Logic and Metaphysics, Moral Philosophy, Natural Philosophy, Rhetoric and Belles Lettres, Universal History, Practical Astronomy, Agriculture, Music, Sanscrit, Engineering, Geology, Political Economy, Fine Art, Education, and Celtic (instituted 1882). Attendance on the first seven of these is required of candidates for the degree of M.A. The Medical Faculty comprises the chairs of Institutes of Medicine, *Materia Medica*, Medical Jurisprudence, Chemistry, Surgery, Practice of Physic, Anatomy, Pathology, Midwifery, Clinical Medicine, Clinical Surgery, Botany, Natural History. The Faculty of Theology comprises the chairs of Divinity, Ecclesiastical History, Biblical Criticism and Antiquities, Hebrew. The Faculty of Law comprises the chairs of Civil Law, Public Law, Law of Scotland, Conveyancing. The degrees granted by the university are Master of Arts, Bachelor of Medicine, Master of Surgery, Doctor of Medicine, Bachelor of Science, Doctor of Science, Bachelor of Divinity, Doctor of Divinity, Bachelor of Laws, Doctor of Laws.

Libraries, Museum, Societies.—The university library originated in a bequest, in 1580, by Mr. Clement Little. The bequest amounted to about 300 volumes. It enjoyed the right of receiving every book entered in Stationers' Hall, but a composition of £575 per annum in lieu of the privilege was subsequently accepted. The University Library contains about 150,000 printed volumes, and 2000 volumes of MSS. The university also contains subsidiary libraries, such as the Theological Library, the Humanity Class Library, &c. The Natural History Museum was established in 1812, and received a government grant of £200 per annum. It was in 1854 transferred to the new Museum of Science and Art, where it forms a Natural History Department, of which the Professor of Natural History is the Regius keeper. The Anatomical Museum was founded by the town-council and the *Senatus Academicus* in 1826. The Botanical Museum is stationed in the Botanic Garden, which is in connection with the university, and several valuable museums exist as appendages to classes. There are several socie-

ties in connection with the university, which meet in its buildings during the winter session.

Bursaries.—There are about 120 bursaries and prizes connected with the various faculties of the University, generally awarded according to the results of competitive examinations; but there are restrictions in most cases, the natives of certain districts only being allowed to compete for many of the bursaries. Their yearly values range from £5 to £90, and they are generally held for a period of four years.

Scholarships and Fellowships.—There have been instituted since 1858 about 50 scholarships, of the value of from £30 to £150, and nine fellowships, from £100 to £160 per annum.

Students.—The number of students has of late been steadily increasing, and in 1881–82 reached the large number of 3300. The existing buildings are now found insufficient for so great an attendance, and spacious and handsome new buildings have been erected in the immediate neighborhood of the new Royal Infirmary for the medical and natural science classes.

EDINBURGH REVIEW, the first of the great critical periodicals which form a distinguishing feature of the literature of the 19th century. It was started in October 1802 by a knot of young men living in the northern metropolis, the principal of whom were Francis Jeffrey (q. v.), Sidney Smith (q. v.), F. Horner, and Henry Brougham (q. v.). So much was secrecy felt or believed to be necessary to the success of the undertaking, that, according to the account which Lord Jeffrey gave to Mr. Robert Chambers in 1846, the 'dark divans' of the reviewers were held for some time 'in a dingy room of Willison's printing office in Craig's Close,' to which each repaired alone, and 'by back approaches or different lanes.' Of the first number, 750 copies were printed; the demand exceeded this limited supply; 750 more were thrown off, and successive editions followed. In 1808, the circulation had risen to about 9000, and it is believed to have reached its maximum—from which it has declined—in 1813, when 12,000 or 13,000 copies were printed. The pay of contributors was at first ten guineas a sheet, but shortly after 'the minimum,' says Jeffrey, 'was raised to sixteen guineas, at which it remained during my reign. Two-thirds of the articles were, however, paid much higher, averaging, I should think, from twenty to twenty-five guineas a sheet on the whole number.' The original publisher was the well-known Constable. The political views advocated in the early pages of the *Edinburgh Review* were Whig, and to these it has consistently adhered to the present day. Its influence in developing and strengthening the political convictions of the Whig party cannot be over-estimated; but its power was even more visible, certainly more immediately palpable, in literature. Amid the feeble and effete periodicals of the day, it burst like a bomb-shell. The keenness of criticism, the sharpness of wit, the brilliancy of style, the vigor of mind and comprehensiveness of knowledge exhibited by the writers, excited amazement and fear in the world of letters; and although, in the case of Wordsworth, Southey, and other writers of a certain school, unfairness of a flagrant kind was undoubtedly exhibited and persevered in, yet impartial justice was, on the whole, administered, and the rising generation of authors strained their utmost to escape the lash. Since the period of Jeffrey, the most brilliant contributor to the *Edinburgh Review* was Lord Macaulay. See *Correspondence of Macvey Napier* (1879).

EDINBURGHSHIRE, or **MID-LO'THIAN**, the metropolitan county of Scotland, lying on the south side of the Firth of Forth. Its greatest length from east to west is 36 miles, and its breadth 18 miles, with an area of 367 square miles. From the south border, the Pentland Hills (mean height 1000 feet, and highest point 1839 feet) and the Moorfoot Hills (mean height 800 feet, and highest point 2136 feet) run north-east through the county. In the north are fertile plains, varied by gentle slopes, ridges, and hills of trap. The coast, 13 miles long, is partly sandy, and is studded with towns, villages, and piers. The chief rivers are not above 20 miles long, and are the Esk, Water of Leith, Almond, and Gala Water. Four great roads and five great railways traverse the county. E. chiefly consists of carboniferous strata, with protrusions of trap. Some lower Silurian rocks occur in the south-east. Coal and iron are chiefly worked in the broad valley of the Esk. Here the bed of coal extends 15 by 8 miles, and contains 33 seams $\frac{1}{2}$ of a foot to 6 feet thick. The fine sandstone quarries of Craighleith contain large fossil trees, and the limestone of Burdiehouse is famed for fossil fishes. Cold and dry east winds prevail in spring. Clay-soil predominates. The county is chiefly agricultural, with large farms. The harvest is a week earlier on the coast than at the height of 200 feet, and a fortnight earlier than at the height of 600 feet. Near the metropolis are extensive nurseries, vegetable and fruit gardens, and dairy pastures. In 1881, of the total acreage of 234,926 acres, 134,999 acres were in crop. Pop. (1871) 328,379; (1881) 389,164. Although not important as a manufacturing county, there are considerable manufactures of various goods, in Edinburgh, Leith, and Musselburgh; and there

are large paper-mills along the course of the North Esk. Much paraffin oil is made from the rich bituminous shale found within the county. E. returns one member to parliament. It contains 32 parishes. The chief towns are Edinburgh, the metropolis of Scotland; Leith, its seaport; Dalkeith, Musselburgh, and Portobello. In E. have been found cairns, stone circles, Roman coins and utensils, and traces of Roman camps and burying-places. E. was included in the Roman province Valentia, and Cramond is supposed to have been a chief Roman port. It afterwards formed part of the kingdom of Northumbria, 446–1020. The county contains many feudal and ecclesiastical remains, as Borthwick Castle, Craigmillar Castle, and Roslin Chapel.

EDISON, THOMAS ALVA, a notable American inventor, was born in Erie County, Ohio, 11th February 1847, but his early years were spent at Port Huron, Michigan. His father was of Dutch, and his mother of Scotch descent. E. was a great reader in his youth, although two months was all the time he spent at a regular school, and at the age of twelve he became a train-boy on the Grand Trunk Railway of Canada and Michigan, began to experiment in chemistry, and purchasing some old type, printed and issued the *Grand Trunk Herald*, the first newspaper printed in a railway train. A station-master, in gratitude for his having saved his child from the front of an advancing train, taught him telegraphy; and thenceforward he concentrated the energies of a very versatile mind chiefly upon electrical studies. After a few failures in furthering his inventions, two telegraph companies in turn availed themselves of his services, and his inventive faculties getting full play, he took out over 50 patents in connection with improvements in telegraphy, including the duplex and quadruple system. He settled at Menlo Park, a New Jersey village, in 1876; established a laboratory, from which have emanated his inventions of the phonograph, a form of telephone, and the practical adaptation of the electric light for purposes of illumination. The 'Edison Electric Light Co.' was started in New York in 1878.

E'DISTO, a river of South Carolina, flows through the south-west part of the state, being formed near Branchville of the North Edisto and the South Edisto, and entering the Atlantic by two arms respectively named from the two confluent. Edisto also designates the island which separates those two arms. The stream is navigable for 100 miles upwards, and its mouth is about 20 miles to the south-west of Charleston.

E'DMONSTONE ISLAND, an outpost as it were, of the Delta of the Ganges towards the Bay of Bengal, is situated at the mouth of the Hoogly, the most westerly arm of the great river above mentioned. It is the arena of a continuous conflict between the fluvial currents and the oceanic tides. From being merely a sand-bank, it came, not many years ago, to be covered with shrubs, and even to yield a supply of fresh water. After having been adopted, under the new phase, as a marine station, it has since then been abandoned, in consequence of the encroachments of the sea. E. I. is in lat. 21° 32' N., and long. 88° 20' E.

E'DMONTON, a large village in the north-east of Middlesex, near the Kerr, 7 miles north-north-east of London. Pop. of parish (1881) 23,463. It contains many villas of London merchants, &c. Charles Lamb is buried in the churchyard here. E. is connected with Cowper's humorous poem of *John Gilpin*.

E'DMUND I'RONSIDE, king of the Anglo-Saxons, son of Ethelred II., and half-brother of Edward the Confessor, was born in 989. He calls for notice chiefly as the great opponent of Canute and the Danish party. On the death of Ethelred, the Danes proclaimed Canute king of England; but the citizens of London declared for E., who drew together his forces, and engaged Canute, first at Pen, in Dorsetshire (or, as other accounts say, at Gillingham, in Somersetshire), then at Sceaorstan, and again at Ottenford, or Otford, in Kent, in all of which battles he was victorious; but a severe defeat which he sustained at Assandun, in Essex, compelled him to a compromise with his adversaries. An arrangement was entered into by which England was divided between the two kings, Canute obtaining possession of Mercia and Northumbria, the rest falling to the share of Edmund. It was also agreed that on the death of either, the survivor was to succeed him. E. having died a few weeks after this agreement had been drawn up, Canute became king of all England. E. received the surname of *Ironside*, either from his great strength or from the color of his armor.

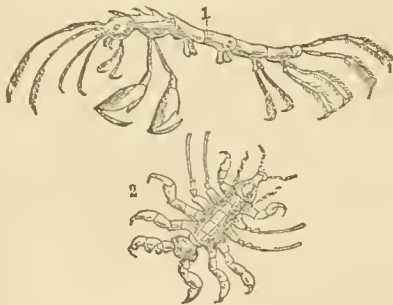
EDMUND'S (St.) HALL, Oxford, derives its name from St. Edmund, Archbishop of Canterbury in the reign of Henry III. As early as 1269, it appears to have been purchased by the canons of Osney, and devoted to purposes of education. On the dissolution of religious houses under Henry VIII., it fell into the hands of two citizens of Oxford, who sold it to William Denyse, provost of Queen's College. The provost devised it to his college, and that society accordingly now nominates the principal of St. Edmund's Hall. There are ten exhibitions attached to the hall,

value £30 per annum, appropriated to students designed for holy orders, and in the gift of the principal. There are usually about 150 names on the books.

EDOM (New Testament, **IDUMÆA**), a word signifying 'red.' It was, according to Gen. XXV. 29—34, the name given to Esau on account of the red pottage supplied to him by his brother Jacob. Hence, the country which Esau afterwards obtained was called the land of Edom, but previously Mount Seir. The ruddy hue of the mountain-range, however, may have had something to do with the naming of the region. E. comprised a strip of country 100 miles long by 20 broad, lying between the south of Palestine and the Gulf of Akabah (an arm of the Red Sea). It is a wild, mountainous region, with the desert on the east and west of it; but rugged though it looks, it contains rich glens and terraces, where flowers, and shrubs, and trees spring up luxuriantly. Its capital was Bozrah (now Baseirah), in the extreme north; its seaports were Elath and Eziongeber, in the extreme south, at the head of the Gulf of Akabah. During the reigns of David and Solomon, E. appears to have been under subjection to the Israelites; but when the kingdom of Israel began to decline, the Edonites repeatedly ravaged the southern borders of Palestine, which circumstance is perhaps the reason why they are so terribly denounced by some of the prophets. At a later period the term Edom (now giving way to the Greek form Idumæa) designated the region between the Gulf of Akabah and the Mediterranean, including a part of the south of Palestine.

The revival of Jewish power under the Maccabean princes once more brought Idumæa under Jewish sway. The people were compelled to conform to the laws and customs of their conquerors, and the country was for the future ruled by Jewish prefects, one of whom, called Antipater, who was born in the country, acquired the friendship of the Roman emperor, and was appointed procurator of all Judæa. His son was the famous Herod the Great, 'king of the Jews.' In the 7th c. A.D., E. was overrun by the Arabs, and has ever since shared the fortunes of Arabia.

EDRIOPHATHA'LMATA (Gr. sessile-eyed), a section of the class of Crustaceans, consisting of those *malacostracous* crustaceans which have the eyes sessile—not mounted upon stalks. They



Edriophthalma;

1, *Caprella phasma*; 2, *Cyamus Balæuarius* (whale-louse).

also differ from the other *malacostraca* in having the organs of respiration connected with the organs of locomotion; some of them, which constitute the two orders *Amphipoda* and *Lamodipoda*, having the respiratory organs connected only with the true or thoracic legs, whilst in the remaining order, *Isopoda*, they are connected only with the abdominal or false legs. The E. are generally marine; many of the *Amphipoda*, however, are inhabitants of fresh water; some of the *Isopoda*—as the armadillo-louse and wood-louse—are terrestrial, but are inhabitants of damp places. Many both of the marine and fresh-water species spend their lives rather among the weeds and decaying matters of the shore than in the water, to consume these being apparently their office in the system of nature; some have organs adapted for leaping and burrowing in the sand, as the common Sandhopper (*Talitrus locusta*), one of the *Amphipoda*, of which countless myriads are to be seen on all our sandy shores, attracting the admiration even of the most careless; some burrow in more solid substances, as the *Linnoria terebrans*, one of the marine *Isopoda*, which too frequently effects the destruction of piers, dock-gates, &c., perforating them in every direction. Many of the E. are parasitic, some of them on whales, some even on prawns and other crustaceans. Some of the parasitic E. are destitute both of eyes and antennæ.

EDRISI, **ABU ABDALLAH MOHAMMAD BNU ABDALLAH BNU EDRIS**, **AL-HAMUDI**, **SHERIF**, also called **AL EDRISI**, **AL-SIKILI** (SICILIAN), or **AL-RODJARI** (ROGER'S), one of the most eminent Arabic geographers, and a descendant of the royal family of the Edrisites—who traced their origin to Mohammed himself—was born at Centa or Sibta (Civitas) in the year 1099. He studied at Cordova, and early distinguished himself by the extraordinary

range and versatility of his talents. He excelled in nearly all the then known branches of science and art; but it was geography which at a very early age seems more than any other science to have attracted him. Having completed his studies, he traveled and visited Constantinople, Asia Minor, Egypt, Morocco, Andalusia, and the coasts of France and England. Roger II. king of Sicily, invited him, on his return, to his court, and lavished upon him all the honors which it was in his power to bestow. A favorite wish of this monarch—one of the most refined and liberal-minded men of his age—had long been to have a representation of the earth, founded on the most recent observations. He accordingly invited travelers from all parts of the world to assist him by sending their itineraries, their measurements of longitudes and latitudes, their observations and adventures—in short, all they had seen or heard on their journeys. The collection of this material occupied fifteen years, at the end of which it was handed over to Edrisi. Thus guided, he drew up a map, on a globe of pure silver, weighing 450 Roman pounds (50,400 drachmas), in which the whole of the then known world was represented. He, like Ptolemy, divided it into seven climates, beginning at the equinoctial line, and continuing northwards to the limits of extreme cold, and intersected each of these with eleven 'regions,' represented by perpendicular lines, without any regard to the political or physical features of the respective countries. In explanation of this map, he wrote a book (1153), *Nuzhat al-Moshatak*, &c., in which a full account is given of the towns, mountains, rivers, &c., proceeding from west to east, according to the order of the climates. Careful as he was in observing and collecting, he could not, in the then state of society and communication, but fall occasionally into serious blunders; but on the whole his statements are peculiarly trustworthy; and being the clearest and most reliable exposition of the state of geographical knowledge in those days, the book remained the great and sole authority down to the time of the Portuguese discoveries. An extract of it was first edited at Rome in 1592, in Arabic, entitled *Nubian Geography*, and reprinted in the monastery of Khesruan, in the Lebanon, with Syriac characters, in 1597—both editions incorrect in the highest degree. The very title was a mistake, the editors having, by a misinterpretation of a passage, been led to believe that E. was a Nubian. Bernardino Baldi translated this extract into Italian in 1600, but his translation was never published. The first published translation was a Latin one, made in Paris (1619) by Gabriel Sionita and Johannes Esronita, a work teeming with the most absurd blunders; and Domenico Maeri translated this Latin translation into Italian. Rosario Gregorio's Latin version of the portion referring to Sicily was published with the text in a collection of Tardia in 1790. Portions of the Arabic text, with comments, have been separately published; the chapters relating to Africa and to Spain by Hartmann (Göttingen, 1796); those concerning Syria by Rosenmüller (1828); and those on Africa and Spain again by Dozy and Goeje (Leyden, 1866).

The translation of E.'s whole work, in French, was made from two MSS. in the Imperial Library, by Jaubert, and published (Paris, 1830 and 1840), but it is unfortunately not sufficiently faithful. The full text has never been edited.

We shall only add that the incidents of E.'s life have given rise to interminable discussions. The year and place of his death, as also his creed, whether Mohammedan or Christian, still remain vexed questions. Chief authorities regarding E. are Hadji Kalifah, Schnarrer, De Saey, Slane, Quatremère, Reinaud, Amari, &c.

EDUCATION is an art, the art, namely, of drawing out (Lat. *educere*) or developing the faculties—of training human beings for the functions for which they are destined. Now, in order to the perfection of an art, it must be founded on a corresponding science; and of nothing is this more true than of education. Before we can hope to mould a human being in a desired way, the nature of that being must be well known. The knowledge of man's nature is usually comprehended under three divisions: the constitution of his body (physiology); the constitution of his mind (psychology); his moral and religious nature (ethics and religion). If we suppose these branches of knowledge thoroughly investigated, they would furnish the solution of the two main points on which all questions of education turn: first—What are the dispositions and acquirements which it is most desirable to implant and foster? in other words, What is the end or aim that the educator ought to pursue? and second—What are the best means to attain that end? But the sciences above named are themselves in too imperfect and unsettled a state to be the basis of any theoretical plan that would be generally accepted; for our knowledge of living beings, and still more of moral beings, must, as is now well understood, be the last to acquire the shape and certainty of science. See **SCIENCE**. It is needless, therefore, to look as yet for any complete theory or *philosophy of education*. Education has existed as an art from the very infancy of society, but it is as yet mostly an empirical art, the rules and methods of which have been arrived at by the blind groping of experience—by the process of trial and error. The art of education is still in the condition in which the

art of agriculture was until the present century, when, by the aid of chemistry and vegetable physiology, then arriving at something like perfection, a scientific foundation was laid for it by Liebig and others. Even were the sciences of physiology, psychology, and ethics, on a more satisfactory footing, they would not be immediately serviceable as a foundation for a theory of education, without a preliminary step. This would consist in deducing from them an intermediate science, embodying the *laws of the formation of character*.

According to J. S. Mill, it is a body of doctrine of this nature, to which he proposes to give the name of Ethology (Gr. *ethos*, habit, custom), that would properly be 'the science of which education is the art.' But so far is such a science from being yet constructed that it is only lately that the necessity for it has been pointed out. Notwithstanding this lack of scientific foundation, the practical art of education has, in recent times, undergone great improvement in almost all its details. It is chiefly in discussions on the subject that the want of fixed scientific principles makes itself felt. A debate on any topic connected with education usually presents little but a hopeless chaos of conflicting opinions, the most inconsistent arguments being often urged in favor of the same view. What renders the confusion greater, education is a subject on which every one thinks himself or herself capable of pronouncing an opinion. But this is only another indication of the want of fixed scientific principles. No one presumes to meddle with a question of astronomy or of chemistry unless he has made it the study of a life. In like manner, it is to be hoped that, in proportion as we advance to a philosophy of education, there will be fewer who will take upon themselves to settle off-hand the most difficult questions regarding it.

In the present article, we can do little more than notice the chief divisions into which the subject of education naturally falls, together with the leading questions that give rise to differences of opinion.

Definition.—It is necessary at the outset to limit the application of the term education. In the widest sense of the word, a man is educated, either for good or evil, by everything that he experiences from his cradle to his grave. But in the more limited and usual sense, the term education is confined to the efforts made, of set purpose, to train men in a particular way—the efforts of the grown up part of a community to inform the intellect and mould the character of the young; and more especially to the labors of professional educators, or schoolmasters. It is evident, however, that school education cannot be understood or practised rightly except by those who have mastered the idea of education in its widest sense. It is only the educator who can appreciate the influences which have gone before his own, which are running parallel with them, and will come after them, that is in a position to judge of the course to be pursued.

Moral Training.—The means employed in education fall naturally under two heads: discipline, or moral training; and instruction, or the imparting of information; although the two often run into each other. Under the head of discipline, come the forming of habits of order, self-control, obedience, civility, love of truth, and reverence for what is good and great. All but the mere outward forms of these is beyond the power of direct teaching; they are imbibed through the silent influence of example. The child instinctively respects and reverences what it sees others respect and reverence; above all, the unselfish affections are called forth only by the breath of affection from without. In this part of the process, it is evident that the school and the professional educator only play a part along with other influences. Nor do they even play the chief part; the home and neighborhood are here the predominant educators.—We cannot here enter into the vexed question of the teaching of religion in schools; it falls under the head of NATIONAL EDUCATION; as does also the question between voluntary and state schools.

As the process of moral development, through the general surrounding influences, is for the most part unconscious on the part both of those who act and those who are acted upon, it has not yet secured the attention it deserves; in fact, the other branch of the subject, viz., instruction, or intellectual education, being more particularly the business of the schoolmaster, has come in common language to usurp the whole field, so that, by education, we seldom mean more than the imparting of information—instruction.

Instruction.—The business of instruction involves two main considerations.—1. What to teach? and 2. How to teach it?

1. Of the vast mass of truths composing the sum of human knowledge, which are to be selected as the *encyclopædia* or curriculum of study for youth? In determining this question, it is to be borne in mind that every truth learned serves two uses—as knowledge to be acted upon, and as mental discipline. In selecting, then, what to teach, we have to consider, not only what is in itself most useful, but also what has the greatest degree of improving effect. On this point, we agree with a recent writer, that 'we may be quite sure that the acquirement of those classes of facts which are most useful for regulating the conduct, involves a

mental exercise best fitted for strengthening the faculties.' If this is true, the prominence given to the teaching of the dead languages of Greece and Rome, in modern education generally, is more than questionable. It is not disputed that a course of the classics, well taught and well learned, is a good intellectual discipline; but so is any kind of knowledge, well taught and well learned, a good intellectual discipline—better than more valuable knowledge imperfectly taught and learned. The question is, whether an equally good culture of the faculties would not be got from a systematic course of equal duration of English and other modern languages, together with logic and moral and physical science. In this case, the subject-matter of the teaching would be an acquisition of great value in after-life to every one, which cannot be said of the other. In the learned professions, no doubt, and for those following literary pursuits, a knowledge of Greek and Latin is of direct use, and will doubtless continue an indispensable element of education; but perhaps three-fourths of those who receive what is called a 'liberal' education, and therefore devote the strength of six or seven years to Greek and Latin, never open a book in these languages from the time they leave school. We are not prepared to maintain that the same effects in the way of discipline have as yet been actually produced, on any great scale at least, by the teaching of science and of modern languages, as result from the drill of the classical schools; but we believe that this arises from the fact, that no such course of instruction has hitherto been pursued with the same system and perseverance which characterize classical schools.

In respect of direct utility, the things most necessary to know, are those that bear most directly—

1. On the preservation of life and health, and the proper performance of the more common industrial labors. This involves a knowledge of our own bodies and of the bodies of which the universe is made up; in other words, more or less of the knowledge which, when put into systematic forms, is known as the sciences of physiology, natural philosophy, and the other physical sciences.

2. A knowledge of our moral relations. Besides a knowledge of the ordinary moral duties, and the high religious sanctions with which they are enforced, this implies some acquaintance with the laws of economy.

3. As a preliminary step, and as the medium through which all other knowledge is conveyed, there is required a knowledge of the mother-tongue, and the faculty of reading and writing it. Allied to language is a knowledge of counting and measuring, and the naming and classifying of the objects of which the world is composed (natural history), together with a knowledge of the countries and places on the earth's surface (geography).

4. The cultivation of the taste and the imagination, or the faculties which derive pleasure from music, painting, sculpture, architecture, poetry, and works of fiction.

Under the head SCIENCE will be given a complete tabular view of the various branches of human knowledge or sciences, together with the corresponding arts or applications. It will there be shown that there is a natural order of dependency among the fundamental sciences, which determines the order in which the different kinds of facts should be taken up. See besides the books named below, Bain's *Education as a Science* (1879); Browning's *History of Educational Theories* (1881); and Fitch's *Lectures on Teaching* (1881).

The different offices and employments characteristic of an advanced state of society, require a corresponding difference in the amount of knowledge and skill possessed by those who are to fill them—a difference which is vaguely and inadequately expressed in the usual division of schools into primary schools, middle or higher schools, and universities.

A course of primary instruction embraces only what is considered absolutely indispensable. Not that there is a limit to the degree of intelligence that is desirable in any class of the community; but for those who must, from early years, spend most of their time in manual labor, i. e., for the vast majority of the race, there is a very short limit to the degree possible. The grand question here would be to determine the order of desirableness of the different subjects to be taught, so that, beginning with the most indispensable, more and more might be added as circumstances would permit.

Until recently, reading, writing, and arithmetic were considered the beginning and end of a course of primary instruction. These, however, are not so much knowledge themselves as instruments for acquiring knowledge; and therefore the primary teacher in the present day considers it his duty to give, in addition, as much information of a directly useful kind as possible. But in avoiding one error, he not unfrequently falls into the opposite; for, after all, the three branches above named are the first and most indispensable steps in instruction. Those who can read and write may acquire information after leaving school. Reading and writing, unless learned at school, are, as a rule, never learned; and thus the grand access to knowledge remains for ever shut. Nor is it

enough to have made a beginning in the arts of reading, writing, and counting; unless such a degree of facility is acquired before leaving school as to render the exercise a pleasure, it is not kept up in after-life, and the little that was learned is soon forgotten. We believe that in all schools, but especially where the children are liable to be early withdrawn, everything else ought to be held secondary until the painful stage in learning to read, write, and count is fairly got over. With regard to the positive knowledge hitherto got in primary schools, there is a general feeling that few teachers succeed in giving it a direct bearing on the actual concerns of life. Hence the aversion expressed in many quarters to the introduction of the 'ologies' into common schools, and the rather vague demand for the teaching of 'common things.'

Middle or secondary schools either serve for those who have leisure for a higher degree of culture than the elementary course above described, or they serve as nurseries for the highest kind of educational institutions, viz., the universities. Under the head of secondary schools may be ranged the institutions that go by the names of high schools, academies, grammar-schools (the *gymnasiums* of Germany, and the *colleges* of France). In these, the course of instruction usually embraces other languages besides the mother-tongue, and more or less of the elements of the various sciences. The titles of a series of text-books, such as those composing Chambers's *Educational Course*, give a notion of the great variety of subjects that are considered requisite in middle-class education. Much yet remains to be done to chalk out a judicious course of middle-class instruction—sufficiently wide to be a foundation for after-acquisitions, and yet not so multifarious and detailed as to be impossible to overtake except as ill-digested cram.—Where preparation for the university is the object, Greek and Latin are the chief subjects of attention.

The highest degree of culture is represented by the Universities (q. v.).

Special or Technical Education.—Up to a certain point, the education of all young persons is, or ought to be, substantially the same; for the end in all cases is to train them up to be intelligent, virtuous, and active men and women, capable of turning their talents to account in whatever situation they may be placed. But in all civilized societies, the duties and employments are so diverse, that the members must begin betimes to receive special training, according to their future destination. This special training is either of an intellectual or a mechanical kind, or it may partake of both. This branching off of education into special tracks is conspicuous in the higher education given in universities, where from the very first there have been—besides the Faculty, as it is called, of Philosophy, including a number of branches of a general nature—special departments or faculties of Law, Medicine, and Theology. But besides these 'professions,' as they are styled, a number of branches of industry have in recent times, by the application of scientific processes, and from other causes, risen into a condition which requires, at least for those who are to direct them, a special range of instruction and information; such are engineering, mining, chemistry applied to the arts (technology), for which special schools are now established in most centers of industry. There are two 'specialties' which, from the immense numbers engaged in them, assume unwonted importance—namely, Agriculture (see AGRICULTURAL SCHOOLS), and Commerce. So prominent a place does commerce hold in this country, that any school which is above an elementary school, and at the same time not a classical school, usually gets the name of commercial. The chief points in a special education for the mercantile life are usually held to be, facility in writing and calculating, and a knowledge of book-keeping. What would seem to be the most essential part of a mercantile education, is usually neglected—the principles, namely, of political economy—the science of wealth.

Industrial Education.—The acquiring of mechanical skill for a particular handicraft or occupation—in other words, apprenticeship—is, properly speaking, a part of education; but as it is not usually begun until the school education is considered finished, it hardly falls within our province. Yet the abrupt separation of these two stages is attended with evils that are beginning to make themselves felt. For, first, the poorer classes, either from necessity or cupidity, are induced to withdraw their children from school as soon as the provisions of the Acts dealing with education will permit them, so that they may as early as possible turn the capabilities of their children to practical account. When to this is added the irregular attendance even during the few years that they are nominally at school—and this is a difficulty which even the recent elementary Education Acts have not been able wholly to subdue—the result is, that this class remain to a great extent uneducated; comparatively few have got over the initial mechanical difficulties of reading and writing, so as to keep up the habit in after-life, and thus they soon lose the little acquirements they had made.

On the other hand, to continue the intellectual and moral education of youth up to the age of fourteen or sixteen, as is the common practice among the middle classes, and among the well-

to-do of the artisan class, and then abruptly to break this off, and begin at once an industrial occupation on the full time of an adult who has been used to the work, is, on the face of it, an irrational way of proceeding. The power of applying steadily, day after day, to one occupation, is the hardest lesson for man to learn; it is that which, more perhaps than anything else, distinguishes civilized man from savage and semi-barbarous man; and as the boy is 'the barbarian of the civilized community,' this aversion to steady industry is yet strong in him. It is surely wise, then, to break him into it gradually; to begin, while yet his school education is going on, by short exercises of his industrial faculties at first, and gradually increase the daily hours of work as his physical strength and powers of will become hardened. We believe that many a youth who, on the usual system, breaks down at the very commencement of his industrial career, runs away from his apprenticeship, and becomes unsteady, idle, perhaps a scamp, for life, might, by a gradual initiation, have become an industrious man and good member of society. So far, again, would this plan be from infringing upon the usual education given at school, that it is only in some such way that, in a country like ours, the school education of those who have to earn their own bread can be prolonged to the age necessary for learning much that every member of the community should know.

Theoretically, we believe it to be indisputable, that school education and industrial training ought to be conjoined. How to make them dovetail into one another in practice, is the difficulty. One step towards it was made in the compulsory *half-time system* for factory children. (For the provisions under the Education Act and the Factory Act of 1878, see FACTORY ACTS.) Children may be employed as early as the age of ten years, but all between the ages of ten and thirteen (or fourteen if the child have not a certificate of educational proficiency) are limited to half-time daily either forenoon or afternoon, or to whole-time every alternate day; nor can they be employed even in these ways but on condition of receiving three hours' schooling daily, or the usual school hours every alternate day. Experience has established the fact, that in proportion to the hours spent in school, these 'half-timers' make more rapid progress than the whole-day scholars; at the same time, whether they are destined to be factory-workers for life or not, they are acquiring habits of industry and manual dexterity which are of essential use in any future employment.

Industrial training is now conjoined, to a greater or less extent, with school-teaching in almost all institutions for the education of pauper children—parochial union schools, ragged schools, as well as in professedly industrial schools. See INDUSTRIAL SCHOOLS, RAGGED SCHOOLS, REFORMATORIES. The chief difficulty in this movement is to find fitting work. And here it may be observed, that the object is not to teach particular trades with a view to the boys following these in after-life; this, though it were desirable, would obviously be impracticable as a general system. The object is, to promote the health, to develop the muscles, and to induce habits of steady and patient endurance of work.

The industrial training of girls is of yet more urgent necessity than that of boys. The ordinary domestic operations involved in household management ought naturally to be learned at home under the guidance and example of the mother; and the object at school, in a right and normal state of things, would be to initiate the girls in things, in the way of improvements, that their several homes might not exhibit—to insure progress, in short. But unhappily, in the homes of the great mass of the operative population of these islands, the mother is at present quite unfit for this primary duty. The extension of the factory system of work, instead of the domestic, has revolutionized the domestic life of a great part of the operative population, and with our *laissez-faire* policy in education, we have allowed a generation to spring up, in which a great part of the married women have lost whatever traditional housewifery their mothers might have had, and can neither cook, wash, nor sew. The consequence is that the food of the household is unsavory, indigestible, unwholesome, and at the same time unthrifty; while the whole *ménage* has that character of untidiness and discomfort that often drives the husband to the pot-house. For girls of this class, there is needed a training in some public institution in the very elements of housewifery; while, for all classes, there is great need for instruction in a better style of cookery than that generally prevalent. The public mind has at last become awake to this necessity, and domestic economy has been made an essential element in primary schools for girls in Great Britain. See DOMESTIC MANAGEMENT.

2. 'How to teach it.'—It is a great error to suppose, that because a man knows a thing, he can therefore teach it. Teaching is one of the most difficult arts, and requires natural aptitude and acquired skill. The necessity of special study and practical training or apprenticeship to make a schoolmaster, is a discovery of recent date, and has given rise to teachers' seminaries or Normal Schools (q. v.), where they receive special instruction in the most approved methods of teaching, and practice in their application. It is to the greater acquaintance with right methods, on the parts of school-

masters, that we are to look for the solution of one of the greatest difficulties—how, namely, to overtake all the work that is necessary to be done in the school-period of life, without keeping the learners too many hours a day at their tasks. As things are usually managed, very little of the time devoted to lessons is spent in actually learning anything whatever; as any one may satisfy himself by calling to mind how his own time was spent while seated on the school-benches. There is here a rich mine waiting to be worked—the gold-fields of future generations. It is not to be disputed, that three hours of hearty, spirited exertion will do more, in the way of learning, than is accomplished in six hours in most schools. The three hours thus set free would be clear gain; for time spent in trifling or in heartless fagging is utterly lost. The child is all the while plagued without being profited, and would be better employed in being happy in his own way. This matter of the happiness of the young has not yet received the attention it deserves in schemes of education. As Sidney Smith has well expressed it, ‘if you make them happy now, you make them happy twenty years hence, by the memory of it,’ so that while looking after the formation of other valuable habits, the educator must not overlook the habit of happiness.

Increased economy of time in teaching, besides setting free sufficient time for play, would admit the more general introduction to school education of military drill (including gymnastics). This, in addition to its immediate purpose (see VOLUNTEERS), would be a most valuable aid in moral education, by promoting habits of prompt obedience, order, and politeness.

See also the heads INFANT SCHOOLS, EVENING SCHOOLS, MONITORIAL SYSTEM, PESTALOZZI, HAMILTONIAN SYSTEM, NATIONAL EDUCATION, &c.; and such works as Herbert Spencer's *Education: Intellectual, Moral, and Physical* (1861); Matthew Arnold's *Schools and Universities on the Continent* (1868); Von Raumer's *Geschichte der Pädagogik* (4th ed. 1874); Schmid's *Enzyklopädie des Erziehungswesens* (1875).

EDUCATION, MILITARY, is now superintended, so far as concerns regimental schools, by a particular department of the War Office. In this sense, it does not really mean military education, but schooling of a humble kind supplied to soldiers and their children. In its proper sense, the term relates to the professional training of those destined to be officers in the army. This is not to so great a degree under government control in England as in continental countries. See ARTILLERY, SCHOOLS OF; CADET'S COLLEGE; CROYDON (Addiscombe); DUKE OF YORK'S SCHOOL; MILITARY SCHOOLS; REGIMENTAL SCHOOLS; SANDHURST; STAFF COLLEGE.

EDU'R, a Rajput state of Guzerat, is tributary to the Guicowar, being, in common with his immediate dominions, subject to the political superintendence of the presidency of Bombay. With a revenue of nearly £25,000, it maintains a force of about 1000 men. Its capital, of the same name, contains about 10,000 inhabitants; and the pop. of the state was in 1872 estimated at nearly 220,000.

EDUCT is a term employed in Chemistry to indicate that the body to which it is applied is separated by the decomposition of another in which it previously existed as such. It thus stands in opposition to *product*, which denotes a compound not previously existing, but formed during decomposition. Thus, the volatile oils which pre-exist in cells in the fruit and other parts of plants, and oil of sweet almonds obtained by pressure, are educts; while oil of bitter almonds, which does not pre-exist in the almond, but is formed by the action of emulsin and water on amygdalin, is a product.

EDWARD THE CONFESSOR, king of the Anglo-Saxons, was born at Islip, in Oxfordshire, about the year 1004. On the death of his father Ethelred, in 1016, Canute the Dane obtained possession of the throne, and in the following year married Emma, the mother of Edward, by whom he had two sons, Harold and Hardicanute. Until the death of Canute in 1035, E. lived in Normandy; he then made an ineffectual attempt to establish his authority in England; but his mother Emma had now transferred her affections to her younger children; and she exerted all her influence and energy in favor of Hardicanute, who on the death of his brother Harold in 1040, became sole ruler of the Anglo-Saxon kingdom. Hardicanute, however, was generous enough to invite his half-brother to England, whither accordingly E. went, and was honorably received. On the death of Hardicanute in 1042, E. was declared king. The person chiefly instrumental in bringing about this result was Earl Godwin, whose only daughter, Editha, was married to the king in 1044. The lady only became his queen, not the partner of his bed. For this revolting asceticism, the honor (if it be such) of canonization, and the title of Confessor, was conferred on him, about one hundred years after his death, by Pope Alexander III. Scrupulous as E. was in regard to one of the passions, he had no repugnance to gratify another of a far less justifiable kind. His first act after his accession, was to deprive his mother of all her treasures—lifting even

the cattle and corn from her fields, and, according to some accounts, endeavoring to compass her death. The whole of E.'s reign is simply the record of the growth and struggles of the Norman or court party with the national or Anglo-Saxon party; for an account of which see articles GODWIN and HAROLD. E.'s wars with the Welsh in 1057 and 1063, and with the Northumbrians in 1065, were short and successful. He died 5th January 1066, and was succeeded by Harold, son of Earl Godwin. The prosperity which England enjoyed during the reign of E. was owing to its not being exposed to the wasteful calamities of foreign invasion, while its free intercourse with France, or at least with Normandy, greatly civilized and refined the somewhat Bæotian habits and manners of its inhabitants.

EDWARD I., king of England, was the eldest son of Henry III. by his wife Eleanor, daughter of Raymond, Count of Provence, and was born at Westminster, June 16, 1239. That union of valor and intelligence which characterized him was exhibited at an early period, at the commencement of the struggle between Henry and his barons, Prince E., who was then governor of the duchy of Guienne, came over to England, and boldly declared his dissatisfaction with his father's conduct. Subsequently, he took the king's side in the war, and by his vigorous generalship put an end to the insurrection in a few years, but there is no evidence to show that he had changed his opinion of Henry's policy; and it is remarkable that he himself, during the whole of his reign, carefully avoided coming into collision with his nobles. When the last of the Crusades was organized, at the instigation of Pope Gregory X., Prince E. arranged with Louis, king of France, to take part in it. Louis died before reaching Palestine, but the former landed at Acre in 1271. Nothing however, of any consequence was achieved; and in the following year he set out on his return to England.

At Messina, he heard of his father's death, whereupon he proceeded to France, and did homage to Philippe III. for his French possessions, arriving in England 25th July 1274. He and his queen, Eleanor, were crowned at Westminster on the 19th of August following. His first military expedition, after his accession to the throne, was directed against the Welsh. After a contest of nearly ten years—in the course of which the famous Prince Llewellyn was slain at Llanfair, 11th December 1282—Wales was finally subdued and incorporated with England. His next ambition was to possess himself of Scotland. The death, in 1290, of Margaret, granddaughter of Alexander III., and known as the Maiden of Norway, who was to have been married to E.'s son, seemed to have frustrated his design; but the selfishness of the ten competitors for the Scottish crown who now appeared, induced them to acknowledge E. as *Lord Paramount* of Scotland, each hoping that he would thereby secure the English monarch's support. The competitors were also foolish enough to make him umpire among them, or perhaps it would be more correct to say, they were not powerful enough to refuse his arbitration. Be that as it may, E. decided in favor of John Baliol at Berwick, 17th November 1292; and Baliol immediately took the oath of fealty to him; and on the 26th of December did homage to the English king for his crown at Newcastle. The patriotism and pride of the Scottish nation took fire at such humiliation, and in a short time Baliol was hurried by his subjects into a war with England. In 1296, E. entered Scotland, devastating it with fire and sword. He penetrated as far north as Elgin, compelled Baliol to resign the kingdom, and governed the country by means of his own officers. It was during this expedition that he carried off from the cathedral of Scone the celebrated stone on which the kings of Scotland used to be crowned, and which is now in Westminster Abbey. A second rising took place in Scotland in the following summer. The leader on this occasion was William Wallace (q. v.), whom tradition represents as the most heroic and unselfish of patriots. He was completely successful for a time, chiefly it is to be supposed on account of the absence of Edward. In the spring of 1298, however, that sovereign again made his appearance in Scotland, and gave battle to Wallace at Falkirk, on the 22d of July. Partly through treachery, and partly, no doubt, through the superior generalship of E., who is considered to have been the first military commander of his time in Europe, the Scottish forces were entirely defeated. The next five years were spent by the English king in reducing the country to obedience—with very imperfect success, however. In the summer of 1303, he led a third large army into Scotland, and once more spread havoc and ruin to the shores of the Moray Firth. The last castle that held out against him was Stirling, which did not yield till the 20th of July 1304. E. wintered at Dunfermline. Some time after this, Wallace either fell into his hands, or was betrayed, and on the 23d August 1305, was hanged, drawn, and quartered as a traitor, at Smithfield, in London. E. now probably thought that he had no further danger to dread from Scotland, but if so, he was quickly undeceived.

Robert Bruce, Earl of Carrick, grandson of the chief rival of

Baliol, suddenly left the English court, where he had been residing, in the beginning of 1306, unfurled once more the banner of Scottish independence, and on the 27th March of that year was crowned at Scone. An English army, under the Earl of Pembroke, was immediately despatched to Scotland; and at the close of the year, the king himself set out to chastise Bruce. But worn with the 'sturt and strife' of many years, the cares of his own kingdom, and the anxieties of conquest, E. only lived to reach Burgh-on-Sands, a village beyond Carlisle, where he expired, 6th July 1307, 'in the sight of that country,' says Lord Hailes, 'which he had devoted to destruction.'

E. possessed most of the qualities that go to form a great ruler; valor, prudence, inexhaustible energy, and pertinacity are visible in his whole career. He was ambitious, it is true, but in his age, ambition was looked upon as a virtue rather than as a crime; it was the natural accompaniment of kingly courage. His relations to Scotland were also unfortunate. Few people of any understanding, however, now doubt that the best thing possible for that country would have been a peaceful union with England, for at that time there was no hatred or jealousy between the two nations. The death of the Maiden of Norway destroyed every chance of such a union, and the great mistake committed by E. was his endeavoring to bring about by force what could prove beneficial only when it was the result of voluntary agreement. The effect of his mad endeavor was to plant in the breasts of the two nations the *germs* of a hitherto unknown hostility, which, in subsequent generations, worked incalculable mischief, and the traces of which have not wholly disappeared even at the present day. As a civil ruler, E. is entitled to the highest praise. Immense progress was made during his reign in the establishment and improvement of law and order throughout the land, the reformation of civil abuses, and the restriction of ecclesiastical jurisdiction and encroachments. He has been called the English Justinian; and both Hale and Blackstone affirm, that 'the very scheme and model of the administration of common justice between man and man was entirely settled by this king.' Ireland and Wales participated in the benefits of English law. It was during E.'s reign, too, that the representation of the Commons of England first became regular; but probably the greatest advantage obtained by the nation, was the declaration that the right or privilege of levying taxes resided in the parliament. In general, it may be said that E. ruled in harmony with the ideas and desires of the best heads among his nobles and burgesses; and though touchy on the question of his prerogative, like every Plantagenet, and very cruel in his treatment of the Jews, he must be regarded, on the whole, as one of the most enlightened, liberal, and sagacious monarchs of his age.

EDWARD II., son of the preceding, was born at Caernarvon, in Wales, 25th April 1284, and in 1301 was created Prince of Wales, being the first heir-apparent of the English throne who bore that title. He accompanied his father on his various expeditions into Scotland, and on the death of the latter at Burgh-on-Sands, he led the English army as far north as Cunnock, in Ayrshire, after which he returned to his own country. At home E.'s conduct was contemptible. While still a youth, he had conceived an extraordinary admiration and fondness for a witty, clever, but dissolute creature called Piers Gaveston, the son of a Gascon knight. After he became king, there was no limit to the honors heaped on the favorite. When he went to France in the beginning of 1308, to conclude a marriage with Isabella, daughter of Philippe V., king of France, Gaveston was left guardian of the kingdom. The nobles were indignant, and demanded his banishment. Twice was Gaveston forced to leave England, but as often was recalled by the weak monarch, whose love for him was sheer infatuation. At last the nobles rose in arms, besieged Gaveston in Scarborough Castle, and having forced him to surrender, hanged him at Warwick, 19th June 1312. Two years after this, E. invaded Scotland at the head of the greatest army ever collected in England—amounting, according to some historians, to 100,000 men. At Bannockburn, on the 24th June 1314, he was encountered by Robert Bruce (q. v.), and defeated with immense slaughter. This victory put Scotland and England on equal terms, for all time coming, and made the notion of a military subjugation of the former country by the latter be given up. Finally, in 1319, after numerous petty successes on the part of the Scotch, E. concluded a truce with them for two years. He now exhibited again his imbecile passion for favorites. The person selected on this occasion was Hugh le Despencer. Once more the nobles rebelled, and both Hugh le Despencer and his father were banished in July 1321, but some months after, were recalled by E., and many of the nobles, among others, the Earl of Lancaster, were beheaded in the following year. Immediately after, E. invaded Scotland for the last time, and penetrated as far as Culross, in Fife; but having achieved no particular success, he concluded a truce with that nation for thirteen years, and returned to England. A dispute now arose between him and Charles IV. of

France, brother of his wife Isabella, in regard to the territories which he held in that country. Charles seized them, whereupon E. sent over Isabella to remonstrate, and, if possible, to effect an amicable arrangement between them. Isabella, it would appear, despised her husband, and disliked the Despenchers. Meeting at the French court many English nobles who, entertaining similar feelings, had left their country to avoid the enmity of the favorites, she was easily induced to make common cause with them against her husband and the Despenchers. At the same time, she formed a connection of a criminal kind with Roger de Mortimer, one of the most powerful of the exiles. This of course more thoroughly involved her in the plot against Edward; and having obtained possession of the young Prince of Wales, afterwards Edward III., she embarked from Dort, in Holland, with a large body of malcontents, and landed at Orwell, in Suffolk, 22d September 1326. The queen and the banished nobles were soon joined by all the influential persons in England. E. fled, but was taken prisoner at Neath Abbey, in Glamorganshire; the Despenchers, father and son, were executed; and the monarch himself, after being formally deposed, 25th January 1327, was murdered in Berkeley Castle, 20th September of the same year. He left two sons and two daughters.

EDWARD III., son of the preceding, was born at Windsor, 13th November 1312, and ascended the throne, 25th January 1327. During his minority, the country was governed nominally by a council of twelve nobles and bishops, but really by Mortimer and his paramour Isabella. On the 24th January 1328, the young king married Philippa, daughter of the Earl of Hainault; and two years after, resolving to take the power into his own hands, he seized Mortimer, and put him to death, 29th November 1330, and banished his mother, Isabella, to her house at Risings (where she lived for twenty-seven years). He next invaded Scotland, to assist Edward Baliol, son of John Baliol, who, in the confusion that ensued on the death of the great Bruce, had made a descent on the country, and got himself crowned at Scone. A bloody battle was fought at Halidon Hill, near Berwick, 19th July 1333, in which the Scots were completely defeated. Baliol now assumed the authority of a king, and did homage to E. for his possessions, the result of which act was, that he had to flee the kingdom in a few months, for the thing most intolerable to the Scottish spirit was that any monarch should dare, or fancy he had a right, to surrender the independence of his country. In the course of three years, E. thrice invaded Scotland; but though he frightfully wasted the country, and brought armies with him such as could not be successfully opposed, he could not break the invincible spirit of the people, who, after each invasion had rolled over them like a flood, rose and rallied with a still more stubborn and impassioned resolution to be free. But the scene of E.'s great exploits was France. Charles IV. having died without a son, Philippe of Valois, the nearest heir by the male line, ascended the throne, under the title of Philippe VI. E. claimed the crown in right of his mother Isabella, sister of Charles; but as the law of France expressly excludes females from enjoying sovereign rights, it is manifest that E.'s claim was utterly groundless. The English king admitted that his mother, being a female, could not inherit the crown of France, but affirmed that he, as her *son*, might. But it is clear that he could not receive from his mother rights to which she herself had no claim. Yet never was a bad cause ennobled with more splendid triumphs. E. declared war against Philippe in 1337. His first campaign was not very remarkable; but in 1346, accompanied by his eldest son, known as the Black Prince, he again invaded France, conquered a great part of Normandy, marched to the very gates of Paris, and on the 26th August 1346, inflicted a tremendous defeat on the French at Crécy (q. v.). Here the Black Prince, though only sixteen, exhibited the courage and the prowess of a veteran, slaying with his own hand the king of Bohemia, who fought on the side of France. After some further successes, such as the reduction of Calais, a truce was concluded between the two nations for several years. Meanwhile, the Scots had sustained a severe defeat at Neville's Cross, near Durham, their king (David) being taken prisoner.

In 1356, the war with France was renewed, and on the 19th September of that year, the Black Prince obtained a brilliant victory at Poitiers, King John of France (Philippe having been dead for some years) falling into his hands. The Scotch monarch was released for a ransom of £100,000 in 1357, and King John in 1360, when a peace was concluded between the French and the English, by which the latter were to retain their conquests. King John, however, finding it not consistent with the honor or desire of his country that such a peace should be carried out, magnanimously returned to captivity, and died in London, 8th April 1364. Shortly before this date, David, king of Scotland, whose residence in England had extinguished the little patriotism he ever had, entered into a secret agreement with E., in virtue of which his kingdom—if he died without male issue—was to be handed over to the English sovereign. Meanwhile, the Black Prince, who had mar-

ried Joanna, daughter of the Earl of Kent, had received from his father Aquitaine and Gascony, and ruled there for some time very prosperously; but ultimately involving himself and his father in a war with France, which was disastrous in its issues, he was obliged, in 1374, to conclude a truce for three years. E. waged war no more. In spite of his brilliant victories, in spite of the dazzling valor of his son, he was at the last unsuccessful. Neither in Scotland nor in France did he realize his desires. Affairs at home were no less unsatisfactory in the last years of his life. He quarrelled with his parliaments, and the Black Prince led the opposition. The latter, however, died 8th June 1376, in the 46th year of his age. E. himself expired on the 21st June 1377, after a reign of 51 years. By his wife, Philippa, he had seven sons and five daughters, several of whom died young. He was succeeded by his grandson Richard, son of the Black Prince, who ascended the throne as Richard II.—The reign of E. was marked by the great progress made in law—a greater number of 'important new laws being passed than in all the preceding reigns since the Conquest.' Among these laws were several indicating the increasing repugnance of Englishmen to ecclesiastical, and especially to papal jurisdiction. Trial by jury also now began to supersede other modes of trial. Justices of peace likewise make their earliest appearance in this reign, and legal proceedings were ordered to be carried on henceforth in English, and not in French. Sir James Mackintosh is of opinion, that though E.'s 'victories left few lasting acquisitions, yet they surrounded the name of his country with a lustre which produced strength and safety'—an opinion which appears, on the whole, to be well founded. It remains to be said that E.'s reign witnessed the culmination of chivalry, and in the Black Prince, possessed a splendid example of its virtues and its vices. The fine arts, especially architecture and poetry, also attained a grand development. Chancer, Gower, and several eminent chroniclers, flourished at this time, and in the sphere of religious reform stands out the noble and thoroughly English figure of Wickliffe.

EDWARD IV., son of Richard Duke of York, and great-grandson of Edmund Duke of York, who was the 5th son of Edward III., was born at Rouen, 29th April 1441 (or, according to another account, in September 1442). His original title was that of Earl of March. It would be quite impossible, in the short space at our disposal, to clear our way through the jungle of family relations by which Richard Duke of York, the father of Edward IV., traced his right to the throne. Suffice it to say, that in 1460 the bloody struggle between the *Yorkists* (the party headed by Richard Duke of York, who at first professed only a desire to remove from the king, Henry VI., his pernicious councillors) and the *Lancastrians* (the party of the sovereign) ceased for a moment. The Yorkists, on the whole, had been victorious on the battlefield, and their leader contrived to induce parliament to appoint him Henry's successor. Shortly after, however, Henry's wife—the brave Queen Margaret—raised an army in the north, and on the 31st December 1460, encountered and overthrew York on Wakefield Green, the duke himself being slain. But this reverse was compensated for by the success of his son Edward, who, after routing the royal or Lancastrian forces, under the Earls of Pembroke and Ormond, at Mortimer's Cross, near Hereford, marched towards London, which he entered on the 28th February 1461. He immediately presented his claim to the crown to parliament, which admitted its validity, and on the 4th of March ascended the throne as Edward IV., amid the acclamations of the citizens of London, with whom he was a great favorite. For three years he had to struggle hard to keep his position. His first victory over the Lancastrians was obtained at Towton, in Yorkshire, 29th March 1461, hardly one month after his accession. Finally, in May 1464, a few days after the victory at Hexham, Henry himself fell into E.'s hands. This closed the war for a time. About this time, E. married Elizabeth Woodville, widow of Sir John Grey. This marriage gave great offence to the Earl of Warwick, by far the most powerful of E.'s adherents, who was at that time engaged in prosecuting an alliance between E. and the sister-in-law of Louis XI., king of France. In 1469, Warwick openly declared against him, joined Queen Margaret, and compelled E. to flee the country. King Henry was released from the Tower, where he had been a prisoner for six years, and once more invested with royal authority. But in the spring of 1471, E. landed at the Humber, proceeded swiftly to London, seized the person of Henry, and was again hailed king by the inhabitants. Warwick now gathered an army, and hurried to encounter him. The two met at Barnet, where Warwick was defeated and slain, April 1471. In the course of the next month, E. routed the Lancastrians at Tewkesbury, capturing both Queen Margaret and her son, Prince Edward. The latter was murdered the day after the battle; the queen, herself, after an imprisonment of four years, was ransomed by the French monarch. E. died 9th April 1483, the later years of his reign presenting few political incidents of any moment. E. was an able commander, as his numerous victories

show, but he was dissolute in the extreme. It was during his reign that printing was introduced into England, as also silk manufactures. In law, few notable changes occurred, but the practice of indirect pleading dates from this period, which is also illustrated with the names of distinguished legists, such as Littleton and Fortescue.

EDWARD V., son of the preceding, was born 4th November 1470. The story of his life is brief and tragic. At the death of his father, he was living at Ludlow, in Shropshire, a boy of thirteen. When the news reached Ludlow, Earl Rivers, his uncle by his mother's side, set out with him for London. Richard Duke of Gloucester, however, contrived to gain possession of his person at Northampton, and brought him to the capital himself, in the beginning of May 1483. Towards the end of the same month, Richard was appointed Protector of the kingdom. About the middle of June, the young Duke of York, brother of Edward V., also fell into his hands. The two hapless boys were then removed to the Tower, and were never more heard of. The general, and in all probability the correct opinion is, that they were murdered by command of Gloucester himself. All attempts to whitewash the bloody and devouring chief, have signally failed.

EDWARD VI., son of Henry VIII. by his wife Jane Seymour, was born at Hampton Court, 12th October 1537. The events which happened during his brief reign were of great importance, but they were of course brought about by others, E. being too young (he was not sixteen when he died) to exercise any personal influence on the statesmen or the tendencies of his age. On the death of Henry in 1547, Edward Seymour, Earl of Hertford, became Protector of the kingdom. He was attached to the principles of the Reformation, and during his rule great strides were made towards the establishment of Protestantism in England. The images were removed from the churches; refractory Roman Catholic bishops were imprisoned; the laity were allowed the cup at the ceremony of the Lord's Supper; all ecclesiastical processes were ordered to run in the king's name; Henry's famous six articles (known as the Bloody Statute) were repealed; a new service-book, compiled by Cranmer and Ridley, assisted by eleven other divines, was drawn up, and ordered to be used, and is known as the *First Prayer-book of Edward VI.* (see COMMON PRAYER BOOK); and the celibacy of the clergy ceased to be obligatory. In war Seymour showed himself to be a brave general. During the first year of his protectorate, he invaded Scotland, on account of the refusal of the Scottish government to fulfil the contract into which it had entered with Henry VIII., by which it was agreed that Mary Queen of Scots should marry Edward. The battle of Pinkie followed, on the 10th September 1547, in which the Scots were completely beaten; and Seymour, now Duke of Somerset, might have inflicted most serious damage on the whole country if his presence had not been required at home. He returned to find that his brother, Lord Seymour, had been caballing against him. Somerset had him arrested, tried, and condemned for treason, and on the 20th of March 1549, he was beheaded on Tower Hill. In the summer of the same year the Protector quelled an insurrection of the populace headed by one Kett, a tanner; but in the course of a few months, a more dangerous adversary appeared in the person of John Dudley, Earl of Warwick, whose party, by dint of insinuations against Somerset, excited the nation against him, and at last compelled the king to sign his deposition.

On the 14th of October, Somerset was placed in the Tower; and on the 1st of December 1551, he was tried before the House of Lords for treason, condemned, and executed, 22d of January 1552. The people regretted, with good reason, his death, for Dudley was both a worse and a weaker man than himself. Before Somerset's execution, Dudley had been created Duke of Northumberland. He was himself (judging from his dying declaration) a Catholic, but he certainly took no means to re-establish the old religion. His great aim was to secure the succession to the throne of England for his family. With this view, he married his son, Lord Guildford Dudley, to Lady Jane Grey, daughter of the Duchess of Suffolk, to whom, by the will of Henry VIII., fell the crown, in default of issue by Edward, Mary, or Elizabeth. Northumberland now worked upon the weak and dying Edward to exclude Mary and Elizabeth, and nominate Lady Jane Grey as his successor. E. at last consented, and a document settling the succession on this lady was drawn up in June 1552. The king lived only a few weeks after, dying on the 6th of July. Subsequent events entirely frustrated Northumberland's design. King E., during his short reign, founded a great number of grammar-schools, which still exist, and are known as *King Edward's Schools*.

EDWARDS, HENRI MILNE. See MILNE-EDWARDS, HENRI.

EDWARDS, JONATHAN, a celebrated American divine and metaphysician, was born at Windsor, in the state of Connecticut, 5th October 1703, entered Yale College in 1716, took his degree of B.A. in the following year, and in 1722 was licensed to preach the gospel. Towards the close of 1723, he was appointed tutor of Yale College, an office which he filled with distinguished success.

In 1726, he accepted an invitation to become colleague to his maternal grandfather, Mr. Stoddard, in a church at Northampton, and was ordained in February 1727. Here he labored with intense zeal for more than twenty-three years, at the end of which period he was dismissed by his congregation. The immediate cause of the rupture between him and his hearers, was his insisting that no 'unconverted' persons should be allowed to approach the Lord's Table; but some years before, he had alienated the regards of a large number of the influential members of the church by denouncing the reading and circulation of certain books which were immoral and injurious, and by attempting to make a public example of the offenders. E. was a powerful and impressive preacher, sombre and even gloomy in his religious opinions and sentiments, but earnest, unaffected, and nobly conscientious. During the famous 'Revival' of 1740—1741, he was much sought after as a preacher, and is in fact often regarded as the originator of that movement. Certain it is that as early as 1734, a local manifestation of religious enthusiasm had taken place in his own parish, of which he published an account, entitled *A Faithful Narrative of the Surprising Work of God, in the Conversion of many Hundred Souls in Northampton*. The quarrel between E. and his congregation shows, however, that the 'revival' had not exercised any very strong influence on the community in general, since only a few years elapsed between the ecstasies of devotion and the circulation of obscenity. After his dismissal in 1750, E. became a missionary among the Indians of Massachusetts. While residing at Stockbridge in that state, he composed his famous treatises on the *Freedom of the Will* and *Original Sin*. In 1757, he was chosen president of Princeton College, New Jersey, whither he proceeded in January 1758, but was cut off by small-pox on the 22d of March in the same year.—E. will always be considered a master in dogmatic theology. Calvinism had probably never so powerful a defender.

According to the late Robert Hall, 'he ranks with the brightest luminaries of the Christian Church, not excluding any country or any age since the apostolic.' His great characteristics are depth and comprehensiveness of argument; and were it not that the age for such discussions as E. loved is gone by, few writings would be more worthy of patient study than those of this illustrious divine. Besides the works already mentioned, E. wrote a *Treatise concerning Religious Affections*, the *History of Redemption*, a *Dissertation concerning the End for which God created the World*, and a *Dissertation concerning the True Nature of Christian Virtue*. The last three were posthumously published. A complete edition of E.'s works was published by Dr. Timothy Dwight in ten vols. (1809), and another at London in 1817. A third was published in 1840, containing an essay by Henry Rogers, and a memoir by Sereno E. Dwight.—JONATHAN EDWARDS, D.D. (born 1743, died 1801), the son of the preceding, was a person of similar character to his father, and, curiously enough, experienced similar vicissitudes of fortune. Both were tutors in the seminaries in which they were educated; were dismissed on account of their religious opinions; were settled again in retired situations; were elected to the presidency of a college; and in a short time after they were inaugurated, died at nearly the same age. The younger Edwards was also a writer of sermons and theological treatises.

EDWIN, an English Saxon prince, was the son of Ella, king of Northumbria, who died about 589. He succeeded to the throne at the age of three years, but a neighboring potentate, Ethelfrith, invaded and conquered his territories, whereupon the infant E. was carried into North Wales, and was there educated. When he grew up to man's estate, Ethelfrith, fearing that his power would not be secure so long as E. lived, forced him from his asylum, and for many years he wandered about a disguised fugitive. Reaching East Anglia, he claimed the protection of King Redwald, which was readily granted. While residing there, Ethelfrith sent messengers to Redwald, requiring him to deliver E. into his hands, and threatening war in the event of a refusal. Redwald promised to accede to the request. A friend made known the resolve to the prince, and counselled flight; to this E. would not consent, but sat down without the palace, brooding over his misfortunes. While sitting there, Bede states that an unknown person approached him, and promised release from all his sufferings, if he would listen to what should be afterwards taught him. The apparition then placed its hand upon his head, and, bidding him remember the interview and the sign, disappeared.

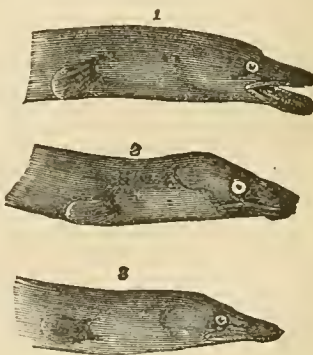
Redwald's queen pleaded the cause of E., and he finally determined to protect him. Raising an army, Redwald surprised Ethelfrith on the Idel, in Nottinghamshire, and defeated and slew him in 617. When E. regained his kingdom, he wooed Edilberga, daughter of Ethelbert of Kent. Her brother, who was a Christian, objected to her alliance with an idolater; but E. promised that he would not interfere with her religious belief. The princess became his wife; and Paulinus, who had been sent by Gregory to assist Augustine in his mission, accompanied her as her bishop.

About this time, E.'s life was attempted by an assassin, sent by the king of Wessex. He escaped with a slight wound, and on the same night the queen was delivered of a daughter. The king thanked his idols for the birth, but Paulinus directed his thankfulness to the Christian Saviour. The king promised to accept the new faith, if Heaven would grant him victory over the king of Wessex. His child and eleven of his household then received the rite of baptism. Raising an army, he defeated his foe, but delayed to fulfil his promise. Paulinus, having heard of the apparition which appeared to him while residing at the court of Redwald, one day entered the apartment in which E. sat, and placing his hand upon his head, asked him if he remembered the sign. The king was visibly affected, and at once assembled his Witenagemote to deliberate on the matter of the new religion. Coifi, the high priest, spoke first, and intimated his willingness to desert the idols, and embrace the Christian faith. A thane next rose and pronounced the beautiful speech which has been verified by so many poets, but which is most effective in the simple serious Saxon of the chroniclers. Coifi then headed the people in destroying the idol temple.

E. and the nobility of his kingdom were baptized in the eleventh year of his reign. Thereafter, he became the most powerful prince in England. He subdued a part of Wales, and his power extended northward to the Lothians. In 634, he fell in battle at Hatfield Chase, in Yorkshire; and in that disastrous fight, one of his children, and the greater portion of his army, perished. The history of this prince has been made the subject of a beautiful poem (*Edwin of Deira*, 1861) by Alexander Smith.

EECLOO', a town of Belgium, in the province of East Flanders, stands on the high road between Ghent and Bruges, and is 12 miles north-west from the former. It is clean and well built; and has manufactures of woollens, cottons, hats, tobacco, chocolate, soap, &c.; also breweries, distilleries, vinegar-works, salt-refineries, dye-works, oil-mills, and a thriving trade in linen, cattle, and timber, as well as in grain, for which it has a large weekly market. Pop. (1873) 9564.

EEL, a name popularly given to all serpent-shaped or worm-shaped fishes, and sometimes extended to other animals of similar form, but otherwise extremely different, as the *eels* in paste, in vinegar, &c. The fishes to which this name is most commonly applied are *malacopterus* fishes destitute of ventral fins, and having the body covered by a soft thick slimy skin, the scales very



Heads of Eels:

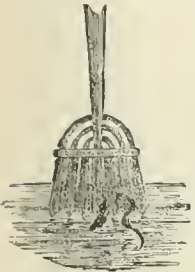
1, The Snig (*Anguilla mediorostris*); 2, Broad-nosed Eel (*Anguilla latirostris*); 3, The Grig (*Anguilla platyce*).

minute, and often almost invisible, or entirely wanting. Most of them were included in the Linnæan genus *Muræna*, and now constitute the family *Murænidæ*, divided by some naturalists into the families *Symbranchidæ*, *Murænidæ*, *Anguillidæ*, *Congeridæ*, and *Ophichthidæ*. All these have the skeleton destitute of ribs, and the fin-rays not jointed; whilst the *Gymnotidæ*, including the Electric Eels (see GYMNOTUS), have ribs encompassing the belly, and the fin-rays jointed or branched. In all the eels, the gill-orifices are very small, and are situated far back, so that there is a long passage from the gill-chamber outwards; and hence, the gills not soon becoming dry, these fishes can remain out of water for a considerable time without injury, and some of them occasionally leave it of their own accord. The smallness of the gill-opening is also regarded as probably indicative of feebleness of respiration; and this, as in reptiles, is connected with extreme tenacity of life.—The *Symbranchidæ* have the gill-passages so united under a common integument, as to present externally only a single orifice. They are almost destitute of fins. The species are few, and found only in tropical and sub-tropical seas.—The *Murænidæ* are also generally destitute of fins, or nearly so; they are all destitute of scales. They are all marine.—The *Anguillidæ*, on the contrary, are fresh-water fishes, although some of them occasionally visit the sea. They have pretty large pectoral fins, anal and dorsal

fins extending to and encompassing the tip of the tail, and numerous longish scales imbedded in groups in the skin, so as to resemble lattice-work. To these the Congers (q. v.), although marine, are very nearly allied. The *Ophidurida*, or Snake-eels (q. v.), of the Mediterranean and other seas, are more widely different, and are easily distinguished by the tail ending in a conical finless point.

Until recently, all the British fresh-water eels were confounded together as of one species (*Anguilla vulgaris*): Mr. Yarrell was the first accurately to distinguish them, and to show that there are at least three, if not four species, differing considerably in form, and in anatomical characters, as the number and form of the vertebrae, &c. Two of these seem to be very generally diffused, the SHARP-NOSED E. (*A. acutirostris* or *A. vulgaris*) and the BROAD-NOSED E. (*A. latirostris*).

The difference in the form of the snout, which these names indicate, is very marked and obvious, and the general form of the sharp-nosed E. is also more slender.—The SNIG E. (*A. mediorostris*), found in some of the English rivers, is intermediate in the form of its snout, and is considered superior to the other kinds for the table. Its cervical vertebrae are destitute of the spinous processes which are found in both the other species. It is comparatively small. The sharp-nosed E. seems to attain the greatest size, sometimes almost thirty pounds-weight. It migrates on the approach of winter to the warmer brackish water of estuaries, often entering water which is perfectly salt;



Eel-Spear.

or if migration is impossible, it buries itself in mud. Eels are taken in great numbers during winter by means of *eel-spears*, or forks with several prongs, plunged into the mud of river-banks, where large numbers are found congregated together. The eels which descend to estuaries or to the sea deposit their spawn there, and countless multitudes of young eels ascend rivers in spring. The passage of the young eels is called on the Thames the *eel-fare*, from a Saxon word signifying to pass or travel. So strong is the instinct which impels them, that they surmount obstacles apparently far more

than sufficient to arrest their progress; they have been seen to ascend the large posts of floodgates, 'those which die, stick to the posts, others, which get a little higher, meet with the same fate, until at last a sufficient layer of them is formed to enable the rest to overcome the difficulty of the passage.' Young eels have also sometimes been met with in large numbers performing migrations on land among moist grass, generally in the evening or during the night; but the purpose of these migrations is not very well understood, nor are they known to take place with regularity.—Those eels which cannot migrate to the sea, breed in inland rivers and lakes.

Eels are very averse to cold, and to this is ascribed their winter descent to brackish water, or hiding of themselves in mud. The number of known species is large, but they all belong to the temperate and warmer regions of the globe. In these also, the marine fishes to which the name E. is sometimes extended, chiefly abound.

There is a prejudice in some countries—particularly in Scotland—against eating eels, on account of their serpent-like appearance; but generally, as in England, they are highly esteemed. The London market is very largely supplied with eels from Holland; they are sent over alive in welled vessels.

There are various means besides those already noticed employed for the capture of the eel. Weirs and stages are erected across rivers, and baskets, or *bucks*, as they are termed, fixed in them for the taking of the eels during their migrations. These baskets are



Eel Snagging Apparatus

of large size, and shaped like a huge Chinese jar, in the mouth of which is fitted a sort of funnel-shaped mouse-trap entrance, composed of flexible withy rods coming inwards to a point, and through which the eels can easily force their way; but when they turn about to find the entrance again, it is closed against them. When the eels are running, as it is termed—that is, during their migrations—many hundredweights are often taken in these basket-traps in a single night. *Eel-pots* are also used for their capture.

These are of a similar nature to the bucks, but are smaller and more slender. They are sunk, by means of bricks tied to them, in the most likely runs or narrow spaces between weeds, or close to banks, and through which eels are likely to run. After a thunderstorm, eels always run well, as it disturbs them greatly. Eels are also caught by means of night-lines. These are long lines with heavy weights at each end, and in the middle if necessary, with hooks tied on every yard. Those hooks are baited with pieces of dead fish, minnows, or worms. The line is sunk, and laid across the stream—or, if fishing for conger-eels, in the sea—with, if it be thought necessary, a small buoy at one end, to recover the line by. These eel-lines should be hauled as early in the morning as possible, or the best eels will be found to have worked themselves off, leaving a mass of knots and slime behind them, to show where they have been. *Snigging* is a favorite amusement with some anglers. A rod or a long stick is provided, bent round at the slender end like the top of a very well used fishing-rod; on the point is fixed a single ring; through this ring is passed a piece of string; one end of this is held in the fisherman's hand. To the other end, on some fine but strong cord, is fastened a stout darning-needle, tied to the chord by the middle. The needle is then baited, or thrust lengthwise into a large lob-worm, until the fine cord alone comes out of the head of the worm. The fisherman then seeks for some hole in which he thinks an eel may be, and applying the point of the rod, pushes the worm into it. As soon as the fisherman believes an eel has swallowed the bait, he gives a slight pull to the string; and the needle, which has gone down the eel's throat inside the worm perfectly straight, being tied by the middle, turns crosswise in the eel's throat or stomach, and hooks him. *Clod-fishing* is thus practised: a quantity of lob-worms are strung by means of a needle on to some stout worsted until a considerable bunch of them is obtained; this is tied to the end of a cord, which is again tied to a stout pole. When the eels are on the move, the fisherman takes his station with a pail half-full of water within reach; he then drops his clod into the water, and allows it to sink to the bottom. As soon as he feels an eel tugging at it, he steadily and quickly, but without jerk, raises the bait from the water. The eel frequently has its teeth so entangled in the worsted as to be unable to let go, and thus is lifted from the water. The bait is held over the pail, a shake or two dislodges the eel, and the clod is then dropped into the water again, to fish for more. Sometimes two or even three eels come up at once, and a great number are often taken thus.

EEL-POUT, a name given in some parts of England to the burbot, and on some parts of the Scottish coast to the viviparous blenny.

EELS in paste, vinegar, fermenting and decaying substances, or stagnant water, are minute worms belonging to the genus *Anguillula* of the order Nematodea (q. v.). Their bodies are mostly cylindrical and transparent, so that one can easily see mouth, stomachs, and intestines of the creature. They multiply with extraordinary rapidity, so that in suitable places millions speedily swarm. Other Nematoids are the *Ascaris* (q. v.) Guinea-worm (q. v.), *Trichina* (q. v.), and see also ENTOMOZOA. Like other lower forms of life, these creatures may be dried and will retain their vitality for months and even years. This is perhaps largely owing to the thick chitinous cuticle which covers them externally, and is impervious to moisture. The eggs also are thick shelled, and do not easily lose their capability of development. The almost universal distribution of the group is explained by these facts. There are many species of *Anguillula* some of which live in salt and fresh water, damp-earth, &c.; the majority, however, live in putrefying animal and vegetable substances, while some few are parasitic; *Anguillula tritici* lives in ears of wheat, and gives rise to the disease known as Ear-cockles (q. v.).

EFAT. See SHOA, ABYSSINIA.

EFFARÉ, or EFFRAYÉ (Fr.) in Heraldry, signifies that the animal to which it refers is to be represented as rearing on its hind-legs as if it were frightened or enraged.

EFFE'CT. The general impression produced on the mind by the first sight of a picture or other work of art, or the impression which it produces when seen from so great a distance as to render the details invisible. The term has reference both to design and coloring, both of which, if correctly indicated, may be judged of with perfect confidence before either has been completed in detail. Bold sketches of their works are generally made by careful artists beforehand, for the purpose of adjusting the composition and coloring so as to produce the desired effect.

EFFE'NDI, a title of honor among the Turks, bestowed upon civil dignitaries and persons of various ranks, in contradistinction to the title of Aga, born by courtiers and military men. The word is equivalent to the English Sir, or the French Monsieur, and is frequently added to the name of an office. Thus, the sultan's first physician is termed *Hakim-effendi*; the priest in the

seraglio, *Imam-effendi*; and the Minister of Foreign Affairs, was formerly called *Reis-effendi*.

EFFERVESCING DRAUGHTS. See **AERATED WATERS.**

E'FFIGY (Lat. *effigies*), a likeness or representation either of the whole figure or of the head and face, as on a coin. See **BRASS, MONUMENTAL.** It is scarcely an artistic word.

EFFLORE'SCENCE is the term applied to the appearance of a white incrustation on the walls of buildings, or when a salt loses its water of crystallization, and presents a white powdery appearance on the surface. Common washing-soda exposed to the air affords a good illustration of this phenomenon.

EFFRAYÉ. See **EFFARE.**

EFT, a term of Anglo-Saxon origin, applied both to lizards and newts, which—withstanding the important differences between them—were until recently confounded even by naturalists. The Scotch word *ask* seems to be the exact equivalent of the English *eft*. In works of natural history, the term *eft* is now used as synonymous with **NEWT** (q. v.).

E'GBERT, the most celebrated of the Anglo-Saxon kings before Alfred, was the son of Alcmund, who is said to have reigned in Kent, and was a descendant of the House of Cerdic. In 787, on the death of Cynewulf, king of Wessex, E. laid claim to the throne, but had to give way to another claimant, Brihtic, who was the more powerful of the two. E. was compelled to flee, and took refuge at the court of Charlemagne. Here he remained for thirteen years, until, in 800, on the death of Brihtic, he was summoned to England to fill the throne of Wessex. England was at this time divided into three great sovereignties; Northumbria, extending over what were occasionally the separate kingdoms of Deira and Bernicia; Mercia, which had now subjugated the petty powers of Kent, Essex, and East Anglia; and Wessex, which had absorbed Sussex. For the first nine years of his reign E. drew no sword. His mild government completed the attachment of his subjects, and the peace which he maintained fostered his strength. In 809, however, he marched against the Britons of the west, and after fighting five years in Cornwall and Devon, he succeeded in subduing the wild tribes to at least a temporary subjection. In 823, the most important event in his career took place. At that time a dispute had arisen between the East Angles and their Mercian conquerors, and the former sent ambassadors to E. imploring aid and protection. E. joined the East Angles with an army which, according to the old chroniclers, had a peculiarly fighting appearance, being 'lean, meagre, pale, and long-breathed.' The encounter between the Mercians and the East Angles with their ally took place at Ellandūn (the modern Wilton, according to some), where a furious battle was fought, in which the Mercians were defeated with great slaughter. By this battle the power of Mercia was broken, and Essex and Kent, formerly Mercian provinces, became incorporated with Wessex. For four years after the great battle of Ellandūn, Mercia remained the seat of discontent and strife, and E., in 827, taking advantage of his opportunity, led thither an invading force, and reduced the country to a state of vassalage. Turning next his arms against Northumbria, he compelled that sovereignty also to acknowledge his supremacy (827—828). He afterwards penetrated into Wales, where, in like manner, success attended his arms.

E., now virtually king of England, though both he and his successors until the time of Alfred were in the habit of designating themselves only kings of Wessex, found it necessary, after a few years' comparatively peaceful rule, to direct his attention to a new and foreign enemy. The Danes, who had been making frequent descents upon the island since 832, and who in that year had defeated the forces of E., reappeared in 835 on the coast of Cornwall, where they were joined by numbers of the Cornish Britons. E., however, at the head of his West Saxons, met them at Hengestes-dūn (Hengstone), and in a great battle completely overthrew them. In the following year he died, after a reign of 37 years.—In E., ambition and prudence, bravery, talent, and courtesy were blended in such a manner as to form a monarch not unworthy to be the first king of England.

E'GEDE', HANS, was born in Norland, in Norway, January 31, 1631, studied in Copenhagen, and was appointed to the church of Vaagen in Norway in 1707. Having determined to proceed to Greenland to convert the natives, he resigned his *cure* at the end of ten years; and, after devoting himself with assiduity to the study of the language, embarked for Greenland, with his wife and sons, in 1721. He remained fifteen years in Greenland, during which time he labored zealously among the people, and by his preaching and teaching secured a permanent footing there for the Christian mission, which owed its origin to him. On his return to Copenhagen, he employed himself in instructing missionaries in the dialects of Greenland; and in 1740 he was made a bishop. He died in 1758. He has described the course and success of his labors in *Det gamle Grønland's nye Perlestrat* (Copenh. 1729

and 1741). He was ably seconded in his labors by his wife and his sons, Povel and Niels.—**POVEL EGEDE**, who was his father's successor in Greenland, and was also a bishop, translated the gospels and several devotional works into the Greenlandic language, and compiled a grammar and dictionary for the use of the Greenland mission; the latter appeared in 1750 under the title *Dictionarium Grønlandico-danico-latinitum*.

E'GER, a town and river of Austria, in the province of Bohemia—1. The town E. stands on a rock on the right bank of the stream of the same name, is 90 miles west of Prague, and near the Bohemian frontier. Formerly, it was a border fortress of some importance; its walls, however, have been almost entirely pulled down, and its fosses filled up with rubbish. Among the conspicuous edifices of E. are its churches, of which there are four—one of them, the deanery church, very handsome; the market-place, within which is the large town-hall; two monasteries, a Dominican and a Franciscan; and the barracks. East of the market-place is the house of the burgo-master in which Wallenstein was assassinated in 1634. The ruins of the imperial burg or citadel, formerly the residence of kings and emperors, is situated in an angle of the fortifications above the river. From the midst of these ruins rises a singular square black tower, constructed of masses of volcanic tufa. The Double Chapel, consisting of two stories, the upper supported by graceful marble pillars, is a fine specimen of Gothic architecture. An avenue, nearly three miles long, leads from E. to Franzenbrunn (q. v.). E. has manufactures of broadcloth, kerseymeres, cotton, chintz, leather, soap, &c. Its industry and commerce, have greatly increased since it became a point of junction of five railways. Pop. (1869) 13,463.—2. The river E. rises 12 m. N. W. of the town of E., flows first S. E. to E., then advances in a general N. E. direction, passing Elbogen, Saaz, Birdin, and Theresienstadt, near which town it joins the Elbe, after a course of about 120 miles. Its current is rapid, and no part of its course is navigable.

EGE'RIA was the name of the Nymph or Camena from whom, according to the legend, King Numa received the ritual of public worship which he established in Rome. The grove where Numa met the goddess to receive her instruction was dedicated by him to the Camenæ. Roman legends speak of two groves dedicated to E.—one near Aricia, the other before the Porta Capena at Rome, where the grotto of E. is still shown.

EGG, or **EIGG**, an island 12 miles off the west coast of Inverness-shire, and 8 miles south-west of the south point of Skye. It is $4\frac{1}{2}$ miles long by $2\frac{1}{2}$ broad. It consists chiefly of trap, which in the north alternates with sandstone and limestone, the latter rocks containing oolitic fossils, carbonized wood, and coal. The Scur of Egg, in the south-west, rises 1339 feet. The upper 470 feet of this hill is a mass or vein of pitchstone, $1\frac{1}{2}$ mile long, and 100 feet broad. Some of the pitchstone forms straight, inclined or curved columns, from a few inches to nearly two feet in diameter. In one place, the pitchstone overlies red sandstone, conglomerate, trap, and the silicified wood of an oolitic pine. In the south part of the isle is a large cave, entered by a narrow opening, through which only one person can creep at a time. Here it is traditionally related that the Laird of Macleod, to revenge an injury done to some of his clan, smoked to death all the inhabitants (200 Macdonalds) of the isle, who had hid themselves in the cave. Pop. (1871) 282; (1881) 291.

EGG (*ovum*). In a great majority of the different kinds of animals, reproduction takes place by means of eggs; in other words, the animals are *oviparous*. It is only in the *Mammalia* that we find animals truly *viviparous*; whilst the *marsupial* quadrupeds and the *monotremata* form connecting links, in this part of their natural history, between the *mammalia* which are *viviparous* in the fullest sense of the term, and the warm-blooded animals (birds) which are *oviparous*.

To the articles **REPRODUCTION** and **DEVELOPMENT OF THE EMBRYO**, we must refer for an exhibition of the differences between *oviparous* and *viviparous* reproduction, and of that original and essential agreement in important particulars, which has been strongly asserted in the saying, *Omne animal ex ovo* (Every animal is produced from an egg). To the article **DEVELOPMENT OF THE EMBRYO** also reference must be made for what may be called the *history* of the egg, and the development and uses of its several parts.

The number of eggs varies extremely in different families, some birds producing only one at a time, or in a year, others twenty or nearly so, whilst the roe of the herring, cod and many other fishes, contains myriads of eggs. The eggs of some animals are enveloped in a gelatinous mass; those of some are joined together, and are laid in a kind of string; those of others are connected together in various ways. For notice of such peculiarities, we must refer to the articles on different classes of animals.

The economical uses of eggs are well known. The eggs chiefly used are those of birds, although the eggs of turtles are also in great repute as an article of food and luxury, and those of fresh-

water tortoises are valued for the oil which they yield. The birds' eggs chiefly used for food are those of the species commonly domesticated as poultry, and others allied to them—gallinaceous birds and web-footed birds. Of gallinaceous birds, the common domestic fowl, the turkey, the peahen, and the guinea-fowl, produce the eggs most generally used and brought to market in different parts of the world; of web-footed birds, the common duck is in this respect the most important, although the eggs of other *Anatida* are also used for food, and those of some of the other web-footed marine-birds are much sought after by the inhabitants of the wild and rocky shores which they frequent. Thus, the eggs of gulls and guillemots afford an important article of food to the people of St. Kilda, and of some of the Orkney and Shetland Islands, as well as to the inhabitants of Iceland and other far northern regions. It is in quest of eggs, as well as of young birds, that the dangers of the most tremendous precipices are braved by men whom their companions let down by ropes, and who gather the eggs from the rock ledges. The coast of Labrador are also visited by *egggers*, who collect the eggs of sea-birds, and carry them for sale to some of the American ports. The eggs of some of the sea-birds of the West Indies are of considerable commercial importance. See EGG-BIRD.

EGG, CHEMISTRY OF. An ordinary good-sized hen's egg weighs about 1000 grains, of which the white constitute 600 grains, the yolk 300, and the shell 100. The white or glaire of the egg is a strong solution of Albumen (q. v.) in water, and whilst readily miscible with water in its ordinary state, it becomes insoluble when subjected to heat, as in boiling an egg. In 100 parts, the white or glaire of egg consists of—water, 80; dry albumen, 15½; salts, &c., 4½. The yoke or yolk of the egg is composed of a strong solution of albumen, through which multitudes of minute globules of oil are suspended, which render it essentially an emulsion. In 100 parts, it consists of—water, 53½; dry albumen, 17½; oil (with small proportion of salts), 28½.

EGG, MUNDANE. See MUNDANE EGG.

EGG TRADE. English poultry does not supply eggs in sufficient quantity to meet the home-demand, on account partly of the large consumption in manufactures. The deficiency is made up by importations, chiefly from France. There are no means of ascertaining the number of eggs produced by English poultry in the course of a year; but the importations are recorded in parliamentary papers. These importations have largely increased within the last few years. In 1844, they amounted to about 67 millions; in 1860, to nearly 160 millions; and in 1871 to 380,668,000, of the value of £1,263,612. Of this enormous amount 281,530,440 came from France. Germany sent us 49,120,160; even Spain and Portugal contribute. (The Orkney Islands sent about 11,000,000 to the mainland in 1880.)

In 1880 above 600,000,000 eggs were imported, value £2,235,451. The imported eggs are seldom equal in quality to those home-produced; they are often packed in damp straw, the odor from which penetrates the shell, and imparts an unpleasant flavor to the egg. There is a certain warmth in new-laid or good eggs, which tends to ferment the damp straw, or other substance in which they are packed, and this fermentation reacts upon the eggs in the way stated. Until the removal of the duty, imported eggs paid 4d. per cubic foot if from British possessions, and 8d. if from foreign countries.

EGGA, a large town of Western Africa, Yamba country, is situated on the right bank of the Niger, in lat. 5° 43' N., long. 6° 20' E. It is said to be two miles long. Its streets are narrow; the houses are principally huts built of clay, the walls smooth, and stained with indigo. Great quantities of narrow cotton, cloth, only a few inches in breadth, and generally dyed blue, are manufactured here. The inhabitants are enterprising and commercial, many of them possess canoes, in which they trade up and down the Niger. These canoes are covered by a sort of shed, under which the traders sleep at night. The chief articles of trade are beautifully carved calabashes, cloth net work, corn, yams, sweet potatoes, dried fish, and a few European articles, as beads and gunpowder. The population, which is said to be immense, is partly Mohammedan and partly pagan.

EGGAR MOTH. the name of certain species of moth, of the genus *Lasiocampa*, allied to the silk-worm moths. One species (*L. trifolii*), of a uniform foxy ochreous color, with wings expanding about two inches, produces a caterpillar as thick as a swan's quill, hairy, and ochreous brown, which feeds sometimes on broom, but frequently in clover-fields.

EGG-BIRD (*Hydrochelidon fuliginosus* or *Sterna fuliginosa*), a bird of the gull family, sometimes called the **SOOTY TERN**. It is fully larger than the common tern of the British shores; has a long, slender, nearly straight, compressed, sharp bill; very long, narrow, and pointed wings, and a long deeply forked tail; the general color is glossy black on the upper parts, except the forehead and the edges of the wings, which, with the under parts, are

white. It abounds in the West Indian seas, and is to be seen in myriads on and near some of the *keys* or low barren islets where it breeds. When visitors land on these keys, the disturbed birds rise and fly about in clouds which darken the air, whilst their tumult overpowers even the roar of the breakers. The nest of the E. is merely a little excavation in the sand, and usually contains three eggs, which are fully two inches long, of a pale-cream color, sparingly marked with light-brown and purple tints. The eggs are esteemed delicious, and form an object of profitable adventure in



Egg Bird, or Sooty Tern (*Hydrochelidon fuliginosus*).

the months of March, April, and May, to the crews of numerous small vessels, fitted out from Kingston, Havana, and other West Indian ports. Curious customs prevail among the egg-gatherers at the most frequent keys, and common consent has established a kind of code of laws among them. The eggs remain fresh and fit for use only for a short time. Along with the eggs of the E., those of Noddy are also gathered, and those of the Sandwich Tern and other allied species; and the name egg-bird, with some prefix, is sometimes extended in the West Indies to several of the terns.

EGG-PLANT (*Solanum melongena*), an annual usually less than two feet high, with stem partially woody; fruit very much resembling an egg in appearance, and varying in size from that of a hen's egg to that of a swan's egg, in color generally white, yel-



Egg-plant (*Solanum*):—A, purple variety; B, white variety.

low, or violet. The fruit is much used as food, not only in the East Indies, of which the plant is a native, but in warm countries generally. The fruit is known by various names—as Egg-apple, Auberjine, Brinjal, &c.

E'GHAM, a village in the north-west of Surrey, on the left bank of the Thames, 18 miles west of London. In the vicinity is Rnymede, a meadow on the Thames, where King John conferred with his barons before signing the Magna Charta in 1215. Near also is Cooper's Hill, rendered famous by Denham and Pope.

E'GINHARD, or **EL'NHARD**, the biographer of Charlemagne, was born towards the end of the reign of Pipin, or the beginning of that of Charlemagne. At an early age he repaired to the court of the latter monarch, and became a pupil of Alcuin. His talents and acquirements gained him the favor of the emperor, who appointed him his private secretary, and superintendent of public buildings. E. accompanied the emperor in all his marches and journeys, never separating from him except on one occasion, when he was despatched by Charlemagne on a mission to Pope Leo. On the death of the emperor, he was appointed preceptor to Lothaire, son of Louis le Débonnaire, and for a number of years

afterwards appears to have been lay abbot of various monasteries; but ultimately becoming tired of secular life, he retired to the secluded town of Mühlheim. Here he erected a monastery, and changed the name of the place from Mühlheim to Seligenstadt (City of the Blessed). He is said to have now become a monk, but this is scarcely authenticated. E. died 14th March 840, and was buried beside his wife, who died in 836. The two coffins are now shown in the chapel of the castle at Erbach. The counts of Erbach trace their descent from Eginhard. His *Vita Caroli Magni*, completed about the year 820, with respect to plan and execution, as well as language and style, is incontestably the most important historical work of a biographical character that has come down to us from the middle ages. It was frequently used as a schoolbook, and was therefore copied *ad infinitum*. The best German edition is that of Perth, in the *Monumenta Germaniae Historica*. His *Epistola*, 62 in number, are also of considerable value in a historical point of view. The French consider the edition of E.'s works by M. Teulet, with a translation, and life of E. (1848), to be the best and most complete.

E.'s second work, the *Annales Regum Francorum, Pippini, Caroli Magni, Ludowici Imperatoris*, embraces the period from 741 to 829. According to a pretty legend, E.'s wife, Emma, was a daughter of Charlemagne. A mutual affection had arisen between them, and on one occasion when the lovers were enjoying a nightly interview, a sudden fall of snow covered the spacious court, thus rendering retreat impossible without leading to a discovery. As the traces of female footsteps could not excite suspicion, Emma carried her lover across the court on her shoulders. The scene, it is said, was observed from a window by Charlemagne, who united the affectionate pair in marriage. On this legend Fouqué founded his romance of *Eginhard and Emma*, and Longfellow has made it the subject of a short poem.

E'GLANTINE, a name sometimes given to the Sweet Briar (*Rosa rubiginosa*), but also sometimes to other of the smaller-flowered species of rose.

EGLINTON and WINTON, ARCHIBALD WILLIAM MONTGOMERIE, Earl of, K.T., twice Lord-lieutenant of Ireland, was born at Palermo in 1812. He was a well-known patron of the turf and field-sports, and his name is particularly associated with a splendid revival of the medieval tournament, which he gave at Eglinton Castle in 1839 (see TOURNAMENT). Lord E., who was at various times Lord-lieutenant and Sheriff-principal of Ayrshire, Lord Rector and Dean of the Faculty of Glasgow University, &c., died in 1861.

E'GMONT is the name of the principal harbor of the Falkland Isles, and of an active volcano in New Zealand, besides several other unimportant places.—1. Port E. is on the north coast of the more westerly of the principal two islands of the group, its seaward barriers being the islets of Keppel and Saunders. It is in lat. 51° 21' S., and long. 60° W. The anchorage is good; and the shores afford fresh water, but are almost destitute of wood.—2. Mount E. is on the northerly island of its own group, rising 8340 feet above the sea. It is 18 miles S. of New Plymouth, in lat. 39° 15' S., long. 174° 13' E.

EGMONT, LAMORAL, COUNT, PRINCE OF GAVRE, was born in the castle of La Hamaide, in Hainault, in 1522; and inherited his property and titles from his elder brother Charles. He accompanied Charles V. on his expedition against Algiers in 1541, and followed that monarch afterwards in all his campaigns, but without distinguishing himself greatly. After the accession of Philip to the throne, E. commanded, with great success, the cavalry in the battle of St. Quentin, 1557, and next year in that of Gravelines; and when Philip finally returned to Spain, he left E. governor of Flanders and Artois. In this position, E. entered into alliance with the party in the Netherlands that were dissatisfied with the Catholic policy of Philip, and from a courtier became all at once a man of the people. His proud, imperious character, however, and his subsequent conduct, have induced many to suppose that, like his bosom-friend the Prince of Orange, he was less actuated in this by high motives than by self-interest, or at least by disappointed ambition. The more common opinion, however, is that he was a humane and virtuous patriot, who, although indifferent to Protestantism as a religion, was anxious to do justice to all the members of that oppressed faith.

When Margaret, Duchess of Parma, against the will of the Protestant party, was made regent-general of the Netherlands, E. and the Prince of Orange entered the council of state, and held the command of the few Spanish troops. At first he sided with the party who were discontented with the infringement of the liberties of the provinces, and the introduction of the inquisition; but when insurrections broke out, he at last broke with the Prince of Orange and the 'Beggars' League,' as it was called. He seemed to have restored order, and to be maintaining it, when, in April 1567, the Duke of Alba was sent as lieutenant-general to the

Netherlands. The Prince of Orange and other chiefs of the insurrection left the country; E., wishing to save his private property, remained, thinking his return to the court had secured his safety. When Alba entered Brussels, 23d August, E. went to meet him, and sought to secure his favor by presents. He appeared to have gained his confidence, when suddenly, after a sitting of the council, he and Count Hoorn were treacherously seized, and carried to the citadel of Ghent. The states of Brabant sought to withdraw E. from the bloody tribunal, as it was called, instituted by Alba, and E., as a Knight of the Golden Fleece, denied its competency. But all in vain. He was called upon to justify himself against ninety counts of accusation; and as he persisted in protesting against the incompetency of the court, and thus left many of the points unanswered, he was held guilty of contumacy, and along with Count Hoorn condemned to death. On the following day, June 4, 1568, they were both beheaded in the market-place of Brussels. Although E. hoped for pardon to the last, and intercession was made for him from the highest quarters, he died with the greatest composure. It is related that as he received the fatal stroke, Johanna Lavil, who had been his mistress, fell down dead, and the people, in a paroxysm of sympathy, dipped handkerchiefs in the blood that seemed shed in martyrdom to freedom. E. left eleven legitimate children, of whom three were sons. The whole of his property, movable and immovable, was confiscated with the greatest rigor. See *Correspondance de Marguerite d'Autriche, Duchesse de Parma* (Bruss. 1842), and *Correspondance de Philippe II. sur les Affaires des Pays-Bas* (Bruss. 1848—1851, 2 vols.). Goethe has made the death of E. the subject of a tragedy.

E'GRET, a name often given to various species of Heron (q. v.), particularly those which, at least during the breeding season,

have the feathers on the lower part of the back lengthened and their barbs loose, so that this part of the plumage is very soft and flowing. Most of the egrets have beautiful white plumage. The distinction between egrets and other herons is not, however, very strongly marked, and the names are often used indiscriminately, although the name E. is never given to the common heron. E. plumes are used for ornamental purposes, particularly the occipital crest and scapulars of the LITTLE E. (*Ardea garzetta*); and the name E. (Fr. *aigrette*) has become a common term for a tuft of feathers, although it is said to be derived from the French *aigre* harsh, on account of the harshness of the voice of the bird. In old English bills of fare, egrets are mentioned as if they were abundant; and not fewer than 1000 'egrittes' are included in the bill of fare of a single great feast, given at the enthronization of George Neville, Archbishop of York, in the reign of Edward IV.; but as there is no other evidence that any species of E. was ever otherwise than of very rare occurrence in Britain, great probability seems to attach to the opinion originally advanced by Dr. Fleming, that perhaps the lapwing might be meant, 'the most common bird with a crest.'



Little Egret (*Ardea garzetta*).

E'GYPT, a country in North-east Africa, extending from the Mediterranean to the first cataract of the Nile, that of Syene, from lat. 24° 6' to 31° 36' N. The name is derived from the Greek *Aigypnos*, probably from *Hakaptah*, 'the city of Ptah,' i. e., Memphis (according to Maspéro). In Hieroglyphic and Coptic, it was called *Kemi* (Black Land), from the color of the soil; and by the Hebrews *Masr* or *Misraim*, modified by the Assyrians into *Musr*, and by the Persians into *Mudraya*. The country may be described as the bed of the Nile, the cultivated territory only extending to the limits of the inundation. This river runs from the cataracts of Assouan, in a northerly direction, to Denderah, where there is one great bend to the west; and a few miles north of Cairo (lat. 30° 15' N.), the river divides into two main streams, forming the Rosetta and Damietta branches. The other five months, which existed in antiquity, have silted up; the alluvial district enclosed by these mouths, and supposed by the ancients to have been gained from the sea, formed the ancient Delta. The basin of the Nile is formed by the ranges of the Arabian hills on the east, and the Libyan on the west side. The rate of deposit of mud is supposed to be about 6 inches in a century. The eastern chain of mountains rises to about 1000 feet above the level of the sea.

The great physical peculiarity of Egypt is the absence of rain, the land being only irrigated by the annual overflow of the Nile.

The climate is remarkably mild and sound, especially south of the Delta; and in the desert, from Cairo to Alexandria, the air contains more moisture than to the south. From the middle of August to December, west winds prevail; east winds from that time till March; after that, unhealthy south winds or Khamsin till June; and from June till August the north or Etesian winds. Earthquakes are occasionally felt; and the temperature varies from 84° F. to 32°. The most remarkable phenomenon is, however, the regular increase of the Nile, fed by the fall of the tropical rains, which commence in 11° N. lat., in the spring; and falling first into the White, and then Blue Nile, reach Egypt in the



Egypt.

middle, and the Delta in the end of June. In the middle of July, the red water appears, and the rise may be dated from that time; it attains its maximum at the end of September, and begins to decline visibly in the middle of October, and subsides to its minimum in April. At the end of November the irrigated land has dried, and is sown, and is covered with green crops, which last till the end of February. In March is the harvest. The state of the Nile, in fact, marks the season more accurately than the variation of temperature. E. is by no means remarkably healthy, as, in addition to the visitations of plague and cholera, ophthalmia, diarrhoea, dysentery, and boils often prevail, and European, and even Nigritic races cannot be acclimated.

Geology.—E. is separated from Nubia by a low hilly region about fifty miles broad from north to south, composed of granite rocks. The same crystalline rocks extend up the shore of the Red Sea to near the opening of the Gulf of Suez, stretching inland for fully thirty miles. The scenery in this district is wild and rude, and the course of the Nile is frequently interrupted by cliffs and broken masses of granite, forming magnificent cataracts. The granitic region terminates at Assouan, the ancient Syene. From the rocks here were obtained the materials for the colossal and monolithic monuments of Egypt. The valley of Upper Egypt is bounded by two ranges of hills running northward—the Arabian range on the right, the Libyan on the left of the river, both alike composed of cretaceous strata, the predominant rock being sandstone. This is a durable and easily worked stone, and was consequently extensively used in the erection of ancient temples. The city of Thebes was built of it. The cretaceous sandstone extends from the granitic rocks forming the first cataract at Assouan for about 85 miles to Esné, where it is covered by a limestone belonging to the upper chalk series. This continues on both sides of the valley for about 130 miles, when it is covered by a tertiary nummulite limestone, which forms the further prolongation northward of both ranges of hills. Because of the easy disintegration of these beds, the scenery in the limestone districts is tame and monotonous; frequent table-lands occur, on one of which are

built the three pyramids of Gizeh, the material employed being the predominant limestone.

Over a large extent of E., these rocks are covered with moving desert sands, and in the flat lands bordering the Nile, with the alluvium brought down by its waters, and which has formed the Delta at its mouth. This alluvium consists of an argillaceous earth or loam, more or less mixed with sand and a quartzose sand, probably derived from the adjacent deserts by violent winds. It is remarkable that this sedimentary deposit has no traces of stratification, and also that within short distances, great varieties are observed in what are apparently synchronous deposits. Mr. Horner's recent examination of the Nile deposits, and the striking conclusions he deduces from his observations, have caused considerable attention to be paid to these deposits lately. See MEMPHIS.

Natural History and Productions.—The fertile valley of the Nile and the desert regions which enclose it, are very different, not only in their botany, but in their zoology. One of the most notable of Egyptian quadrupeds is the hippopotamus, which formerly reached the Delta, but is now to be seen only in the more southern parts of the Nile. The giraffe is occasionally found within the southern borders of Egypt. The jackal and hyæna are common; also the ichneumon (q. v.), so much celebrated among the ancients; and the jerboa. The one-humped camel was originally introduced by the Ptolemies for the transit of the Indian trade. The other usual domestic quadrupeds have existed from the most ancient times. Of domestic birds, water-fowl were anciently the most numerous; the gallinaceous poultry now common not being probably of older date than the Persian invasion. Pigeons have always been abundant. The Egyptian vulture (q. v.) is a common and notable bird, as is also the ibis (q. v.), held sacred by the ancient Egyptians, and of which many fables have been related. The ostrich sometimes occurs in the desert. Of reptiles, the most famous is the crocodile of the Nile: monitors (q. v.) are also abundant, saurian reptiles of considerable size. Smaller lizards abound. The trionyx, or soft tortoise, is plentiful in the Nile. Serpents are numerous: amongst the most venomous and dreaded of which are the asp (q. v.) or haje, and the cerastes (q. v.). E. abounds in fish, the most remarkable being the Binny (see BARBEL), the *Latus* (one of the perch family), the Bayad or *Silurus*, the *Chromis Nilotica*, and the *Mormyrus oxyrhynchus*. The sacred beetle (*Scarabæus sacer*) is one of the most remarkable insects. Locusts are a dreaded pest. E. is still notable also for the abundance of the other creatures mentioned by Moses as its plagues. Many of the European trees and plants are found in E.; the date-palm, the doom-palm, the sycamore, acacias, tamarisks, &c., are among its more peculiar botanical productions; also the papyrus (*p-apt*), which anciently supplied material for paper, and the lotus (*shuin*) or water-lily of the Nile. The extensive culture of papyrus has been, in modern times, replaced by that of the sugar-cane, cotton, indigo, and tobacco; and the plant has almost disappeared. Gourds and melons have always abounded. To the wheat and barley of antiquity have been added maize and durra. E. is very deficient in timber trees; the Pharaohs obtained cedar from Lebanon and ebony from Ethiopia. The rocks of E. afforded the stones used in its edifices and sculptures; granite, syenite, basalt (at Assouan), breccia (in the Cosseir Road), porphyry (from the quarries of Gebel Doshan, opened in the reign of the Emperor Claudius), sandstone, and limestone. Alabaster (found at Tel-el-amarna) has been used from the earliest periods to the present day. Emeralds are produced by the mines of Gebel Zabara; salt, natron, and—since 1850—sulphur, are among the other mineral productions of Egypt.

Divisions.—The country was anciently divided into 44 nomes—22 in Upper, and as many in Lower Egypt. Each nome or department had a separate local municipal government of a nomarch or lieutenant-governor, *ha*, besides governors of the cities, of the temples, scribes, judges, and other functionaries. Their limits were measured and defined by landmarks. This division, as old as the 4th dynasty, varied in number at different times. Under Sethos I. or Sesostris, there were 36 nomes—10 in the Thebaid, 10 in the Delta, and 16 in Middle Egypt. At the time of the geographer Ptolemy, there were 47—the Antinoites having been added. The country beyond the cataracts to Hierosycaminos was named at the Roman period Dodekaskoinos. In 400 A.D., Egypt was divided into Augusta Prima and Secunda on the east, and Ægyptiaca on the west, the Heptanomis as far as Oxyrhynchus was named Arabia, then Thebais Proxima as far as Panopolis, and Thebais Supra to Philæ. Under the Arabs, E. has been divided into Masr-el-Bahri or the Delta; the Faioum, El Bostani, or Middle Egypt; and Es Said or Upper Egypt. In addition to E. proper, Nubia, Darfur, and extensive territories on the Upper Nile are now subject to the ruler of Egypt, whose dominions thus embrace 1,400,000 sq. miles.

For a description of the most remarkable antiquities of E., see ABOUSAMBUL, ALEXANDRIA, EDFOU, MEMPHIS, THEBES; also NILOMETER, OBELISK, PYRAMID, &c.

The population of the country must have been large at the earliest period, as 100,000 men were employed in the construction of the Great Pyramid alone during the 4th dynasty. It has been placed at 7,000,000 under the Pharaohs, distributed in 1800 towns, which had increased to 2000 under Amasis, 525 B.C., and upwards of 3000 under the Ptolemies. In the reign of Nero, it amounted to 7,800,000. The pop. in 1844 was 2,500,000; in 1859, 5,125,000; and in 1879 including Nubia, Darfur, and other dependencies, nearly 17,000,000, of whom 5,200,000 inhabited Egypt proper. The great bulk of the inhabitants consist of native Mohammedans; the Copts (q. v.) are estimated at 150,000, and the rest are composed of Bedouin Arabs, Negroes, Abyssinians, Turks, Syrians, Greeks, Armenians, Jews, and Western Europeans. The original population appears, both from the language and the physical conformation of the mummies, to have been of Asiatic origin, afterwards blended with Ethiopian by subsequent irruptions and conquests; but there appears to have been an aboriginal race at an early period, of copper color, fair proportioned, although with rather thin legs, large feet, rather high cheekbones, and large lips. According to Herodotus, Diodorus, and Plato, the system of castes prevailed in Egypt. The first of these authors says there were seven castes—of priests, warriors, cowherds, swineherds, innkeepers, interpreters, and pilots. Diodorus makes only five—priests, soldiers, cultivators, shepherds, and artisans; and Plato the same. The evidence of the monuments, however, shows that these were rather conditions of society than castes, as the different orders not only intermarried, but even, as in the case of priests and soldiers, held both employments. As in all bureaucracies, the sons often obtained the same employments as their fathers.

Religion.—The Egyptian religion was a philosophical pantheism, the various attributes of the Deity being divided amongst the different gods of the Pantheon. Unlike the Greek, where a god was honored in a separate temple, each Egyptian divinity was accompanied by a *put* or 'company' of companion-gods. The principal nomes and cities had each a family group or gods, consisting of a parent deity, a wife and sister, and a son. Thus Ptah or Vulcan, the eponymous and principal god of Memphis, formed a circle with the goddesses Pasht and Bast; and his son Nefer Tum, Amen Ra at Thebes, was allied with Mu, Nit, and Khonsu. These tetrads, or rather triads, for the female principle was dualized, were often accompanied by inferior deities; and personifications of the elements, passions, and senses, and feelings were introduced. The worship of some triads however, became universal—that of Osiris, Isis, and Horus being found all over Egypt at the earliest period. The gods, indeed, are stated by the Greeks to have been divided into three or more orders. The first contained eight gods; the second, twelve; the third, an unknown number. The eight gods of the first order wore Ptah, Ra, Shu, Seb, Osiris, Set, or Typhon, and Horus, according to the Memphite; and Amen, Mentu, Atum, Shu, Seb, Osiris, Set, Horus, and Sebak, according to the Theban version. Great uncertainty prevails about the gods of the second and third order, and still greater difficulty about the genesis and nature of the gods, different doctrines prevailing at different times and places; and the tendency to fuse different gods into one, particularly at a later period: Amen Ra, for example, being identified with Horus; and Horus, Ra, Khnum, Mentu, and Tum being merely considered the sun at different periods of his diurnal course. Very little light is thrown on the esoteric nature of the deities by the monuments, and the classical sources are untrustworthy; but the antagonism of good and evil is shown by the opposition of the solar gods and the great dragon Apap, a type of darkness, and the hostility of Osiris and Set or Typhon.

Some of the gods were self-existent, others emanated from a father, and some were born of a mother only, and others were the children of greater gods. Their energies and powers differed, and their types, generally with human bodies, have often the heads of the animals which were their living emblems, instead of the human. A few foreign deities became at the close of the 18th dynasty engrafted into the religious system—as *Bar*, Baal; *Ashtarata*, Ashtaroth; *Anta*, Anatis; *Ken*, Kiun; *Reshepu*, Reseph; *Set*, Satan.

All the gods had human passions and affections, and their mode of action was material; they walked on earth, or sailed through ethereal space on boats. The principal deities are Ptah, the opener, represented as a bow-legged dwarf or foetus; the Phœnician Pataikos, the creator of the world, the sun and moon, out of chaos (*ha*) or matter (*Mu*), to whom belong Pasht, 'the lioness,' and Bast, Bubastis, lion-headed goddesses presiding over fire, and Nefer Tum, his son, a god wearing a lotus on his head. Next in

the cosmic order is Khnum—worshiped at Elephantine—the ram-headed god of the liquid element, who also created the matter of which the gods were made; and connected with him are the goddesses Heka the Frog, or primeval formation, Sati, or 'sunbeam,' and Anuka, alluding to the genesis of the cosmos. The Theban Triad comprised Amen Ra, 'the hidden' power of the sun, the Jupiter; *Mu*, the 'Mother' goddess or 'Matter,' the Juno; *Nat*, the 'Shuttle,' the Minerva; and Khonsu, 'Force' or Hercules, a lunar type. A subordinate type of Ammon is Khem, 'the enshrined,' who, as *Harnekht*, or Powerful Horus, unites beginning and end, or cause and effect. The solar worship comprises *Ra*, the Sun, who traversing the 'sha,' or empyreal space of Gates, passes each hour a separate region, and as he descends behind the west hills of the horizon, becomes Atum, also a demiurge; while as Mentu, a hawk-headed god, he is Mars, and as Kephra, a scarab-headed god, the male creative or existent principle, and is identified with Amen, Khnum, and other deities. Day and night, Ra and his satellites pursue the Apap or 'Giant' Darkness with alternate success. The souls of the blessed come off from earth, and entering the boat of Ra, there enjoy the perpetual streams of light which emanate from his orb. From *Ra* or Helios spring Shu and Tef the Gemini, Athor and Ma. *Seb* or 'Time,' and *Nu* or the 'Firmament,' gave birth to Oiris, Isis, Nephtys, Set, and the elder Horus, a group of terrestrial and infernal deities. The myth of Osiris destroyed by his brother Set, hewn in pieces, recovered by Isis, and avenged by Horus his son, embalmed by Anubis and the genii of the dead, and defended by Thoth, the Egyptian Logos, at the 'great judgment' before his accusers, Set and the conspirators, was the type of the judgment and future destiny of man, and all deceased were called by his name. See OSIRIS. Numerous inferior deities, such



Amen Ra.



Pasht.



Anup, or Anubis.



Thoth.

as Hapi, the Nile, appear either as other forms of the superior deities or local varieties of the myths. Each deity had its sacred animal which received a local worship, and which was considered to be the 'second life' of the deity it represented.

The special animal selected was installed in the adytum of the temple, and gave oracular responses. The most remarkable of these animals was the Apis bull of Memphis, whose worship had a national extension. The Egyptians believed in the transmigration of souls, and all not sufficiently pure to be admitted into the courts of the sun, or whose bodies had perished before the expiration of 3000 years, passed from body to body (see EMBALMING), having first descended to the Hades, and passed through the appointed trials and regions, endeavoring to reach the manifestation to light. In this progress, the soul was required to know and tell the names of the doors, regions, and their guardian demons through which it had to pass.

Chronology and History.—One of the most important points of Egyptian history is the chronological, involving as it does the date of the earliest historical epoch of man. In the time of Ptolemy Philadelphus, in the 3d c. B.C., Manetho of Sebennytus, high-priest of Heliopolis, drew up, at the request of the king, a history, in which he divided the space of time from Menes to the reconquest of Egypt by Darins II. into 30 dynasties. The work of Manetho has perished, but chronological epitomes remain in the works of Julius Africanus, a writer of 300 A.D., and Eusebius, and George the Syncellus, 800 A.D. Besides the Bible, Herodotus, Diodorus, Josephus, and other writers, especially Eratothenes, also contained sources of chronological information, and the learned of Europe for the last three centuries had endeavored to reconcile the conflicting statements of these authors, the discrepancy of their ciphers, and the inaccuracy of their details. Even in Biblical chronology, the Hebrew, Samaritan, and Septuagint versions gave very different results; but in England the

chronology of Usher, which, from the Hebrew, placed 4004 B.C. as the date of creation, and 2348 B.C. for the Deluge, has somehow obtained the sanction of theological writers. To reconcile these conflicting authorities, two schools of chronological critics, called of the Long and Short Chronology, have arisen, and the epoch of Menes has been placed by the advocates of the long chronology, as Boeckh, at 5702 B.C., by Bunsen, at 3643 B.C., by Lepsius, at 3892 B.C., by Henry, at 5305 B.C.; while the same date falls, according to Sharpe, 2000 B.C., to Nolan 2673 B.C., and Poole, 2717 B.C. Unfortunately, the monumental information is defective at certain periods, while in all, the national custom of dating in kings' reigns only, without the use of the controlling date of any cycle, renders the subject still more obscure; for the Sothic cycle, or Dogstar period of 1461 vague years, was not in official use. The celebrated hieratic papyrus at Turin, of the age of the 19th dynasty, which contained a system of chronology arranged on a principle of cyclic and regnal years, has unfortunately suffered so much mutilation that it is impossible to reconstruct it satisfactorily. It is therefore better to arrange the history according to the dynastic successions of Manetho, giving these as waves of time, leaving the question of their duration to individual judgment. At present, the elaborate systems of chronology are only chronological draughts from recollection of a vast ruin, each more or less happy or defective in some particular respects or general conception. There are not sufficient monumental data for a sure conclusion about the remoter dynasties.

Mythically, Egypt was said to have been first governed by a dynasty of gods, who, according to Manetho and other Greek authors, were Vulcan or Ptah, Helios the Sun or Ra, Sôs or Shu, Saturn or Seb, Osiris or Heshar, Typhon or Seti, and Horus or Ilor. These gods reigned 13,900 years, and were succeeded by the Manes and demigods, whose reign occupied 4000 more years. But considerable difference exists in the lists—that of Thebes giving Amen, Mentu, Tum, Su and Seb, Osiris, Seti, and Horus; that of Memphis, Ptah, Ra, Shu, Seb, Osiris, Set, and Horus. After the reigns of the gods, the epoch of Menes is the first point in the chronology of the history of ancient Egypt, and has been placed, as above mentioned, by the rival systems of chronology.

No contemporary monuments of Menes exist, but he is said by tradition to have corrupted the simplicity of the patriarchal life of the nation, instituted the first laws, and divine worship, founded the temple of Ptah by turning the course of the Nile, by means of a barrage, to the west at Kosheishie, and to have founded Memnefer or Memphis, after some expeditions against the Libyans, and to have been devoured by a crocodile. The statue of Menes is represented borne in ancestral procession in the reigns of Rameses II. and III. at Thebes, but no contemporary monument of this monarch exists. His successor Athothis, wrote a work upon anatomy, and built the palace of Memphis. The other kings of this dynasty were Kenkenes, Venephes, who built the Pyramids at Ko or Kochohe, Miebis, Semempses, and Bieneches; but their names have not been identified, nor do any monuments of them remain. This dynasty reigned about 250 years, and was succeeded by the 2d, which lasted about 300 years, but of which no contemporary monuments remain. This dynasty, however, introduced the worship of sacred animals, and abolished the Salic law, which had hitherto prevailed. With the 3d dynasty of Memphites, which endured about 200 years, monumental history properly begins, the monumental king Seneferu of this dynasty having conquered the Sinaitic peninsula, and opened the copper mines of the Wady Magara. The 4th dynasty, also of Memphites, had an existence of 284 years. The celebrated canon of Turin contains fragments of the duration of the reigns and lives of the monarchs of this line, some of which were prolonged to upwards of 90 years. Monumental remains are found of Soris. The two Khufus built the two great Pyramids of Gizeh, and held the Arabian peninsula in subjection. Cheops, or the elder of the two Khufus, constructed the largest of this group of the pyramids by means of a forced conscription, and was regarded as a detestable and impious tyrant. Subsequently, he repented, and wrote a book in honor of the gods, which enjoyed a great reputation. Khafren, his successor, built the second of the great pyramids, and Mencheres, or Mycerinus, the third pyramid. The so-called book of the Ritual, which dates from this period, and the high civilization which Memphis had then attained, mark an epoch in Egyptian civilization, and the numerous tombs, in the vicinity of the pyramid, constructed during this and the subsequent dynasty, exhibit a highly progressing state of civilization; the cultivation of farms, the chase, the arts, enjoyed a great deal of the attention of the Egyptians; but horses and wheel-carriages were alike unknown, although the simpler mechanical instruments and manufactured articles had been invented.

The 4th dynasty began, according to Lepsius, 3427 B.C. The 5th, which monumentally appears a continuation of the 4th terminates with Annos or Onnos, who was killed by his guards. His sepulchre was the pyramid of the Mastabat-el-Faraoun, near Saqqarah. This 5th dynasty was, however, from Elephantine, and

appears to have ruled in Upper as well as Lower Egypt, monuments of it being found in the Thebaid. Considerable difference, however, exists between Lepsius and Bunsen in the assignment of the royal cartouches of this period, Lepsius assigning them to the 5th, and Bunsen to the 3d dynasty. The group of the Abosseer Pyramids is of this age. The next dynasty, the 6th, a Memphite, was more remarkable, and tombs and numerous small objects of the period are found in Upper and Central Egypt, and in the valley of Hamamat, leading from Coptos to the Red Sea. The principal monarchs of this line were Othoes, killed by his guards; Phiois or Apappus, whose reign extended to 100 years; and Nitocris, whom the legends represent as drowning the murderers of her brother, and constructing the third Gizeh Pyramid, in which she was buried, and which she perhaps enlarged from the old original sepulchre of Mycerinus, having added to it the revetment of red syenitic granite. Of the 7th dynasty, two names, An and Assa, are supposed to have been found; but the monumental connection between the close of the 6th and 11th dynasties, has not been even conjecturally restored, from the conflicting tablets of Karnak and Abydos, and the mutilated papyrus of Turin. It is not possible to follow the order of the succession till the 11th dynasty, nor are there monuments either of a public or sepulchral nature to show the existence of the intermediate period, rendered more unintelligible by the contemptuous silence of the lists of Manetho, one tyrant, Aethoes, being alone mentioned in them. Considerable discrepancy exists between the canon of Turin and the lists of Manetho relative to this period; the canon making two dynasties—one of six, the other of 17 kings between the 6th and the 12th dynasty; Manetho, 86 kings, and about 500 years. The impossibility of reconciling these statements has given rise to the idea, that the lists were respectively Memphite and Theban, each having contemporary kings. The existence, however, of the 11th dynasty, consisting of a line of monarchs called Hantefs and Mentuhetps, has been proved by the discoveries of their coffins in their tombs at Gournah and the El Assasifs, and the tablets of the island of Konosso and others, referring to the construction of the fortress of Coptos and in honor of the local god. The successive reigns and monarchs of the 12th dynasty are fixed by numerous monuments. Amenemha I., the founder of the line, opened the quarries of Tourah, embellished An or Heliopolis, and founded the temple of Amen at Thebes, reigning nine years alone, and seven with Osirtesen I., his successor. A historical papyrus recording his dreams and other facts of this reign remains.

The monuments of Osirtesen I. exist in the Faioum at Benihasan and Heliopolis; he subjected some of the Ethiopian tribes. During his reign there occurred a famine; and in the 38th year of his reign, he associated Amenemha II. into the government for four years. Little of historical import is known of his successors, Amenemha II. and Osirtesen II., except their conquest of Kashi or Ethiopia, and the arrival of a tribe of 36 Amu or Semities in the sixth year of Osirtesen II. These resemble, in their costume and physiognomy, the Hebrews, and have been supposed to represent the arrival of Jacob in Egypt. Osirtesen III., his successor, established the southern frontier at Samneh, which he fortified; and was subsequently deified in Nubia, and received, in the reign of Thothmes III., a worship in that region, and fortified Coptos. His successor, Amenemha III., excavated the Birket-el-Keroun or Moeris lake; constructed the Labyrinth, composed of 6000 rooms; the Pyramid of Crocodilopolis, in its vicinity; and the temple of the goddess Athor at the Sarabont-el-Khadem. His successors, Amenemha IV., and the queen Sebeknefru, are only known from the remains of the Labyrinth, and some inferior monuments. The same difficulty of tracing the succession which exists between the 6th and 12th, occurs again between the 12th and 15th. The most plausible conjecture, however, is that the 13th (Diospolite) and the 14th Xoite dynasty, in Lower Egypt, were contemporaneous, and that the 15th and 16th Theban and Diospolite had for their contemporaries the 17th Hykshos or Shepherd dynasty in Lower Egypt. The monarchs of the 14th dynasty appear from the monuments to have been occupied in regulating the course of the Nile at Samneh, while their power reached from the isle of Argo to El Hamamat, and they engaged in traffic with the Phœnicians. About 2000 B.C., the advance of the Assyrians in Asia, or some internal revolution, precipitated the so-called Hykshos or Shepherd Kings, who appear to have been Arabs or Phœnicians, on Lower Egypt. These invaders overthrew the Xoite dynasty of Lower Egypt, took Memphis by assault, and established themselves in the city of Haouar or Avaris, subsequently called Tanis, where their monuments still exist. But the Egyptian rulers of Upper Egypt overthrew their rule, and under Ra-skenen, the last king of the 16th dynasty, Avaris was invested, while his successor, Aahmes I., of the 17th, took it by assault, besieged Sarahan or Sharon, and attacked the mountaineers of Nubia. The Hykshos endeavored to substitute the worship of Sut or Set for Ra or the Sun, but Aahmes I. restored the ancient temples, and opened the quarries of Tourah. Amenophis I., his son and successor, who reigned under the tute-

lage of his mother, continued the Ethiopian campaigns, and embellished Thebes. Thothmes I. carried his arms to Tombos, in the heart of Nubia, and into Naharania or Mesopotamia, and embellished Thebes.

Thothmes II., who reigned under the guardianship of Hatasu, defeated the Shos. His brother and successor, Thothmes III., elevated E. to the highest pinnacle of glory; and by the victory of Megiddo, in his 23d year, subjected the whole of Syria and part of Mesopotamia to his arms, receiving immense tributes from Kash and the Ethiopian races of the south, the islands of the sea, and Assyria, Babylon, Phœnicia, and Central Asia, and endowing the Temple of Thebes with the revenues of tributary cities. A calendar preserved at Elephantine recording the heliacal rise of the Dog-star on the 28th Epiphi, shows that the year 1444 B.C. fell in his reign. Thothmes III. recovered the copper mines of Magarah, and decorated all Egypt. Amenophis II. continued the conquests of the Ruten, took Nineveh by assault, and vanquished the Ethiopians. Thothmes IV. is supposed to have erected the Great Sphinx. Amenophis III. maintained the frontiers of the empire. At this period, a heresy became introduced into E., favored by the queen Taia. Amenophis

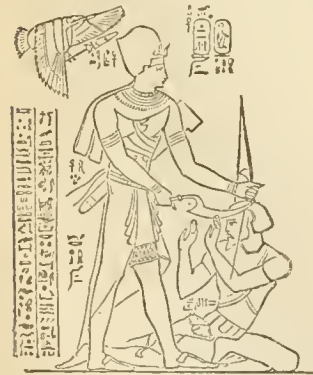


Head of
Thothmes III.

IV. became a worshiper of the Aten or solar orb, to the exclusion of the other deities of E., especially of Amen Ra. The capital was removed to Tel-el-Amarna or Alabastron; the king changed his name to Akhuenatnen, and a succession of three heretic monarchs ruled E. for about 33 years, till Haremhebi or Horus restored the orthodox faith and the limits of empire.

The link which connects the last monarchs of the 18th to the monarchs of the 19th dynasty has been lost; but Horus was succeeded by Rameses I.—the first of a long line of monarchs—who appears to have formed a treaty with the Khita or Hittites, and to have advanced the conquests of E. to the Wady Halfa. He was succeeded by Seti I. or Sethos, who attacked the Remennu or Armenians, the Rutennu, and the Shasu or Shepherds, who had again advanced to the Pa-khetem or Pitthoum, on the confines of Egypt. Naharania or Mesopotamia, and Sharu or Syria, Pant or Phœnicia, had also been invaded by his arms. The city of Atsh or Katsh, the supposed Cadytis, was also besieged by Sethos, whose Asiatic victories introduced into E. the worship of Baal and Ashtaroth. Tyre, Avathus, and Bethanath in Canaan were garrisoned by his forces. E. was also embellished with many noble monuments in his reign. He was buried in a deep excavated rock-tomb in the Biban-el-Molook—the kings of the 18th and 19th dynasties having substituted long excavated tunnels or syringes, in the mountains of the Arabian chain of Western Thebes, for the ostentatious pyramids in use from the 4th to the 12th dynasty, which attracted the cupidity of the invaders of Egypt.

Rameses II., the son of Seti I., seems to have succeeded him at the very youthful age of seven. In his fifth year, he defeated the Khita and their Syrian confederates at the battle of Katsh, in which many of the princes and officers of the Khita were drowned in the river Arunata, or Orontes. The battle endured two days, and the panegyric of an Egyptian scribe, Pentaur, has invested Rameses with the power of a god. The war lasted till his ninth year, and the king took Shaluma or Salem, the ancient site of Jerusalem, and other cities. In his twenty-first year, a treaty of peace and extradition was established between the two countries, and Rameses married a princess of this nation. It is the tablet of this monarch which is found at the Nahr-el-Kelb, or Passes of the Lycus, near Beyrout. This monarch subjected Ethiopia, which had revolted, to



Rameses II.

his arms, reimposed the tribute, and placed the country again under the government of the princes of Ethiopia, or Egyptian viceroys. He also established a fleet on the Mediterranean. His name and reputation formed the basis of the legendary Sesostris; the exploits of the monarchs of the 18th dynasty, and probably of his successors, being united with his fame. The reign of Rameses, although it exhibits a decline of art, yet demonstrates E. to have been in the height of its glory; and his epoch appears to have been about 1322 B.C., a special calendar having been

sculptured to record the coincidence of the heliacal rising of the Dog-star and 1st Thoth, or commencement of the fixed and canicular year. His place of burial is uncertain—perhaps in the vaults of the Ramesseum. His thirteenth son, Meriempah or Menephthes, succeeded him upon the throne, transferred the capital to Memphis, successfully contended with the Tamahn or Libyans and the Rahu, and appears to be the Amenophis of Manetho, and the Pharaoh of the Exodus. He introduced the heretical worship of Sut, Seth, or Typhon, and was succeeded by Sethos II., Amenmes, Siptah, Tausri, and Setinekht, whose inglorious reigns close the 19th dynasty.

The connection of Rameses III. with the previous dynasty is obscure. This monarch was chiefly at war with the Philistines, and the other maritime tribes of Greece and Asia Minor, and gained naval victories in the Mediterranean, and repeated the conquest of Ethiopia. He was followed by the splendid but inglorious line of the Ramessids, the sixth of whom gained victories in Ethiopia; and the twelfth of whom, having married a princess of the land of Bakhten, sent the ark of the god Khous to Bakhten, at the request of the monarch of that country, for the cure of the queen's sister. The fall of this dynasty appears to have been owing to internal revolution, as their Tanite successors held the office of high priests of Amen Ra at Thebes. They held the government for 130 years, and entertained foreign relations, one of the monarchs having married a princess of the Rutennu. The 22d dynasty, the monumental, is rather confused. They were also high priests of Amen Ra. Shashank I. is the Biblical Shishak. His invasion of Israel, with 12,000 chariots and 60,000 cavalry, and the capture of Jerusalem, is recorded on the portico of the Bubastites at Karnak. The other monarchs of this line, Osorkon I., Takelot I., and their successors, have left no remarkable records; and the dynasty, which appears of foreign origin, is more chronologically than historically important, the taking of Jerusalem falling between 989 and 959 B. C. The 23d Tanite dynasty, which succeeded it, exhibits a decadence in E., and was succeeded by the 24th dynasty, of a single monarch, the celebrated Bekenrenf or Bocchoris, who reformed the laws; but having been taken prisoner by the Ethiopian Sabaco, of the 25th dynasty, was burned alive. From this period, the history of E. becomes involved with that of Judæa and Greece. Tirhaka came to the assistance of Hezekiah against Sennacherib, and built the temple of Gebel Barkal. According to this Assyrian euneiform inscription, the Ethiopians were expelled by the Assyrians, and the country placed under various monarchs. This state of affairs was closed by the rise of Psammitichus I. of the 26th dynasty, who, by the aid of Greek mercenaries, overthrew the other petty princes. His age marks a revival in art, and restoration of the old constitution of the empire. His successor, Nekao or Necho II., planned the canal across the isthmus of Suez, from which he desisted, warned by the advice of an oracle, after having lost 120,000 men in the attempt. Under his reign, the Phœnician navigators first passed the line.

After defeating Josiah, king of Judah, and conquering Palestine, he was himself defeated by Nebuchadnezzar at Karkemish. Psammitichus II. carried his arms into Ethiopia. Apries, his successor, having lost all the conquests, was deposed by Amasis, his successor, and strangled. Amasis favored in different ways the Greek colonies in E., and married a Cyrenæan wife, and conquered Cyprus, but incurred the enmity of Cambyses, who overthrew his son and successor at the battle of Pelusium (526—527 B.C.). Cambyses treated E. with considerable moderation, but after an unsuccessful expedition against Ethiopians, lost his reason, stabbed the bull Apis, and committed various atrocities. His successor, Darius I., governed E. with more prudence; but Xerxes I., and Artaxerxes I. had successively to reduce it to subjection, which they did in spite of assistance rendered to it by the Athenians. The 27th dynasty of Persians was followed by the Saite line, the 28th, Amyrtæus and Pausiris, who still held ground against the Persians; the 29th, Mendesian dynasty of Nephelches and Achoreus, maintained a Greek alliance; and the 30th, Sebenytic, consisted of Neectanebes I., who successfully resisted Pharnabazus and the Iphicrates; of Teos, who employed Agésilas; and Neectanebes II., who fled into Ethiopia before the Persians (340 B.C.).

From this time, E. remained a province of Persia, till its conquest by Alexander the Great, who founded Alexandria. Subsequently, E. passed under the Greek rule, and the language of the government, and the administration and philosophy, became essentially Greek. The court of the Ptolemies became the center of learning and philosophy; and Ptolemy Philadelphus, successful in his external wars, built the Museum, founded the library of Alexandria, purchased the most valuable of manuscripts, engaged the most celebrated professors, and had the Septuagint translation made of the Hebrew Scriptures, and the Egyptian history of Manetho drawn up. His successor, Euergetes, pushed the southern limits of his empire to Axum. Philopator (221—204 B.C.) warred with Antiochus, persecuted the Jews, and encouraged

learning. Epiphenes (204—180 B.C.) encountered repeated rebellions, and was succeeded by Philometor (180—145 B.C.) and Energetes II. (145—116 B.C.), by Soter II. and Cleopatra till 106 B.C., and by Alexander (87 B.C.), under whom Thebes rebelled; then by Cleopatra Berenice, Alexander II. (80 B.C.), and Neos Dionysus (51 B.C.), and finally by the celebrated Cleopatra; and after the battle of Actium (30 B.C.), E. passed into the condition of a province of Rome, governed always by a Roman governor of the equestrian, not senatorial rank.

The most important events in E. under the Roman rule were—the introduction of the Julian year by Augustus (24 B.C.), the visit of Vespasian to Alexandria (70 A.D.), and that of Hadrian (122 A.D.), the development of the Gnostic heresy, the visit of Carnacalla (211 A.D.), the conquest of E. by Zenobia (270 A.D.), the revolt of Firmus, (272 A.D.), the persecution of Diocletian (304 A.D.), and the rise of Manicheism, the great Arian controversy in the reign of Constantine, rise of the asceticism, magic, and astrology, and the final destruction of paganism (379 A.D.).

At the division of the empire (395 A.D.), E. fell to the Eastern Empire, and, at its fall, had become one of the Great Patriarchates of the Christian Church; but owing to the religious feuds of the Jacobites and Melchites, it became a province of Persia (616 A.D.) for 12 years. The Coptic governor Makankas, who reigned in the name of Heraclius, endeavored to make himself independent, and invited the arms of the Arabs, and Omar I. easily conquered Egypt, in the nineteenth year of the Hegira (640 A.D.).

History since the Mohammedan Conquest.—Although Alexandria was retaken by Constantine III., the Arabs drove him out, and E. remained an appanage of the califat. It afterwards passed into the dynasty of the Thiononides (868 A.D.): a new dynasty, the Akshidide, succeeded in 935 A.D., to give way to the Fatimide in 969 A.D., under which Cairo was built, and Egypt regained some of its prosperity, although in 1118 A.D. Baldwin I. burned the maritime town of Faramah. Subsequently it passed under the Ayoubites, and Saladin, who fortified Cairo, built the citadel, excavated the well, and erected the granaries of Jusuf. In 1218 A.D., the Crusaders took Damietta, but were subsequently driven back in 1221 A.D. One of the later princes, Saleh-Nedjim Eddin, built the castle of Rhodah, and created the order of Mamelukes; but Louis IX. of France (1248 A.D.) took Damietta and gained the battle of Mansourah. In 1254, the Ayoubites entirely fell, and E. became subject to the Baharite and Bordjite Mamelukes, under whose government it flourished, and even pushed its conquests to Cyprus and Asia Minor, till, in 1517, Touman Bey fell into the power of Selim I., and E. became a province of the Turks, and administered by pashas. In 1601, the use of tobacco was introduced. Constant rebellions of the Mamelukes, and the violence of contending factions, distracted the country. The most remarkable event of this period was the French invasion by Bonaparte in 1798, which, by the conquest of Alexandria, and the battle of the Pyramids against the Mamelukes, led to the entire subjection of the country, from which the French were finally expelled by the Turks and British in 1801, and the country restored to the Ottoman Porte. The rise of Mohammed Ali in 1806 imparted a galvanic prosperity to E. by the destruction of the Mamelukes, the formation of a regular army, the increase of security, the improvement of the irrigation, and the introduction of European civilization. In 1816 Mohammed Ali rendered part of Arabia tributary by means of his son-in-law, Ibrahim; and afterwards wrested Syria from the Porte, and held it as tributary by the treaty of Kutahia in 1835. The victory of Nisib, in 1839, would have elevated him to the throne of Constantinople; but the quadruple alliance in 1840, the fall of St. Jean d'Acre to the British, and the evacuation of Syria, compelled him to limit his power to the pashalik of Egypt. Ismail Pasha reduced Nubia to a dependency of Egypt in 1820.

In 1849, Mohammed Ali died, and was succeeded by Abbas Pasha, his grandson, replaced in turn by Said Pasha in 1854. M. de Lesseps now obtained the previously withheld co-operation of the Egyptian government in his scheme of the Suez Canal (opened in 1869). Said was succeeded in 1863 by his nephew, Ismail, who, by leave of the sultan, took in 1866 the hereditary title of Khedive (q. v.). The same firman made the succession to the throne of Egypt direct from father to son, instead of descending, according to Turkish law, to the eldest heir; and in 1873 the Sultan granted to the Khedive the right (withdrawn in 1879) of concluding treaties and that of maintaining an army. Darfur was annexed to E. in 1874, and in that and the following year further conquests were made in the south. Through Sir Samuel Baker and Gordon Pasha, governor of the Soudan, the Khedive endeavored to suppress the slave-trade in his dominions. In 1875 the Khedive sold to Great Britain 177,000 shares in the Suez Canal (q. v.) for £4,000,000. The condition of the Egyptian finances was almost hopelessly involved, when in 1876 the revenue was put under the management of European commissioners. An Egyptian contingent of about 10,000 men, under the command of Prince Hassan, third son of

Ismail Pasha, fought for the Croissant in the Russo-Turkish War of 1877-78. The new financial system having proved unsuccessful, another commission of inquiry was appointed; and ere long it was announced that the Khedive had absolutely accepted the European system of constitutional government, and had made Nubar Pasha head of a reformed administration. The summary dismissal of this ministry in April 1879 was followed by the interference of the European governments. The Khedive, who declined voluntarily to abdicate, was, at the instance of the Western Powers, deposed by his suzerain the Sultan in June, and Prince Tewfik, Ismail's eldest son, was proclaimed Viceroy of E.

A Law of Liquidation, for regulating the conditions of the public debt, was passed at the instance of five European powers in 1880. In the next year came the military revolt under an officer, Arabi Pasha, who demanded from the Khedive an immediate change of ministry, and the increase of the army to 18,000 men. The Khedive yielded. Growing dislike to European interference, and to the presence of European officials, secured Arabi a large measure of popular support, when, as War Minister, he overawed the Khedive, and ultimately defied his authority. He was practically a military dictator, and in 1882 strengthened the fortifications of Alexandria. British and French war-ships had been despatched to Alexandria; and the British admiral demanded that work at the fortifications should be discontinued. Arabi persisted; and after an atrocious massacre of Europeans in the streets of Alexandria, the British ships bombarded the fortifications (11th July). The Egyptian troops were suddenly withdrawn from Alexandria, whereupon the city was plundered and partly burnt by riotous Egyptians.

An English military expedition was manifestly inevitable; troops were now swiftly despatched from England and from India, including a large contingent of native Indian soldiers. The point of debarkation was Ismailia, on the Suez Canal; and in twenty-five days the British forces had traversed the desert, inflicted various minor defeats on Arabi, utterly defeated the main body of his army at Tel-el-Kebir, and occupied Cairo. The war was practically over, and the authority of the Khedive restored, all open opposition having disappeared. The greater part of the British troops were withdrawn, and measures taken for the reorganization of the country. The French, who had been intimately associated with Britain in what was known as the Anglo-French Control, took no share in the bombardment, in the military expedition, or in direct co-operation with Britain in the rearrangement of Egyptian affairs on a fair basis. Recent events have loosened the hold of Egypt on her provinces in the Soudan; and a wide-spread rebellion took place in 1882. A severe visitation of cholera occurred in the summer of 1883; about 150,000 persons are thought to have perished.

Statistics.—The revenue is about £10,000,000, and rarely suffices to cover the expenditure, which includes an annual tribute of £700,000 to the Porte. The national debt is over £98,000,000; besides, the Khedive's personal debt amounted in 1878 to £8,815,000. In 1880 the imports of E. had a value of £6,823,000, the exports (chiefly cotton) of £13,525,000. The peace strength of the army at the time of the military revolt in 1881 was estimated at 30,000 men, with equal number of reserves, and a large irregular force of mounted Bedouins.

Ancient Civilization.—It now remains to consider the old civilization of the Egyptians, which had made such strides at an early period of their history. In the sciences, as early as the 4th dynasty, the notation of time, the decimal system of numbers, weights and measures adjusted to a pound of 1400 grains, the geographical division of the country, and the division of the year (of 365 days) into three periods (of four months of 30 days) and twelve months, were already known, while the form of the buildings implies a knowledge of geometry and its sister sciences. An empirical knowledge of astronomy was probably possessed; nor could the arts have reached such a high development without some acquaintance with chemistry; and tradition assigns a knowledge of medicine and anatomy to a still earlier age. The art of literary composition also existed in the 11th dynasty, for fragments of the religious or so-called Hermetic books of that age have reached us (see PAPHOS); and Cheops himself was an author of renown. The language of the period, although concise and obscure, was nevertheless fixed; and a code of manners and morals, under the 6th dynasty, has been handed down.

Architecture had attained great refinement at an early period; not only were the chambers and temples, and other edifices, squared and directed to face the cardinal points, but the use of a kind of false arch, or stones disposed so as to form an angle overhead to relieve superincumbent pressure, *en décharge*, was practised as early as the 4th, and the vault or arch was in existence in the 11th and 18th dynasties, eight centuries before that of the Cloaca Maxima of Rome. Columns were in use as early as the 4th dynasty; and in the 12th, the so-called proto-Doric ones of Benihasan, with their cornices and triglyphs, show that the Greeks derived this order of architecture from Egypt. The sym-

metric arrangement of the temples, consisting of rectangular court-yards and hypæthral halls of many columns, built before the original shrine, with their gateways, slightly converging to the apex, and their bold and severe lines, and the obelisk (see OBELISK), and the pyramid (see PYRAMID), forms admirably adapted to resist the inroad of time, not to mention the remarkably fine masonry, prove the high development this art had acquired at the remotest age. Nor was sculpture less advanced, for long before Dædalus, the statues of the 4th dynasty, at least 2000 B. C., had been moulded with great accuracy to a fixed canon; and although their architectural employment had rendered their action rectilinear—such as the arms pendant, the left foot advanced, and the feet not detached but when in stone, with the part between them reserved—and the ears were placed too high in the head, and a kind of spillar was fixed behind in standing figures, yet in portraiture they had attained to great perfection. Sculpture, indeed, in the human form was always restricted to a few conventional attitudes; but some of the lions and sphinxes are executed with a spirit surpassing the power of Greek artists. A peculiar kind of bas-relief prevailed in E., the figures being sunk below the surface like the intaglio figures of a gem but in slightly convex relief, not concave. This style, called cayo-rilievo, or intaglio, has been most successful in preserving the hieroglyphs and anaglyphs of the monuments. Bronze statues cast from moulds, and having a leaden or other core, were first made in E., and subsequently introduced into Greece by Rhæcus. This art flourished best under the earlier dynasties, and had much degenerated in the 19th and 20th, although subsequently revived by the 26th. Painting appeared at the same age chiefly in tempera or whitewashed surfaces, although fresco was occasionally used, and encaustic appears only under the Greeks and Romans. This art, of course, was freer than sculpture, but yet had a rigid architectural character, and followed the same canon as sculpture, the colors used being generally the pure or primitive, and the background uniformly white.



Sistrum.

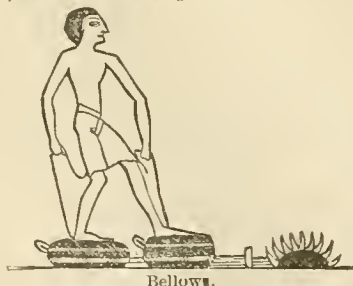
The architectural details of Egyptian temples and the hieroglyphs appear to have been always colored, and added additional charm to the sculptures.

The religious papyri or rituals were also often embellished with elaborately colored vignettes, resembling the illuminations of modern manuscripts. Nor had the Egyptians attained less eminence



Egyptian Glass-blowers.

in the art of music, the harp and flute appearing in use as early as the 4th, and heptachord and pentachord lyres as early as the 12th dynasty; besides which, drums, tambourines, flutes, cymbals, trumpets, and guitars, are seen in the 18th, and the national instrument, the jingling sistrum, in the 4th. Many of the instruments are of great size, and must have produced considerable effect. Nor



Bellows.

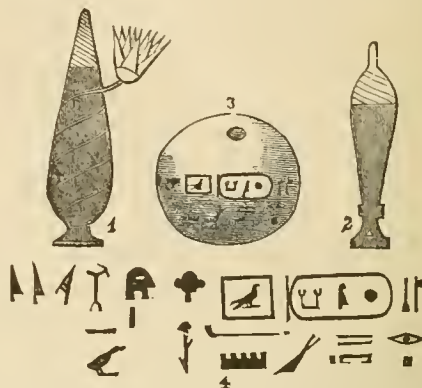
was the art of song wanting, and measured recitations or songs occur on monuments of the 12th dynasty, while the lays of Maneros traditionally dated to a still earlier period. Poetry, indeed, was at all times in use, and the antithetic genius of the language suggested

the application of the strophe and antistrophe (see HIEROGLYPHICS), although it is not possible to define the metre. In the mechanical arts, many inventions had been made: the blow-pipe, used as a bellows, appears in the 5th dynasty; bellows and syphons in the 18th. The saw, the adze, the chisel, press, balance, and lever ap-



Syphons used in the year 1455 B. C.

pear in the 5th, the harpoon in the 12th, razors in the 12th, the plough and other agricultural implements in the 5th. Glass of an opaque kind is seen in the 4th, and dated specimens in the reign of Thothmes III. (1445 B. C.), give the priority to E. (see GLASS); the oldest transparent glass, the Assyrian, not dating older than



1, 2, glass bottles represented in the sculptures of Thebes; 3, Captain Henvey's glass bead, about the real size; 4, the hieroglyphics on the bead containing the name of a monarch who lived 1500 B. C.

Sargina (711 B. C.). A glazed pottery or porcelain (see POTTERY), the potter's wheel, and the kiln, appear in the 4th; and the art of metallurgy, with the use of tin, at the same period.

In the military art, the Egyptians used at an early age defensive armor of shields, cuirasses of quilted leather, and helmets; while spears, clubs, maces, swords, daggers, bows, and hatchets formed their offensive weapons. For sieges, they employed the testudo, ladders, torches and lanterns, and mines. The army was composed of infantry till the beginning of the 18th dynasty, when war-chariots were introduced; for, prior to that period, the ass only was known and used for transport; and carriages not having been invented, persons and goods were transported on the panniers of asses, or on a kind of saddle slung between two of these useful animals. War-boats no doubt existed at an early period, and are mentioned as early as the 12th dynasty; but sea-going vessels not till the 18th, and no fleet till the 19th. The Nile, however, was constantly navigated by row-galleys with sails. An extensive commerce was carried on with neighboring nations, and their tribute enriched the country with slaves, cattle, gems, valuable metals, and objects of curiosity. Rare animals were collected for ostentation. Under the earlier dynasties, the chief occupation of the nation appears to have been rearing cattle, cultivating grain, indulging in banquets, fishing, fowling, and the chase, and the establishment of each noble contained in itself all the organization and artificers necessary for its maintenance. How transactions were carried on without the use of money, is not very clear, unless gold circulated moulded in the shape of rings adjusted to a given weight, but coin-plate is mentioned by its pounds, *mna*, and its ounces, *kat*. The



A Guard apparently with a Lantern.

Persians first introduced money. See NUMISMATICS. The wealth of families was, however, spent on the tombs and furniture of the dead, and the preparations for embalming, which were on so vast a scale that filial piety did not disdain to mortgage not only the sepulchres, but the very mummies of its ancestors. See EMBALMING. Amusements were various, from the single-stick and juggling, the dance of almeis, the bull-fight, to draughts, dice, and morris. In fact, ancient Egypt had a material civilization, which exerted all the acquirements of industry, and forgot none of idleness. Pleasure was the object of existence, not, however, untimpered by the voice of reason or the appeals of conscience, the moral code of duties being as pure as that of contemporary nations.

The civil government was administered by the three upper castes. The priests, distinguished by their superior knowledge, cleanliness, and godliness, had the ecclesiastical; the temples being administered by high priests and an inferior hierarchy, with overseers, and governors of revenues, domains, and donatives. Each temple, like a monastic institution, had its carefully subdivided organization, each denizen having a separate charge or jurisdiction. The political and civil government was administered by royal scribes, or secretaries of state, who attended to the revenue, justice, foreign affairs, and all the interests of the executive. Sacred scribes attended to the ecclesiastical interests, and inferior scribes to the local interests. The public works, the collection of grain, and of the linen dues; the cattle, workmen, wells, irrigation, had each their separate superintendents and scribes. The military force of 410,000 men, at a later period, comprising all arms of the service, was ruled with severe discipline, and under the direction of nomarchs (*ha*), colonels (*hrai*), captains (*mer*), and lieutenants (*atnu*). The criminal and civil law was administered by judges (*satem en ash*), who held traveling assizes, and to whose tribunals the necessary officers were attached. The athlophoros or standard-bearer also transmitted the decrees of the royal chancery. The execution of deeds required so many witnesses that fraud evidently often occurred. The superior position of women in the social scale, notwithstanding the permission to marry within degrees of consanguinity usually forbidden, shows that the Egyptians reached a higher point of delicacy and refinement than either their western or eastern contemporaries. Colossal in its art, profound in its philosophy and religion, and in possession of the knowledge of the arts and sciences, E. exhibits the astonishing phenomenon of an unexpectedly high and ancient civilization. See Bunsen, *Aegyptens Stelle* (1845—1857); Lepsius, *Denkmäler* (1849—1874) and other works; Rawlinson's *History of Ancient Egypt* (1881); S. T. Poole's *Egypt* (1881); Sharpe, *History of Egypt* (1846); Brugsch, *Histoire d'Egypte* (1849; new ed. 1875); Wilkinson, *Manners and Customs of the Egyptians* (1847; new ed. by Birch, 1879); Laue, *Modern Egyptians* (1842); M'Coan, *E. as it is* (1877); Jerrold, *E. under Ismail Pasha* (1879); E. Wilson, *The E. of the Past* (1881).

EGYPTIAN VULTURE (*Neophron percnopterus*), one of the smaller *Vulturidæ*, of a genus differing from the true vultures in



Egyptian Vulture and Young.

the slender bill, which is covered for more than half its length with a naked cere, and sharply hooked at the point. The head and throat are naked, but feathers extend along the back of the neck to the crown. The E. V. is not much larger than a raven. The plumage of the male is white, except the great quill-feathers, which are black. This bird is plentiful in Egypt, where it renders important service—as also in Turkey, Syria, and other countries—in devouring and so cleansing away carrion from the vicinity of human abodes. It is constantly to be seen in the streets of towns, and seems to be aware that it is regarded with favor, and enjoys

the protection of mankind. Europeans in Egypt often call it Pharaoh's Hen, or Pharaoh's Chicken. It follows caravans in the desert, to devour whatever dies. Numbers are often seen congregated together, but the E. V. is not truly gregarious, and lives generally in pairs. Its geographic range extends over the whole of Africa, and great part of Asia; it is common in many parts of the south of Europe, is an inhabitant of the Alps and the Pyrenees, sometimes visits more northern regions, and has been killed in England.

E'HNINGEN, a town of Würtemberg, situated 21 miles south-south-east of Stuttgart, is the rendezvous of a great number of pedlers who traverse the neighboring districts for the purpose of disposing of their wares. Pop. about 4000.

E'HRENBURG. CHRISTIAN GOTTFRIED, one of the most distinguished naturalists of Germany, was born, 19th April 1795, at Delitsch, in Prussian Saxony. Although he had been originally intended for the clerical profession, he early relinquished the study of theology in favor of medicine; and after having attended the classes at the medical faculty at Leipsic for two years, he removed in 1817 to Berlin, where he graduated in medicine in 1818. His favorite study at this period was botany, and his earliest publications are devoted to botanical subjects, and more especially to such as demand the use of the microscope—an instrument with which the name and reputation of E. must ever remain inseparably associated; for to him belongs the merit of having rescued it from the discredit into which it had fallen, and of having been one of the first fully to appreciate its capabilities. In 1820, E. accompanied his friend Henrich on his travels to the East; and after having visited Egypt, Syria, and Arabia, returned, in 1826, to Berlin, where he was appointed to one of the medical chairs of the university, which he occupied until his death. The three years which intervened before he again set forth on a scientific expedition, were devoted to the arrangement and classification of some of the abundant materials which he had accumulated in his eastern travels; and to this period belong the composition of his *Akalephen des Rothen Meeres*—which has largely contributed towards our knowledge of the Medusæ—and his *Symbolæ Physicæ*. In 1829, E. accompanied G. Rose and A. von Humboldt on an expedition to the Ural and Altai Mountains, in the course of which he collected materials for his numerous memoirs on the Infusoria, and for his great work, *Infusionsthierchen*, published at Leipsic in 1838, which have identified his name with the history and study of this department of animal life. E. divided the Infusoria into Rotatoria (now found to belong to higher orders of animal life) and Polygastrica, which correspond more nearly with the Infusoria as now admitted, although many of his polygastric organisms have been found to be vegetable structures, and some to be the larval forms of worms, and the like. E.'s researches were not confined to living organisms, but included fossil Infusoria; and his great work, *Mikrologie*, on the application of the microscope to geology, contains the results of his investigations in this department of inquiry. E. was a member of most of the scientific bodies of Europe, and was for nearly fifty years an active contributor to the scientific literature of his country. He died September 1876.

E'HBREIT'STEIN (Honor's Broad Stone), a town and fortress of Rhenish Prussia, is picturesquely situated on the right bank of the Rhine, directly opposite Coblenz, with which it is connected by a bridge of boats. The town of E. has several mills, a tobacco-manufactory, a flourishing trade in wine, corn, and iron, two cattle-markets, and four annual fairs. Pop. (1880) 5692. The fortress of E. occupies the summit of a precipitous rock 490 feet high, and has been called the Gibraltar of the Rhine, on account of its great natural strength, and its superior works. On three sides, the fortress is so precipitous as to be perfectly inaccessible; on the fourth and only approachable side, the north-west, it is fortified by three successive lines of defences, one within another. It is defended by 400 pieces of cannon; has cisterns capacious enough to hold a supply of water for three years, and a well sunk 400 feet deep in the rock, and having communication with the Rhine. E. was besieged in vain by the French in 1688, but fell into their hands in 1799, after a siege of fourteen months. Two years after, the French, on leaving E., at the peace of Lunéville, blew up the works. It was assigned, however, to Prussia by the Congress of Vienna in 1814, and under that country was restored and thoroughly fortified. It is now one of the strongest forts in Europe. It is capable of accommodating a garrison of 14,000 men, and provisions for 8000 men for ten years can be stowed in its vast magazines. The view from the fortress, which comprehends a considerable portion of the course of the Rhine, including its confluence with the Moselle, is picturesque in the highest degree.

EIBENSTOCK, a town of Saxony, 16 miles south-south-east of Zwickau. It is a center of lace-making industry. Pop. (1880) 6706.

EL'CHHORN, JOHANN GOTTFRIED, one of the most distinguished scholars produced by Germany, was born at Döringimern, in the principality of Hohenlohe-Oehringen, in 1752, and studied at Göttingen. He first became rector of the school of Ohrdruff, in the duchy of Gotha, afterwards, in 1775, Professor of Oriental Languages in the university of Jena, and in 1788 removed to Göttingen in the like capacity. Of this university he continued a distinguished ornament till his death in 1827.

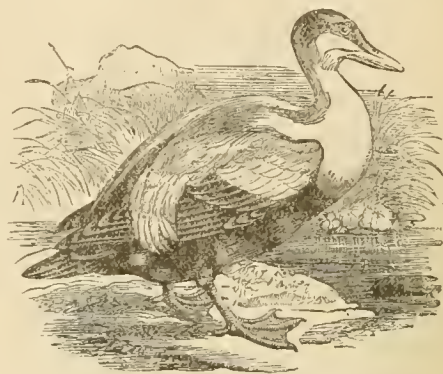
His scholarship was almost universal, and he has left numerous treatises on a multitude of subjects, both ancient and modern, classical and Oriental, but he is chiefly known in this country as a biblical critic, and a chief of what is called the rational school. E. examined the Scriptures from an anti-supernatural point of view, but applied to their elucidation and criticism an unrivalled knowledge of Oriental and biblical antiquities. Miraculous appearances recorded in the Bible are held by him to be explainable as natural events, and everything is to be brought to the test of reason. Rationalism in this form can hardly be said to exist now, even in Germany; but some of E.'s views as to the historical origin of the canonical gospels have been extensively adopted. His chief works on this subject are a Universal Library of Biblical Literature (*Allgemeine Bibliothek der Biblischen Literatur*, 10 vols. Leip. 1787—1801); an Introduction to the Old Testament (*Einleitung in das Alte Testament*, 4th ed. 5 vols. Gött 1824); an Introduction to the New Testament (*Einleitung in das Neue Testament*, 5 vols. Gött. 1824—1827); and an Introduction to the Apocryphal Writings of the Old Testament (*Einleitung in die Apokryphischen Schriften des Alten Testaments*, Gött. 1798). In a work entitled Primitive History (*Urgeschichte*, 2 vols. Nürnberg. 1790—1793), he subjects the Pentateuch to bold criticism. His last work was a History of the House of Gneff, which he traces back to the 5th c., *Urgeschichte des Hauses Welfen* (Han. 1817).

EL'CHSTADT (earlier AICHSTADT, Lat. *Aureatum, Arborfelix*, or *Dryopolis*, the last signifying the same as Aichstadt—viz., oak-town), a town of Bavaria, is situated in a deep valley on the left bank of the Altmühl, about 40 miles west-south-west of Regensburg, in lat. 48° 53' N., long. 11° 11' E. It consists of the town proper, with four suburbs, is well built, and has several fine squares, one of which is adorned with a fountain, and a statue of St. Wilibald, the first Bishop of Eichstadt. Among the notable buildings are the palace of the Duke of Leuchtenberg, containing a museum of antiquities, and some good portraits; the cathedral, founded in 1259, an imposing gothic structure, with monuments in bronze and marble, good paintings, and fine painted glass; the town-house (1444), with a square tower; and the Wilibaldsburg, or castle of St. Wilibald, built on an eminence 1200 feet high, and lately used as a barracks. The manufactures are woollen and cotton fabrics, ironmongery, and stoneware; there are also breweries, and several mills. Pop. (1880) 7489. E. is of Roman origin, and in 908 was surrounded by walls. The bishopric of E. was founded as early as 745. E. came into the possession of Bavaria in 1805. In 1811, Eichstadt, along with the landgraviate of Leuchtenberg, was bestowed upon Eugene Beauharnais, Duke of Leuchtenberg, but reverted to Bavaria in 1853.

EL'CHWALD, EDUARD, a Russian naturalist, was born at Mitau, in Russia, 4th July 1795, and studied the physical sciences and medicine at Berlin, 1814—1817. After spending some years in travel, he returned to Russia, and in 1823 was appointed Professor of Zoology and Midwifery at Kasan. In 1827, he accepted a call to Wilna as Professor of Zoology and Comparative Anatomy; and in 1838 he went to St. Petersburg as Professor of Mineralogy and Zoology. He held various other appointments, but retired in 1851. E. investigated the shores of the Caspian Sea, the Caucasus, Persia, Germany, Switzerland, and France, traveled over the greater part of Russia, including the Scandinavian provinces, and in 1840 made a geological journey through Italy, Sicily, and Algeria. His geognostic, botanical, and zoological researches were unquestionably of more service to Russia than those of any man since Pallas. His principal writings are—*Zoologia Specialis* (Wilna, 1829—1831); *Plantarum Novarum quas in Itinere Caspio-Caucas observavit, Fasciculi* (Wilna and Leip. 1831—1833); *Travels to the Caspian Sea and the Caucasus* (Stuttg. 1834—1837); *Memoir on the Mineral Riches of the Western Provinces of Russia* (Wilna, 1835); *Palaeozoic Russia* (1840); *The Palaeontology of Russia* (1851). Other palaeontological treatises appeared as late as 1872. E., who was a member of many learned societies, died at St. Petersburg in November 1876.

EL'DER, a river of N. Germany, forming the boundary-line between Schleswig on the north, and Holstein on the south. It rises 12 miles south-west of Kiel, flows first north-west, then in a general westward direction, though with many windings, and enters the North Sea at Tönning, after a course of about 90 miles. It is navigable as far as Rendsburg, from which town the Schleswig-Holstein Canal stretches east to Kiel Fiord, on the shore of the Baltic, thus establishing water-communication between the North and Baltic Seas.

EL'DER, or EL'DER-DUCK (*Somateria*), a genus of oceanic ducks, having the hind toe furnished with a deep lobe, and the bill swollen and elevated at the base, and extending up the forehead, where it is divided down the middle by an elongated projection of feathers. The tertials are elongated, and fall down over the wing. This genus is further characterized by the very abundant development of a fine elastic gray down, particularly on the breast, the valuable *Eider-down* of commerce.—The COMMON E. (*S. mollissima*) is intermediate in size between a common duck and a goose; not much exceeding the common duck in entire length, because of the comparative shortness of the neck, characteristic of the oceanic ducks, but being about twice its weight. The male is larger than the female; and, in the breeding season, has the under parts black, the upper parts and the neck white, the crown of the head velvety black, the cheeks greenish white. After the breeding season, the white color almost disappears from the upper parts.



Common Eider Duck (*Somateria mollissima*).

and gives place to black, without change of feathers. The female is of a pale-brown color, tinged with red, and varied with transverse marks of dark brown. Young males at first resemble the females, and do not acquire the full adult plumage till their third winter. The young are termed Brattocks in many parts of Scotland. The E. is an inhabitant of the northern parts of the world, abounding on arctic and subarctic shores, and becoming rarer in more southern and temperate regions. It is merely an occasional winter visitant in the middle latitudes of Europe, and the Fern Islands are its most southern breeding-place on the British coasts. In North America, it seldom breeds further south than the Bay of Fundy. Great numbers breed on the coasts of Labrador and more northern parts of America, where hitherto the gathering of the down has been generally neglected; but in Iceland and Norway the breeding-grounds of eiders are carefully protected, and are transmitted as valuable inheritances from father to son. Cattle are sometimes removed from islets, in order to induce the eiders to settle upon them, and a strict watch is kept against dogs and foxes. Promontories are sometimes even formed into artificial islets, on the same account, as the E., like many other sea-birds, prefers islands for its breeding-places, probably on account of their greater quiet and security. The nest is formed of fine seaweeds, mosses, and dry twigs, if they are to be had, matted and interlaced. The eggs are usually five, sometimes six or seven in number, about three inches long, and fully two inches broad, of a uniform pale green; they are at first deposited without any down, but as incubation proceeds, the mother strips the down from her breast, and places it about them. By it they are kept warm when she at any time has occasion to leave them, but it seems to be indispensable to their being hatched; for if the eggs and down are removed, and if this is done a second time, so that the female cannot afford a further supply, the male comes and contributes for the third set of eggs the down of his breast, which is of a paler color. The common practice in Norway and Iceland is to take away the eggs and down twice, leaving the third set of eggs to increase the number of the species.

The eiders of the Icelandic and Norwegians breeding-grounds show so little alarm at the approach of visitors, that the females will permit themselves to be touched as they sit on their nests, the males moving about close beside them, but agitated and disturbed. The nests are often placed so close together that great care is necessary in walking among them to avoid trampling upon them. In the islet of Vidöe, a valuable breeding-ground near Reikiavik, the capital of Iceland, almost every little hollow place between the rocks is occupied by the nests of these fowls; they readily take possession of holes cut for them in rows in the sloping side of a hill; nay, garden-walls and the interiors of buildings are in like manner occupied. In Orkney and Shetland the E. is commonly known by the name of Dunter-Duck.

The E. is sometimes called ST. CUTHBERT'S DUCK, from a rock called St. Cuthbert's Isle, one of the Fern Islands. It seems prob-

able that, with due care, the number of the eiders at the Fern Islands, and some of the Scottish islands, might be greatly increased, and their down yield a considerable revenue, but at present their eggs are indiscriminately taken with those of other seabirds, and no protection is extended to them. The eggs are remarkably fine. The flesh of the birds, also, is not unpleasant, and is said to become of superior excellence when they are partially domesticated, and when farinaceous food is mixed in considerable quantity with their natural diet of marine molluscs, crustaceans, &c. The complete domestication of the E. has been successfully attempted, where access could be obtained to the sea.

About half a pound of eider-down is said to be annually obtained from each nest, but this is reduced by cleaning to a quarter of a pound. The elasticity of the down is such that three-quarters of an ounce of it will fill a large hat, although two or three pounds of it may be pressed into a ball and held in the hand. Its extensive use, particularly in Germany and other parts of the continent of Europe, for stuffing the bed-coverings, which there usually supply the place of blankets, &c., is well known. The down taken from birds which have been killed is inferior in quality to that obtained from the nests. The latter is known in commerce as *live down*, the former as *dead down*.

The KING EIDER, or KING DUCK (*S. spectabilis*), also yields no inconsiderable part of the eider-down of commerce, especially of that which is brought from the Danish settlements in Greenland. This bird belongs to still higher northern latitudes than the common eider. On some parts of the coasts of Greenland, on those



King Eider (*Somateria spectabilis*).

of Spitzbergen, Nova Zembla, the North Georgian islands, &c., it occurs in great numbers. A few breed in Iceland and the Farøe Islands. In Britain, the bird is a rare visitant. It is of about the same size as the common eider. The female is very similar to the female of that species; but the male has a remarkable large protuberance over the base of the upper mandible, and the white color of the neck extends only over the upper part of the back. Skins of king ducks are made into winter garments by the inhabitants of Siberia and Kamtchatka.

EIGHT, PIECE OF, a name once popular given to the Spanish dollar, as being divided into eight reals.

EI'GHT-FOIL, used in Heraldry to signify a grass having eight leaves, as the trefoil has three. According to Sylvanus Morgan, it may be used as the difference of the ninth branch of a family.

EIK, in the legal phraseology of Scotland, is an addition made to a document for the purpose of meeting circumstances which have subsequently arisen. Thus, a reversion being a deed granted by a borrower, who reserves to himself the right of redeeming the land which he has conveyed in security to the lender (see WADSET), an eik to a reversion is a subsequent deed by the reverser acknowledging the receipt of a further sum, and declaring that the property shall not be redeemable until repayment of the additional loan. In like manner, an eik to a confirmation or testament is an addition to the inventory made up by an executor at his confirmation, in consequence of additional effects belonging to the deceased having been discovered. Where the executor appears to have fraudulently omitted or undervalued any effects belonging to the deceased, any creditor or person interested may apply to the commissary to be confirmed executor with reference to these additional effects, *ad omissa vel male appretiatia*.

EI'KON BASI'LIKE, a work presumed to have been written by Charles I. during his confinement, but now more correctly imputed to another writer. The following are the explanations of M. Guizot on the subject, in his *History of Oliver Cromwell and the English Commonwealth*. 'It is to the *Eikon Basilike* that Charles I. is principally indebted for the name of the Royal Martyr. The work is not by him; external testimony and internal evidence

both combine to remove all doubt on the matter. Dr. Gauden, Bishop, first of Exeter and afterwards of Worcester, under the reign of Charles II., was its real author; but the manuscript had probably been perused and approved, perhaps even corrected, by Charles himself during his residence in the Isle of Wight. In any case, it was the real expression and true portraiture of his position, character, and mind, as they had been formed by misfortune; it is remarkable for an elevation of thought which is at once natural and strained; a constant mingling of blind royal pride and sincere Christian humility; heart-impulses struggling against habits of obstinate self-consciousness; true piety in the midst of misguided conduct; invincible, though somewhat inert devotion to his faith, his honor, and his rank; and as all these sentiments are expressed in monotonous language, which, though often emphatic, is always grave, tranquil, and even unctuous, with serenity and sadness, it is not surprising that such a work should have profoundly affected all royalist hearts, and easily persuaded them that it was the king himself who addressed them.' The view that Charles was the author is, however, still maintained by some. See new editions of the E. B. in 1880 by Scott and Phillimore; and the *Athenæum* of 1880.

EILDON HILLS, an isolated range, with three conical summits, near Melrose, in Roxburghshire. The central peak, 1385 feet high, commands a very wide and glorious view. See RHYMER.

EI'LENBURG, a town of Prussian Saxony, on an island in the river Mulde, is 26 miles E.N.E. of Merseburg. The manufactures of E. consist of calico, woollen yarn, tobacco, chemicals, beer, and agricultural implements. Pop. (1880) 10,654.

EILETHY'IA, a city of Egypt, anciently Nuben, and known at present by the name of El Kab. The town was anciently walled. The present ruins consist of the remains of small temples dedicated by Rameses II. to Ra; a Ptolemaic temple dedicated to the Eponymous goddess by Physcon or Euergetes II., with additions by Ptolemy Alexander I., and Cleopatra; and another temple dedicated by Amenophis III. to the local deities. The names of other monarchs are also found in the ruins; but the most interesting and important remains are the rock-tombs excavated in the vicinity. That of Aahmes-Pensuben, a functionary, records his military services in the wars of the early monarchs of the 18th dynasty against the Shos or Shepherds, and other Asiatic and Nigritic races. Another, of Pabri, is decorated with paintings representing the pursuits of agriculture. Swine were sacred to the local goddess. The town itself, during the 18th dynasty, appears to have been governed by princes, and some of the tombs appear as late as the 19th and 20th dynasties.—Wilkinson, *Modern Egypt*, vol. ii. p. 270; Champollion, *Notice Descriptive*, p. 265; Brugsch, *Reiseberichte aus Aegypten*, p. 214.

EI'MBECK, or EI'NBECK, an old town of Hanover, is situated on the Ilme, forty miles south-south-east from Hanover, in lat. 51° 49' N., long. 9° 50' E. It was a place of considerable importance in the 15th c., and was a House city, but has decayed greatly in recent times. The minster is large and beautiful. The houses of E. are antiquated; its streets narrow, tortuous, and badly paved. One portion of the town, however, which was burned down in 1826, has been rebuilt in a greatly improved manner. E. has manufactures of woollens, cottons, and linens, and chemical products; and has distilleries, breweries, tanneries, and tobacco-factories. E. owes its origin to the pilgrimages made to the Chapel of the Holy Blood, founded here in 1094 by Count Alexander von Darul. Pop. (1880) 6809.

EI'MEO, one of the Society Islands, in the Pacific Ocean, lies in lat. 17° 30' S., and long. 150° 10' W., about 30 miles to the west-north-west of Tahiti, the principal member of the group. It measures nine miles by five, and numbers about 1300 inhabitants. It consists of deep valleys and abrupt hills—the former well cultivated, and the latter heavily timbered. It is worthy of notice chiefly as the cradle of Polynesian Christianity. Here, in or about 1814, occurred the first popular manifestation in favor of the new religion; and here was established, as an instrument of evangelization, the South Sea College of the London Missionary Society.

EINSIEDELN, a small town of Switzerland, in the canton of Schwytz, and 9 miles north-north-east of the town of that name. It is worthy of mention on account of its Benedictine Abbey, containing a black image of the Virgin, to which about 150,000 pilgrims annually repair. The town has 55 inns and 20 alehouses, supported chiefly by the pilgrims. The dedication festival of the abbey, 14th September, is the great pilgrimage season. The present abbey, one of the finest in Switzerland, was built at the beginning of the 18th c., and is the fifth since the foundation of the abbey, in the 10th century. Its treasury was rifled by the French in 1798. Pop. (1880) 8401.

EIRE, EYRE, JUSTICES IN (corruption of Lat. *in itinere*). By this term, both in England and Scotland, were the judges of

Assize (q. v.) formerly designated. Justices in eire were first established in England by the statute of Northampton (1176 A.D.), in the reign of Henry II. At first, they made the circuit of the kingdom once in seven years; but by Magna Charta, c. 12, the chief justices are directed to send justices through every county once in the year. In Scotland, the chief-justiciar, says Erskine, i. 3, s. 25, was originally bound to hold yearly two justice courts or aires at Edinburgh and Peebles. This court gradually became fixed at Edinburgh. Besides this court, special 'justice-aires' were frequently held in the more remote parts of the country by the king in person, or by judges named by him, twice in the year, in spring and autumn (st. Robert III. c. 30. 1440 c. 5. 1491 c. 29). These courts were discontinued, but revived by 1587, c. 81. The term is still in use in Scotland, where, at the commencement of every circuit, proclamation is made to the lieges to attend the 'circuit eire.'

EI'SENACH, a town of Germany, Saxe-Weimar, is beautifully situated amid finely wooded hills on the Hürsel, 45 miles west from Weimar. Once the capital of a principality to which it gave name, E. is still a prosperous and industrious town, and is well built, with wide, clean, and well-paved streets. E. has a ducal palace, a large and handsome building, now used as a court-house; a spacious market-place, including a handsome civic school; numerous churches; and a school design. Its manufactures are woollen, cotton, and linen goods, soap, white-lead, meerscham pipe-bowls, leather, and carpets; there are also breweries and tanneries, and oil, powder, and spinning-mills. Pop. (1880) 18,624.

On a lofty eminence in the immediate vicinity, surrounded by forests, stands the castle of Wartburg, now used as a prison, but formerly a residence of the landgraves of Thuringia, and worthy of notice as the spot where the Minnesingers (q. v.) assembled to hold a trial of skill in 1207, but chiefly as being the asylum to which Luther, at a time of great danger, was carried by his friend the Elector of Saxony, who, waylaying the great reformer, seized him, with an appearance of violence, and hurried him to this fastness, where he remained in safety from May 1521 to March 1522. The chapel in which Luther preached, as well as the chamber which he inhabited, and in which he discomfited the Evil One by throwing the inkstand at his head, is still pointed out. Another portion of the castle contains a fine armory, with suits of the 16th and 17th, and even, it is said, of the 13th and 14th centuries.

EI'SENBERG (Ger. Iron Mountain), a small town of Germany, in the duchy of Saxe-Altenburg, is situated on an eminence near the Saale, 26 miles east of Weimar. It is well built, its chief edifices being the castle, the observatory, the lyceum, and the town-house. E. has manufactures of woollens, porcelain, and earthenware, and has five annual fairs. Pop. (1880) 6277.

EI'SENERZ, a small town of Austria, in the north of the province of Styria, 20 miles west-north-west of Bruck. Its appearance is dirty and unprepossessing, and is worthy of mention only for its connection with the Erzberg (ore mountain), at the southern base of which the town lies. This mountain, which is about 2840 feet high, and about five miles in circumference at the base, is literally a solid mass of iron ore, of a quality so rich, that, instead of cutting mines into it and following the metal in veins—which process was formerly adopted here—the top and sides of the rock are quarried from the outside, and the ore is then broken small, and conveyed to the smelting-house without further preparation. Mines have been worked on this mountain for upwards of 1000 years. Arragonite (*Eisenblüte*, or *Flos ferri*), resembling branching coral in form, and of the most beautiful and purest white, is found in grottos in the interior of the mountain. Nowhere else does it occur in equal perfection. Pop. (1880) 3038, employed in mining. In 1872, 2,044,820 centner, or about 125,000 tons of pig-iron were produced.

EISENSTADT, a free town of East Hungary, stands in lat. 47° 50' N., and long. 16° 30' E., 12 miles north-north-west of Oedenburg. It is a walled town, has two gates, and consists principally of three main streets. It has also a Franciscan monastery, containing the burial-vault of the Esterhazy family, who are the proprietors of the palace, which forms the chief architectural feature of Eisenstadt. This palace was built in 1683, but was altered and enlarged in 1805. It contains 200 chambers for guests, and has a saloon sufficiently large to dine 1000 people. Its library contains a magnificent collection of church-music—masses, litanies, oratorios, &c., with some of Handel's MSS. In the suburbs is a conservatory, one of the largest in Europe, containing 70,000 specimens of exotic plants. The Magyar name of E. is *Kis-Marton*. Pop. 3000.

EISLEBEN, a town of Prussian Saxony, is situated about 20 miles west of Halle. E., once capital of the counts of Mansfeld, is the center of a rich mining district, and consists of old town, new town, and suburbs. E. makes large quantities of beer, and

has manufactories of potash and tobacco; in the vicinity are copper and silver mines, producing yearly about 1000 tons of copper, and 25 tons of silver. Pop. (1880) 18,187. Here, on Nov. 10, 1483, Luther was born, and here also he died, Feb. 16, 1546. The house in which he was born was partially consumed by fire in 1689. An interesting remnant of it, however, is still extant, having the portrait of Luther placed over the entrance. In the church of St. Andrew are the cap, cloak, and other relics of the great reformer.

EISTEDDFODS, the name given to the gatherings of Welsh bards for competition in national minstrelsy. See BARD, and WELSH LANGUAGE AND LITERATURE.

EJE'CTMENT, ACTION OF (*Ejectio firmæ*), in English Law, 'is a possessory action, wherein the title to lands and tenements may be tried, and the possession recovered, in all cases where the party claiming title has a right of entry.'—Selwyn's *Nisi Prius*. 'The action of ejectment,' says Lord Mansfield, 'is the creature of Westminster Hall, introduced within time of memory, and moulded gradually into a course of practice by rules of the courts.' *Fairclim & Fowler v. Shantille*. 3 Burr. 1292. According to the strict rules of common law, a person dispossessed of his property in land, &c., was obliged to enforce his right by means of one of the forms of real Action (q. v.) now abolished. But as the form of action differed according to the nature of the possession of the holder of the land, this process was tedious and inconvenient. In order to remedy this defect, the action of ejectment was by degrees adopted as a means of establishing a title to land. This action was at first applicable to the special case where the plaintiff was lessee for years, and it was limited originally to a demand for damages simply. But it is said that as early as the reign of Richard II. or Edward IV., the court gave judgment that the plaintiff should also recover the term and the possession of the land. The action having thus acquired in some measure the character of a real action, it was found convenient to extend its effect. By means of a legal fiction, introduced in the time of Henry VII., the action was first applied to the purpose of enforcing a title to land. The process adopted was as follows: The judges having declared that a tenant for years succeeding in his action should have possession, the claimant of the land commenced by feigning a lease for years granted by himself to an imaginary lessee, John Doe. It would seem that at first the plaintiff actually granted a formal lease to a friend, who was also formally ousted, in order to raise the question of title. But these men of straw being removed as the cause proceeded, it was soon found that they might be altogether dispensed with, and the fictitious John Doe and Richard Roe substituted in their room. The declaration proceeded to state that upon this lease Doe entered, and that Richard Roe, also an imaginary person, had ousted him. Notice of this action was then given to the actual tenant of the lands, together with a letter from the imaginary Richard Roe stating that he should make no appearance to the action, and warning the tenant to defend his own interest. If no appearance was made, judgment was given in favor of the plaintiff, who thereupon became entitled to turn out the tenant in possession. But if the latter made appearance, the first step in the action was a formal acknowledgment by him of his possession of the lands, of the lease in favor of Doe, of Doe's entry, and of the ouster by the tenant himself.

These matters, be it remembered, were, in fact, mere fictions; but having been introduced on the record simply to comply with the technical rules of legal title, they were equally readily removed when the real question at issue presented itself. This reduced the cause to the simple question of the right of the plaintiff to grant the lease to Doe, and thus the title to the land became the real question at issue. But it must be observed that this remedy was confined to the case of one having a Right of Entry (q. v.). Where, therefore, a person had suffered a Deforcement or Discontinuance (q. v.), he was still obliged to resort to a real action to establish his right. This state of things continued till 3 and 4 Will. IV. c. 27, whereby the remedy by ejectment was, with a few exceptions, in fact extended to every one who alleged that he was wrongfully dispossessed; but it was at the same time provided that no action should be brought to recover land but within twenty years after the right accrued. But while the remedy was thus extended, the same elaborate string of fictions was suffered to continue until the passing of the Common Law Procedure Act (15 and 16 Vict. c. 76), whereby the ancient machinery is quite swept away. The action now commences by a simple writ addressed to the tenant in possession, and 'to all persons entitled to defend the possession,' setting forth that the plaintiff has asserted a claim to the land, and calling upon those interested to appear within a certain time to defend their right. The writ also contains a notice that, in default of appearance, the tenant in possession will be ejected. On appearance being made, issue is joined, and the cause proceeds as in ordinary actions. Judgment in ejectment will not carry the mesne profits or rents. In

somes cases of forcible entry, justices of the peace can also summarily eject the intruder and give possession.

EJOO. See GOMUTO.

EJUTLA, a town of Mexico, in the province of Oajaca, 250 miles south-south-east of Mexico city. Pop. 7500.

EKATERINBURG, a fortified town of Russia, in the province of Perm, is situated on the eastern slope of the Ural Mountains, on both banks of the Isset, in lat. $56^{\circ} 50'$ N., long. $60^{\circ} 7'$ E. It is a well-built town, its streets long and straight, but unpaved. As a substitute, however, planks are laid along the sides of the streets, and used as footpaths. The majority of the houses are of wood, but there are also many very handsome stone buildings. In the southern portion of the town, which is connected with the northern by a fine bridge, are the government magazines, the mills, factories, and the market-place. The opposite side, however, is the handsomer. It contains the dwellings of the mine-proprietors and of the merchants, and is laid out in elegant and spacious streets. E. is the seat of administration for the Ural mines, and is the center of the mining districts of these mountains. Among its institutions, it has a museum of mineralogy, an excellent chemical laboratory, a school for educating miners, an imperial mint, numerous works for cleansing and amalgamating metals, and for cutting and polishing precious stones. The greater number of inhabitants are supported by the productiveness of the neighboring mines. E. stands on the high road between Russia and Siberia, and is therefore a place of brisk trade. In the vicinity are the gold mines of Niviansk and Beresoff. Pop. (1880) 25,133. E. was founded by Peter the Great in 1723. Its average temperature during the year is $31^{\circ} 9'$.

EKATERINODA'R, a town of Russia, and capital of the country of the Cossacks of the Black Sea, is situated on the right bank of the river Kuban, about 160 miles from its mouth, in lat. $45^{\circ} 5'$ N., long. 39° E. It is surrounded on all sides by swamp and morass. Its houses are almost all of earth, having thatched roofs, and are of one story in height. The streets are broad, regular, and straight, but exceedingly dirty. E. has a cathedral with six wooden towers, and a wooden fortress. Pop. (1880) 32,300.

EKATERINOGRAD, a town and fortress in the south of Russia, in the government of Caucasus, is situated on the left bank of the Terek, in lat. $43^{\circ} 40'$ N., and long. $44^{\circ} 3'$ E. It is an important military post of the Cossacks; its houses are regular, but miserably built. A stone triumphal arch was erected at E. by Catharine II., in memory of Prince Potemkin, who founded the town in 1777. Pheasants abound here, and form a principal article of food. Pop. about 3000.

EKATERINOSLA'V, a government of Russia, in the province of South Russia, bounded on the N. by Little Russia, and on the S., reaching in one part to the shores of the Sea of Azov. The government of E., together with that isolated portion of it which lies on the eastern border of the Sea of Azov, and comprises the district of Taganrog and the country of the Azovian Cossacks, has, in all, an area of 26,050 square miles, and in 1879 had 1,532,045 inhabitants. Only about one-third of the entire area consists of cultivable land, the remainder being desert (see STEPPE). The climate is mild, and a great many highly esteemed fruits, as apricots, peaches, cherries, &c., which do not occur in the more northern parts of Russia, are found here. E. possesses deep and extensive beds of coal. Though in 1870 not more than fifty tons were raised, the quantity had within three or four years increased to many thousand tons annually.

EKATERINOSLAV, a fortified town of South Russia, is situated on the right bank of the Dnieper, 250 miles north-east from Odessa, in lat. $48^{\circ} 27'$ N., long. $35^{\circ} 5'$ E. It was founded in 1787 by the Empress Catharine II. The streets are long and broad, but not so clean or so well filled with houses as they might be. E. has manufactures of silk and woollen goods, and an important annual wool-fair. It is the residence of an archbishop. In the vicinity is a palace, now in a ruinous condition, formerly the residence of Prince Potemkin. Pop. (1880) 33,973.

EKHMIM, or AKHMIM, a town of Upper Egypt, near the right bank of the Nile. It occupies the site of the ancient *Chemnis*, or *Panopolis*, one of the great cities of the Thebaid. Remains of ancient buildings exist. Pop. 4000.

ELÆA'GNUS, a genus of oxogenous plants, of the natural order *Elæagnaceæ*. This order consists of trees and shrubs, usually covered with scurfy scales, and having alternate or opposite entire leaves, without stipules. There are only about thirty known species of this order, all natives of the northern hemisphere, but found both in its warm and cold regions. The Sallowthorn (*q. v.*) is the only British species. *Shepherdia argentea*, a North American shrub of this order, yields a pleasant fruit. The genus *Elæagnus* consists of a number of deciduous shrubs or low trees, with male and female flowers on the same plant. *E. angustifolia*, the OLEASTER, sometimes called Wild Olive, is a native of the south

of Europe and the Levant, a spiny tree of 15—20 feet in height, with lanceolate leaves, which, as well as the young shoots, are hoary with stellate hairs. It is frequently planted in England, for the sake of its silvery white foliage, beautifully contrasting with the green of other trees, and its very fragrant flowers, which are small and of a dull yellow color.

ELLE'IS. See OIL PALM.

ELÆOCARPA'CEÆ, according to some botanists, a natural order of oxogenous plants, but regarded by others as merely a sub-order of *Tiliaceæ*; the chief distinctions being deeply cut or fringed petals and anthers opening at the apex. The E. are mostly East Indian trees. The fruits of some are eaten; those of



Elæocarpus Cyaneus :

a, magnified flower; b, petal; c, stamens; d, ripe fruit; e, same cut away, showing wrinkled seed.

some are dried and put into curries; those of *Elæocarpus serratus* are pickled in brine and eaten with oil in Ceylon, and much resemble olives. *E. cyaneus*, a native of New Holland, is here figured. The deeply wrinkled seed or stone of the fruit of some, particularly *Elæocarpus genitrus* and *Monocera tuberculata*, being very hard, and having a fine sculptured appearance, are made into beads for necklaces and bracelets, and are sometimes set in gold. They are often called OLIVE NUTS. These beads are frequently worn by religious devotees in India, and are sometimes sold as ornaments in the shops of Europe.

ELÆOCO'CCA, a genus of *Euphorbiaceæ*, the seeds of some of which yield useful oils. The oil obtained from *E. verrucosa* is used for food in Japan, notwithstanding considerable acidity. The tree is cultivated in the Mauritius, and the oil is there used only for burning. That obtained from *E. vernicia* is used in painting in China.

ELEODE'NDRON, a genus of trees of the natural order *Celastraceæ*, having a 5-partite calyx, 5 petals, a 5-angled disc, 5 stamens, the ovary immersed in the disc, and a drupaceous fruit. *E. glaucum*, a native of Ceylon and the south of India, is sometimes called the *Ceylon Tea-tree*, from the resemblance of its leaves to those of the tea-shrub. The timber of *E. croceum*, called SAF-FRONWOOD at the Cape of Good Hope, is much used there in building and cabinet-making; it is fine-grained, hard, and tough. The fruit of *E. Kuhn*, another South African species, is eaten by the colonist. That of *E. Argan* yields an oil similar to olive oil, much used by the Moors.

ELAGA'BALUS, or HELIOGABALUS, emperor of Rome, was born at Emesa in 204 A.D. His real name was Varius Avitus Bassianus, but having, when a mere child, been appointed high-priest of the Syro-Phœnician sun-god Elagabal, he assumed the name of that deity. Soon after the death of his cousin Caracalla, E. was proclaimed emperor by the soldiers, in opposition to the legitimate sovereign, Macrinus, who had become obnoxious to the troops from the severity of his discipline. The rivals met in battle at Antioch in 218 A.D. Macrinus was defeated, and E. quietly assumed the purple. His reign, which lasted rather more than three years and nine months, was infamous for the nearly unparalleled debaucheries of every kind in which he indulged. He was murdered in an insurrection of the praetorians in 222 A.D., and was succeeded by his cousin and adopted son, Alexander Severus.

E'LAND (*Antelope Oreas*), a species of antelope, abounding in South Africa, wherever there are fertile plains and low hills, except in the longest settled and most cultivated parts of Cape Colony, where it has been too much hunted to be any longer of very frequent occurrence. It is described by Livingstone as 'the most magnificent of all antelopes.' It is one of those which are sometimes called *bovine* antelopes, because they seem to approximate a little in some of their characters to the ox-tribe, having a broader

muzzle, less slender limbs, and greater bulkiness of form than the antelopes in general. The E. however, is a very graceful and beautiful animal; it is as large as a horse, fully five feet in height at the shoulder, and weighs from seven to nine cwt. The horns—which in the male are about a foot and a half long, and in the female longer and more slender—are almost straight, inclining backwards and outwards; they are pointed, and their great strength is increased by a spiral wreath. The E. has a large protuberance

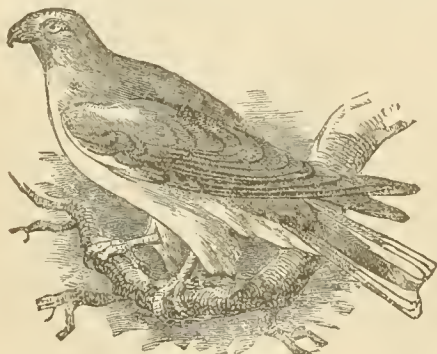


Eland (*Antelope Oreas*).

on the larynx, in this resembling the elk, from which, probably on this account, it has derived its name. It is also known as the *Impoof* or *Impoofoo*. Its tail very much resembles that of an ox, and terminates in a tuft of long black hair. It is a gregarious animal, and the herds are often large. It is generally very fat, and not difficult of pursuit, its gentleness also increasing the facilities of the hunter. Its flesh is very much esteemed, particularly the muscles of the thighs, which are dried like tongues. It is surprising that no attempt has been made to domesticate, for useful purposes, an animal very easy of domestication, and possessing so many valuable qualities.

Livingstone discovered a variety of the E. in regions to the north of the Cape Colony, having the body marked with narrow white transverse bands. According to the figure given in his travels, it seems even more bovine in form than the common variety.

E'LANET (*Elanus*), a genus of *Falconidae*, allied to the Kites, which they resemble in many of their characters; but from which they differ in having the short tarsi half covered with



Elanet (*Elanus dispar*).

feathers, and the claws, except that of the middle toe, rounded beneath. The tail is very little forked. One species (*E. melanopterus*) is common in Africa, from Egypt to the Cape of Good Hope, and is found also in India. Another species is the Black-shouldered Hawk (*E. dispar*) of America, the northern limit of which appears to be South Carolina. Both of these feed chiefly on insects, which they catch on the wing, but they also prey on small birds and reptiles.

ELAPS, a genus of venomous serpents, inhabiting the warm parts of the world, and chiefly the Indian islands, Australia, and tropical America. They are of slender and cylindrical form, with an elongated head, and often of bright and beautiful colors. They are not very agile, are said to prey chiefly on other reptiles, and live among the luxuriant vegetation of meadows or of forests.

ELASSMOBRANCHIA, a name proposed by Bonaparte, and now largely used for the order of fishes also termed *Chondropterygia* (see CARTILAGINOUS FISHES). The E. comprises the sharks, rays, and chimæras (q. v.); and is divided into two sub-orders, *Plagiostomata* and *Holocephala*.

ELASMOSAURIANS, a genus of huge marine saurians of the cretaceous period, combining the characters of serpents, lizards, and plesiosaurs, are also described as a kind of reptilian whales. One species had vertebræ as large as those of an elephant, the bulk of a whale, the neck long and flexible, the paddles short, and the tail serpent-like; a long, narrow, flat muzzle; spout holes, and sharp teeth. It attained a length of 45 feet, and its remains are found chiefly in New Jersey.

ELASTIC TISSUE, known also as Yellow Fibrous Tissue, is one of the forms of Fibrous Tissue (q. v.). It derives its name from the remarkable physical property which it possesses of permitting its fibres to be drawn out to double their length, and again returning to their original length. It occurs in various ligamentous and other structures of the animal body in which elasticity is required, as, for example, in the vocal chords, the membranes connecting the cartilaginous rings of the trachea, the middle coat of the arteries, the skin, &c.

ELASTICITY, or SPRING. When an external force acts upon a solid body, it produces at first slight alterations in the relative positions of the particles; and if before these alterations exceed a certain limit, the force ceases to act, the particles return to their former position, and the disfigurement disappears. This power or property of recovering their previous form after alteration, is called elasticity, and we are justified in ascribing it to all bodies, though in very different degrees. It was once believed that there were definite limits within which changes of form produced by pressure or other forces disappeared completely. It was thought, for instance, that when a weight of no great magnitude is suspended from a metallic wire, the slight increase of length which the wire is observed to undergo, is completely lost when the weight is removed; and the limit to which the wire might thus be stretched, and still suffer no permanent increase of length, was called the limit of its elasticity. But recent more accurate experiments have shown that no such limits exist, at least in the case of metals; or, which is the same thing, that permanent lengthening results, however slightly the wire be loaded—it never contracts again quite so far as it was stretched. It is necessary, therefore, to fix the limit arbitrarily; and this is done by agreeing that it shall be held to begin when the metal in question suffers a permanent elongation of 0.00005 of its length. To get the elastic extensibility of a wire, then, we must compare its length with a weight suspended, with its length when the weight is removed. In this way it is found that the extensions produced are proportional to the extending forces or weights. From this law, then, we can calculate what weight it would require to stretch a wire or rod of a square inch in section to double its own length; supposing it possible to proceed so far without breaking it, and that the law of elasticity continued up to this point unaltered. This weight, which is different for every metal or kind of wood, is called the *coefficient* or *modulus of elasticity* of the particular substance; and is used in mechanics in calculating how far a given weight will extend a wire or rod of given diameter. This coefficient is not constant for the same metal; for all circumstances that increase the density of the metal, increase the modulus of elasticity. Bodies manifest elasticity not only when extended in length, but also when compressed, when bent, or when twisted.

If an ivory ball be dropped from a height upon a marble slab smeared with fat and lampblack, when caught after the rebound, it is seen to have touched the marble, not in a point, but in a circle of several lines in diameter; and must therefore have lost for a time its spherical shape over that extent. In the same way the mark of a well hit golf-ball is pretty broadly shown upon the face of a club after the stroke. The elasticity shown by wires and threads of glass when twisted, has been turned to account in the Torsion-balance (q. v.), for measuring other weak forces. Steel, ivory, caoutchouc, &c., are well known for their elastic properties, to which they owe much of their utility.

The propagation of waves of sound through solid bodies depends upon their elasticity; and from observations of this kind made with different substances, the modulus of elasticity for each may be deduced; the results, however, differ slightly from those arrived at by attaching weights, owing to the heat produced by the vibratory movement.

All solid bodies are only imperfectly elastic—that is, they do not quite recover their form and volume when the disturbing force ceases. Liquids and gases, on the contrary, are perfectly elastic, or return exactly to their original bulk or volume when the pressure is removed. The elasticity of liquids and gases, however acts only in expanding after compression, while that of solids acts also in contracting after extension. The expansive elasticity of liquids and gases is equal to the force used to compress them. Water and other liquids are easily seen to be compressible, by the fact of their conveying sound—a sound-wave being merely a *state* of compression, propagated from each layer of the liquid to the next. The coefficient of elasticity of water determined by Colladon and Sturm, from the velocity of sound in the Lake of Geneva, agrees

very well with that determined by direct measurements in Oerstedt's apparatus. The discovery of the compressibility of water, is an English one, due to Canton, in 1762. Previous attempts, by Italian and Dutch philosophers, to compress water by hammering a silver shell filled with that fluid, had failed to give any certain result, as the water was forced through the pores of the metal. At a temperature of 50°, one atmosphere compresses water to about 0.999995 of its volume. From the existence of a maximum density temperature for water, some curious consequences arise with regard to the effects of pressure on the fluid. The volumes or bulks which a given quantity of any gas assumes under different pressures, are nearly in inverse proportion to the pressures. See **MARIOTTE'S LAW**. The elasticity of gases is usually measured by the height of the column of mercury that they sustain. The elasticity of gases is a force much and variously employed in the arts of life. See **AIR-GUN**, **AIR-PUMP**, **GUN-POWDER**, &c.

ELATER, a Linnæan genus of coleopterous insects, now divided into many genera, and forming the tribe or family *Elateridae*. They have a narrow elongated body; the head is in almost all cases inserted deeply into the thorax; a strong spine on the under part of the thorax at its base, fits into a groove; the legs are short, and rather slender. They are generally found upon the flowers and leaves of plants, which are their food. When disturbed, they fold their legs and antennæ close to the body, and let themselves drop to the ground. If they fall on their back, or are placed on it, the shortness of their legs incapacitates them for obtaining another position by the means common to other insects; but they are enabled to do so by a violent muscular exertion, arching the body a little, and suddenly straightening it again, so that they fling themselves into the air with a jerk and a *click*. Hence the names **CLICK-BEETLE** (q. v.) and **SKIP-JACK**. The spine and groove of the thorax are supposed to be of use in this. The larvæ are long, rather slender, with six feet near the head, and a tough skin. Many feed on rotten wood; others, **WIRE-WORMS** (q. v.), on the roots of plants. Many are British. Some of the *Elateridae* of tropical regions diffuse from spots on the thorax a strong and beautiful light, and are called **Fire-flies** (q. v.).

ELATERIUM, a drug obtained from the fruit of the **SQUIRTING CUCUMBER**, or **SPIRTING CUCUMBER** (*Ebolium agreste*, formerly known as *Momordica Elaterium*), also called the **Wild Cucumber**, an annual plant of the natural order Cucurbitaceæ, a native of the south of Europe, common on rubbish in the villages of Greece and the Archipelago. The whole plant is rough, with stiff hairs; it has a trailing branching stem, without tendrils; the leaves are heart-shaped, somewhat lobed and toothed, on long stalks; the flowers axillary, yellow, the male flowers in small racemes; the fruit oblong, about an inch and a half long, grayish green, covered with soft prickles, and finally parting from its stalk, and expelling its seeds along with a thin mucus through the aperture where the stalk was inserted. This remarkable phenomenon is ascribed to osmotic action within the fruit; a thin membrane separating a mucus which immediately surrounds the seeds from a less dense juice which abounds in the succulent part of the fruit, and the quantity of the former being gradually increased at the expense of the latter, till, on the perfect ripening of the fruit, the much distended central cell is opened, to permit its ejection. It is this mucus surrounding the seeds—a thick green mucus of a very peculiar character—which contains the elaterium.

To obtain the drug, the juice of the nearly ripened fruit is allowed to stand for a short time, when it becomes turbid, and deposits a sediment. The sediment, carefully collected and dried, is elaterium. It is of a pale grayish-green color, light and friable, with an acid taste, and a peculiar not unpleasant odor. It is an exceedingly powerful or drastic purgative, used chiefly in dropsies, and in very small often-repeated doses. It should not be used except under medical advice. It acts as an irritant not only on the eyes, if it comes in contact with them, but even on the fingers of those who handle it. Its properties seem to depend chiefly on a crystalline principle called *Elaterin*. The use of E. was known to the ancients. A few acres of the **Squirting Cucumber** are grown at Mitcham, in Surrey.

ELATMA. See **JELATOM**.

ELBA (Lat. *Iva*, Gr. *Æthalia*), an island belonging to the kingdom of Italy, in the Mediterranean Sea, between Corsica and

the coast of Tuscany, from the latter of which it is separated by the channel of Piombino, a strait 5 miles in breadth. Its greatest length is about 18 miles, and its breadth varies from 3 to 10 miles, this irregularity being caused by indentations both on its northern and southern shores. Its area is about 90 square miles. The coast is bold and precipitous. The surface is traversed from west to east by a chain of mountains, which divides into two spurs at the eastern extremity of the island; the highest summit, Monte della Capana, attaining an elevation of 3600 feet above sea-level. These mountains are for the most part bare; but on their lower ridges, and in the valleys, the vine, olive, mulberry, and other trees flourish. The climate, except in the low-lying districts on the shore, is temperate and healthy. There are few streams in E., but it has numerous wells. The principal products are wines, white, red, and sweet, and of good quality; wheat, Indian corn, vegetables, and water-melons. 50,000 cwts. of salt are produced annually from the salt-pans on the shore. Sheep, goats, pigs, and asses abound, but horned cattle and horses are scarce; the coasts supply fish plentifully. Iron of excellent quality is obtained from a mountain in E., 2 miles in circumference, and 500 feet in height. This hill, which stands on the east coast, is almost entirely a mass of ore, and so rich that it yields from 50 to 75 per cent. E. also yields loadstone, alum, vitriol, and marble. Porto Ferrajo, the capital and residence of the governor, has a population of about 4000. E. has been rendered famous in history from having been Napoleon's place of exile from May 1814 till February 1815. Pop. about 22,000.

EL BASSA'N, **ALBASSAN**, or **ILBASSAN**, a town of Turkey, in the central part of Albania. Pop. 10,000.

ELBE (called by the Romans *Albis*—i. e., white—and by the Bohemians *Labe*), an important river of Northern Europe. It originates in the confluence of numerous streams which rise at the south-western base of the Schneekoppe (Snowcap), one of the highest summits of the Riesen-Gebirge, a mountain-range on the northern border of Bohemia. The course of the E. begins near lat. 50° 45' N., long. 15° 36' E.; at an elevation of about 4400 feet above sea-level. Its total length, including windings, is estimated at from 700 to 720 miles, and its basin at 56,000 square miles. The average depth of the E. is 10 feet, and its mean breadth 900 feet, although occasionally it has a width of upwards of 1000 feet, and at its mouth of several miles. In the course of its progress to the sea, it is joined by 17 rivers and upwards of 70 streams. From the base of the Schneekoppe, it flows south to Pardubitz, whence it proceeds west to Brandeis, and afterwards in a general north-west direction past Melnik, Leitmeritz, Aussig, and Tetschen, where it quits the Bohemian territory, and enters Saxony. At this point, it is 355 feet wide. Its principal affluent in Bohemia is the Moldau. On its course north-west through Saxony, the E. passes Pirna, Dresden, and Meissen, and entering Prussian Saxony, about seven miles above Mühlberg, it advances to Torgau and Wittenberg, from which point it flows first west, then north-west to Magdeburg, receiving in its progress the Mulde and the Saale, both from the left. From Magdeburg flowing north-east, the E. arrives at the border of Brandenburg, receiving the Havel from the right; then turning north-west, it forms the boundary between Prussian Saxony and Brandenburg, and enters Hanover, through which it flows for upwards of 30 miles. Then still flowing north-west, it forms the boundary of Lauenburg, the Hamburg territory, and Holstein on the north, and Hanover on the south, until it empties itself into the North Sea at Cuxhaven, where it attains a breadth of upwards of 10 miles. At this point the tide rises 12 or 13 feet. The E. is divided into several branches between Hamburg on the north, and Harburg on the south, by the numerous islands that there interrupt its course. Vessels of 14 feet draught can at all times ascend to Hamburg. The scenery of the valley of the E., although generally pleasing, is not remarkable in any portion of its course, except that which extends between Aussig and Dresden. Between these two towns, the course of the E. is generally between bold cliffs, and high natural battlements of rock; the banks covered with foliage, wherever a tree can support itself; and occasionally varied by a strip of green glade. It has been said that here the E. has all the variety of the English Wye, on a scale nearly as majestic as that of the Rhine. Its waters are stocked with abundance of highly esteemed fish; beavers likewise build in the stream. Steam-boats ply from Dresden up the river, and down as far as Torgau, as well as from Magdeburg to the sea. The navigation of the E. was formerly impeded by all manner of imposts and monopolies; and, what was quite as bad, sand was allowed to accumulate, so that vessels were often obliged to wait three or four weeks for want of sufficient water. The former of these impediments has of late years been gradually removed, till in 1870 all then existing tolls were abolished, but something still remains to be done towards improving the channel.

ELBERFELD, one of the most important manufacturing towns in Germany, is situated on both sides of the Wupper, an.



Wild Cucumber (*Ebolium agreste*).

affluent of the Rhine, 16 miles east-north-east of Dusseldorf. Its site, in the narrow and hill-girt valley of the Wupper, is picturesque and healthy. The old parts of the town are poorly built, straggling and irregular, but the more recently erected portion is well built, with numerous spacious and imposing buildings, in a high architectural style. E. is chiefly famous for its dyeing, bleaching, and printing establishments, also for its extensive and important manufactures of cotton, silks, tapes, ribbons, merinos, fancy woollen goods, velvets, &c. Bleach-fields occupy a great part of the environs of E., and of the banks of the Wupper, the waters of which are said to possess very valuable bleaching properties. At E., the well-known dye, Turkey red, is imparted to yarns, at a cheaper rate, and with more clearness and firmness of color, than at any other town in Europe. The patterns for the printed goods are designed at Elberfeld. E. supports, amongst its numerous educational institutions, an important establishment, in which young manufacturers and overseers are taught the management of the Jacquard-loom, pattern-drawing, &c. Like the rest of the Wupper valley, E. is notable for religious zeal and orthodoxy. Pop. (1840) 31,500; (1880) 93,538 (mostly Protestants). E. is connected by a tramway with the neighboring town of Barmen (q. v.), also the seat of extensive manufactures.

ELBEUF, or ELBEUF, a manufacturing town of France, in the department of Seine-Inferieure, is delightfully situated in a picturesque valley on the left bank of the Seine, about 75 miles north-west from Paris. It was originally badly built, but it has recently been greatly improved. Large factories also have arisen rapidly; and a spacious market-place (*champ de foire*), adorned with rows of chestnut-trees, has been erected. The two principal public buildings of E. are the churches of St. Etienne and St. Jean-Baptiste, both containing fine specimens of richly painted glass. The factories of E. and the vicinity exceed 200 in number; these are for the most part worked by steam-power, and give regular employment to more than the half of the population. The manufactures are principally double-milled and waterproof cloth, flannel fabrics, billiard table-covers, and light woollens of every color and description. E. has active steam communication with Paris, Havre, and Rouen. The population in 1876 was 21,935. E., which has been called the Leeds of France, had 80 cloth manufactures as early as the 16th century. In consequence of the revocation of the Edict of Nantes, the greater number of the cloth manufacturers emigrated; and it was not till after the Revolution of 1789, and more particularly since the separation of Belgium and France, that industry again began to flourish.

ELBING, a considerable trading and manufacturing town in West Prussia, is situated in the midst of a fertile valley, on the navigable river of the same name, 34 miles east-south east of Danzig, and 5 miles south of the south-western extremity of the Frisches Haff, into which the Elbing flows. It is connected by a canal with the Nogat, the eastern arm of the Vistula. The town was formerly surrounded with walls and mounds, of which, however, there are now but few remains. Of the numerous churches, the most remarkable is the Marienkirche, erected in the 14th century. The gymnasium, founded in the year 1536, contains the town library, consisting of 24,000 volumes. There are likewise several well-conducted educational and charitable institutions. The manufactures are chiefly linen and cotton cloths, leather, tobacco, soap, and chicory. There are also oil manufactories, iron foundries, breweries, dye and print works. E. was founded about the beginning of the 13th c., by colonists from Lübeck and Bremen, who settled round the fortress erected by the German knights. After various vicissitudes, it was annexed to Prussia in 1772, and after a period of decline, has again risen to a thriving condition. The larger vessels unload at Pilau, which serves as the harbor of Elbing. Pop. (1880) 35,842.

ELBOW. See ARM.

ELBOW-PIECES, in armor, or *coudières*, were the metal-plates used to cover the junction of the rere-brace and vant-brace, by which the upper and lower half of the arm were covered. They increased to an enormous size, as in the effigy of Sir Thomas Peyton, in Isleham Church, but again decreased to their normal size. An *Elbow Gauntlet* was a gauntlet of plate reaching to the elbow, adopted from the Asiatics in the 16th century.—Fairholt's *Costume in England*, p. 494.

ELBU'RZ, a lofty mountain-range that runs longitudinally along the entire southern border of the Caspian Sea. It frequently divides itself into subordinate parallel ridges, enclosing extensive and fertile valleys, many of which are well inhabited and carefully cultivated. Demavend (q. v.), said to be 21,000 feet in height, is one of the highest summits.—ELBURZ, or ELBRUZ, is also the name of one of the summits of the Caucasus, 18,500 feet high.

E'LCHE (anciently, *Illice*, or *Illice*), a town of Spain, in the province of Alicante, and 16 miles south-west of the town of that name, is picturesquely built on both sides of a steep ravine, near

the Elda, a tributary of the Segura, and about two leagues from the sea. It has an Oriental appearance. The climate is eastern, winter is unknown, and around the town rises a huge encircling plantation of palms; the Arab alone is wanting to complete the likeness to an eastern city. E. is a flourishing town, is well built, its streets in general are wide and clean, and it has numerous squares and public walks. The church of Santa Maria is an imposing edifice, with a large dome, five gates, a famous organ, and a tabernacle made of precious marbles. The dates gathered from the palm-plantation around E. are exported from Alicante; they are not so good as Barbary dates, though sold as such. Its manufactures are linens, woollens, cottons, brandy, wine, cigars, oil, soap, &c.; in these articles, and in cattle, rice, and wool, there is a considerable trade. Pop. about 18,500.

E'LCHINGEN, a village of Bavaria, on the left bank of the Danube, about eight miles north-east of Ulm. It is noteworthy as the scene of a battle fought on the 13th October 1805, between the French under Ney and the Austrians under Laudon, in which the latter were defeated. Ney's victory obtained for him the title of Duke of Elchingen.

ELCHO, FRANCIS WEMYSS-CHARTERIS-DOUGLASS, LORD, born August 4, 1818, succeeded his father as Earl of Wemyss in 1883. Educated at Christ-church, Oxford, where he graduated in 1841, he was returned to the House of Commons as M.P. for East Gloucestershire from July 1841 to February 1846, and sat for Haddingtonshire from 1847 to 1882. He accepted office in the coalition government of the Earl of Aberdeen, and was a Lord of the Treasury from January 1853 to February 1855. In the organization of the Rifle Volunteers in Great Britain in 1859, Lord E. took the earliest and most prominent part. Lord E. is an LL.D. of Edinburgh University. In 1871 he published *Letters on Military Organization*.

E'LDER, an office-bearer in Presbyterian churches. The name is an exact translation of the Greek *presbyteros*, which occurs frequently in the New Testament, and from which the English word *priest* is derived. That the *presbyteroi* of the churches of the apostolic age were not *priests* in the special sense of that word, in which it denotes a person appointed to offer sacrifice on behalf of others, and to appear for them before God, is admitted by Protestants in general; but there remains much division of opinion as to the precise meaning of the term, and the bearing of the passages in which it occurs on the subject of church government. See BISHOP, INDEPENDENTS, and PRESBYTERIANISM. All are agreed, indeed, that *bishops* and all pastors of congregations are included among *elders* in the scriptural use of the term; but the ordinary use of it is now limited to Presbyterian churches, and in them it has become the usual designation of the office-bearers associated with the minister of each congregation in the care and oversight of the flock. The argument for this class of office-bearers will be found briefly stated in the article PRESBYTERIANISM. They exist in the greater number of the churches of the Reformation; and even in the Church of England, Bishop Burnet states that their introduction was only prevented by Queen Elizabeth's dislike to a proposal, in which, with Burleigh and others of her advisers, she saw danger of an abatement of her prerogative, 'since, if the concerns of religion came into popular hands, there would be a power set up distinct from hers, over which she could have no authority.'

In some Protestant churches, elders are appointed only for a certain term of office; but more generally it is until death, resignation, removal from the bounds of the congregation, or deposition. The appointment of elders takes place variously: in the Established Church of Scotland, they have generally been nominated by the kirk-session (consisting of the minister and elders); in the other Presbyterian churches of Britain and America, they are elected by the congregation. In most of the churches of the continent of Europe, which have any kind of connection with the state, there is some regulation of the civil law or some interference of the civil authorities in this matter. The ordination of elders takes place in the congregation, but usually without imposition of hands; a difference between the mode of ordination of elders and ministers for which it is not easy to account, and which has certainly tended to produce a general impression that a greater difference of office subsists than the advocates of Presbyterianism admit. In the Established Church of Scotland, the elders have very generally discharged the functions of Deacons (q. v.), at least as much as those which, according to the theory of Presbyterianism, belong to their own office; an example which, until recently, was almost universally followed in other Presbyterian churches. According to the *Second Book of Discipline* of the Church of Scotland, it is the duty of elders to watch over the spiritual welfare of the people, to admonish, to visit the sick, to assist in the examination of persons seeking admission to the Lord's Table, &c. Elders, along with ministers, compose all the courts or assemblies of the Presbyterian churches, and have equal votes in all questions.

ELDER (*Sambucus*), a genus of plants of the natural order *Cuprifoliaceae*, consisting chiefly of shrubs and trees, with pinnate



Flower-stick, Leaves, and cluster of Berries of Common Elder (*Sambucus nigra*).

leaves, small flowers of which the corolla is wheel-shaped and 5-cleft, and 3-seeded berries. The wood of the young shoots contains a very large pith. The species are very widely distributed.—The COMMON E. (*S. nigra*), the *Bourtree* of the Scotch, is a native of Europe, north of Asia, and the north of Africa. It is found in all parts of Britain. It is a very large shrub, sometimes a small tree, with rather large leaves, and large terminal cymes of cream-colored flowers, which are followed by small black—or rarely whitish—berries. Its leaves and young shoots diffuse a narcotic odor,

and it is said to be dangerous to sleep under its shade. The inner bark has a bitter acrid taste. The leaves possess the same properties in a rather milder degree. The flowers have a peculiar sweetish and rather sickening smell, but are much used for making a distilled water—*Elder Flower Water*—which has a very agreeable odor, and is employed both in perfumery and confectionery. Distilled with water alone, they yield a volatile oil, which, on cooling, assumes a buttery consistence.

A popular cooling ointment is made by boiling them in lard. They are also used for imparting a flavor to currant-wine and jelly, being added at the time of a slight fermentation which takes place in the spring of the year, after the currant-wine is made; and a wine is made from them which in scent and flavor resembles Frontignac. The clustered flower-buds are pickled, and used like capers. A grateful wine, well known in England, especially about Christmas, is made from the berries; and in some parts of Kent there are large plantations of E. to supply the London market for its manufacture. It is generally drunk hot or mulled.

The berries are subacid and sweetish, with a rather unpleasant flavor. A rob made from them is a gentle aperient, diuretic, and sudorific, easily administered to children. In some parts of Germany, the poorer people use them as an ingredient in soups. They are said to be used to no small extent in England in the adulteration of port wine, and the manufacture of spurious port wine.—The wood of the E. is yellow; that of old trees is very hard and tough, takes a fine polish, and is used by turners, and as a substitute for box-wood in making mathematical instruments and other articles. Tops of fishing-rods are sometimes made of it. The pith of the young shoots being very light, is generally used to make pith-balls for electrical experiments. Toys for children are also made of it; and few boys are unacquainted with the use of E. branches, from which it has been expelled, for making pop-guns. The E. is very useful as a screen-fence near the sea and in other exposed situations, as it grows with remarkable vigor, and makes great shoots, the destruction of the more tender and less matured parts of which in winter only tends to make it more bushy and useful for shelter. It is readily propagated by portions of its shoots stuck into the ground.—The **SCARLET-FRUITED E.** (*S. racemosa*), a native of the south of Europe and Siberia, much resembles the common E., but has softer and more herbaceous shoots, remarkably large buds, which are conspicuous in winter, and racemes of greenish-white flowers, which are followed by scarlet berries, the racemes of ripe fruit having much the appearance of beautiful pieces of coral. It is a frequent ornament of shrubberies in Britain, and when in full fruit, is almost unrivalled in beauty, but more frequently produces its fruit in cold districts than in those where the milder winter induces it to flower before the spring-frosts are over. The juice of its berries is a powerful sudorific. The **DWARF E.** or **DANEWORT** (*S. Ebulus*), is a rather rare British plant, a coarse herbaceous plant, with fetid smell. The inner bark has been employed in dropsical complaints as a hydragogue cathartic, and is given in the form of a decoction prepared by boiling down 1 oz. of the bark in 2 pints of water till the whole is concentrated to 1 pint. The dose is about 4 fluid ounces. In smaller quantities, it is useful as an aperient in certain chronic disorders. The flowers are white when freshly plucked, but become yellow in drying, and consist of a volatile oil, certain gummy, resinous, albuminous, and saline matters, and are stimulant and sudorific. They are employed in the preparation of *elder flower water* by adding two gallons of

water and 3 ounces of rectified spirit to 10 pounds of the flowers, and distilling off about 1 gallon. It is a good perfume.

White elder ointment is procured by boiling equal weights of lard and elder flowers, and pressing through a cloth. It has an agreeable odor, and is employed as a cooling application to surfaces which are irritable. When the berries are expressed, they yield a purple juice named *elder rob*, which, when diluted with water, is useful in inflammatory and febrile complaints as a cooling drink. It contains malic and citric acids, sugar, gum, &c.

E'LDON, BARON, Lord High Chancellor of England. John Scott, better known as Lord Eldon, was born 4th June 1751, in Love Lane, Newcastle, of obscure but respectable parents. William Scott, his father, began life as an apprentice to a 'fitter,' a sort of water-carrier and broker in coal; later in life, he became a 'fitter' himself, and kept a public-house near the quay, to supply drink to his keelmen on the truck-principle; he engaged also in speculations in shipping and marine insurance. By his various occupations he became wealthy, and died worth about £20,000. John Scott's mother was a daughter of a Mr. Atkinson of Newcastle, and to her, Lord Campbell, in his *Life of Lord Eldon*, traces the talent inherited by her sons William and John. William became Baron Stowell, and was the head for many years of the High Court of Admiralty. See **STOWELL, BARON**.

John Scott was educated under the Rev. Hugh Moises, at the grammar-school, Newcastle, and as a boy gave no promise of his subsequent splendid career. On finishing his education under Mr. Moises, he, on the 15th May 1766, entered University College, with a view to the church; the following year he obtained a fellowship, and in the summer of 1771 won the prize for the English essay, but did not otherwise distinguish himself. A clandestine marriage, into which he entered with a Miss Surtees in 1772, nearly ruined him; however, by the advice of his brother, he returned with his wife to the university. Here, during the year of grace, he lived on his fellowship and gains as a private tutor; and the year expiring without a church living falling vacant, he betook himself to the study of law. In 1776, he was called to the bar. By this time, his wife's friends had become reconciled to her, and made her some provision; and by the death of his father, in the year of his passing at the bar, E. found himself in possession of £3000. On his own and wife's money, he found he could just manage to live, and so settled on the northern circuit. His success on his first circuit was not great; but in his second year his prospects, through the aid of his brother and friends, began to brighten. It was not, however, till 1780 that prosperity could be said to have dawned upon him. A happy chance then occurred of showing both his talents and powers of work. The result was speedy affluence. Business poured in upon him; and by 1787 his practice at the equity bar had so increased, that he was forced to give up the eastern half of his circuit.

With success in his profession, E.'s ambition expanded, and he became political. A silk-gown, and then, through the favor of Lord Thurlow, a seat in parliament, were but steps towards knighthood and the post of Solicitor-general conferred on him by Pitt. From this point, his progress was secure, and effected much in the way in which political lawyers usually succeed. In 1793, he became Attorney-general.

In 1799, the office of Chief-justice of the Court of Common Pleas falling vacant, his claim to it was not overlooked; and after 17 years' service in the House of Commons, he entered the House of Peers as Baron Eldon. In 1801, on the formation of the Addington ministry, E. ascended the woolsack—a post given to him nominally because of his great anti-Catholic zeal, but really because of his part in the intrigue which ousted his old patron Pitt from office. From this time till 1827, with little intermission, E. continued to occupy the woolsack under successive governments. He was in succession Chancellor under Addington, Pitt, and Lord Liverpool; and when, after the two brief administrations of Canning and Goderich, the Duke of Wellington constructed a cabinet, E. again expected the woolsack, and resented his non-appointment to it. His love of office indeed continued to the last, and in 1835, we find him actually in hopes of office under Peel. In 1834, he ceased to speak in parliament. In 1821, E. was made an earl by George IV.; and in the same year, his brother William was raised to the peerage under the title of Lord Stowell. In 1831, he lost by death his wife, his 'beloved Bessy.' His brother William died in 1836. He himself, after outliving almost all his immediate relations, died in his 87th year, January 3, 1838, leaving behind him a fortune of over half a million sterling.

E. is said to have been a man of very winning and courtly manners, and of a handsome, prepossessing appearance. In the circle of his friends he is said to have been irresistible, and probably to the charms of his manner his success in life was somewhat owing. His career amply proves that he was a man of the greatest talent, sagacity, and power of managing men. He was undoubtedly a great lawyer, and his judgments, which have been much praised

for their accuracy, fill a small library; at the same time, he took so long to arrive at them, that he has been charged with having caused more injustice by delay than worse judges by the iniquity of their decisions. For literature, as for art, he had no feeling, and the style of his decisions is generally detestable. He was a great drinker, though drink seems never to have unfitted him for work; and is said, when he went into retirement, to have spent his time over the newspapers and the gossip of old cronies, preferring their company to that of men of refinement and taste. Undoubtedly, the best of him is seen in his private relations. His love of and devotion to 'Bessy' his wife was truly beautiful. As a public man, he is far from estimable. He was a great canter, whose life was a succession of intrigues and duplicities. He was no statesman; his one aim in politics was power, and his name is unassociated with even a single law intended purely for the public good. For forty years, he was a leading enemy of reform and religious liberty. The champion of the church, he never attended on public worship. Without political principles, his whole stock in trade, as a politician, was zeal against the Roman Catholics, which, however, proved enough in the then state of society. He is said to have added parsimony to his other defects; but while various circumstances, besides the amount of the fortune which he accumulated, favor this charge, it is probable that his apparent parsimony rose out of habits formed in his family while he was yet struggling; and it is certain that he was capable of generous actions. See Twiss's admirable book, *Public and Private Life of the Lord Chancellor Eldon*; *Life of Lord Eldon*, by Lord Campbell; *Sketch of the Lives of Lords Stowell and Eldon*, by Dr. W. E. Surtees.

EL DORA'DO (the Golden or rather the Gilded Land) existed originally in the imaginations of the Spanish conquerors of America, whose insatiable avarice loved to dream of richer rewards than those of Mexico and Peru. The Castilians found an imitator in Sir Walter Raleigh, who twice visited Guiana in quest of this fabulous region. The name has at last made for itself an abiding-place beyond the furthest limits of Spanish possession. It indicates a county in the north-east of California, of which the capital, Calloma, stands near the spot where the first discovery of gold was made in that state. The district in question is drained by some of the northern feeders of the Sacramento, which empties itself into the Bay of San Francisco.

ELÆA'TIC SCHOOL. The group of ancient Greek philosophers so called begins with Xenophanes of Colophon, who settled in Elea, a Greek city of Lower Italy (whence the name), and includes Parmenides and Zeno, who both belonged to Elea, and also Melissus of Samos. The most flourishing period of this philosophy falls from 540 to 460 B.C. In opposition to the physical philosophy of the Ionic school, and to the doctrine of Heraclitus (q. v.), who denied all being or existence, the Eleatic philosophers made this conception of pure being, unmixed with all marks or properties derived through the senses, the foundation of all their speculations. As being, one and unchangeable, seemed to them to exclude all plurality and alteration of appearances, they gave up, with remarkable consistency, all attempts to explain scientifically the world as we see it; and the startling abruptness of their simple fundamental principle, taken in conjunction with the opposite doctrine of Heraclitus, was one of the chief causes that led Plato at a later period to attempt a reconciliation between the notions of *being* and *becoming*, or of absolute existence and phenomena.

ELECAMPANE (*Inula*), a genus of plants of the natural order *Compositæ*, sub-order *Corymbifera*, nearly allied to *Aster*. The only important species is the common E. (*I. Helenium*), a native of damp meadows in the middle and south of Europe, rather rare in Britain. This plant was formerly much cultivated for its root, which was used in medicine, and still retains its place in the pharmacopœias, although comparatively neglected. The root has a faint aromatic odor; and a bitter, acrid, and somewhat camphor-like taste. It acts as a gentle stimulant to the organs of secretion, promotes expectoration, and is diuretic and sudorific. It contains a peculiar principle called *Inulin*, which resembles starch, but is deposited unchanged from its

solution in boiling water, on its cooling, and gives a yellowish instead of a blue color with iodine; also another peculiar principle called *Helenin*, or *Elecampane Camphor*, which resembles camphor in some of its properties.

ELECTION denotes, in theological language, the divine act by which certain individuals are chosen to salvation in Christ, and the doctrine of election is the doctrine of 'God's everlasting purpose, whereby he hath constantly decreed by his secret council to deliver from curse and damnation those whom he has chosen in Christ out of mankind, and to bring them by Christ to everlasting salvation as vessels made to honor.' These words, taken substantially from the articles of religion of the Church of England, may be said to represent, in a moderate form of expression, the orthodox doctrine on the subject of election. Besides this form of the doctrine, there is a lower and a higher form of it, which, apart from technical and polemical language, may be said to spring—the one from the supposed subordination of the divine act or purpose to the divine foreknowledge of human conduct—the other from the exaltation of the divine act or purpose into an absolute and arbitrary supremacy, having no relation whatever to human will or conduct. The former of these extremes corresponds to the Pelagian or Arminian doctrine of election, the latter to the hyper-Augustinian or Calvinistic. The Arminian aims to condition or limit the absolute character of the divine act in redemption in some way or another; the Calvinist aims to give to this act the most arbitrary and irresponsible character. The one, while not altogether repudiating a doctrine of election, yet gives such prominence to the human conditions of the elective purpose, as (in the view of Calvinists) to destroy it altogether; the other maintains not only a doctrine of election or predestination, but also the correlative doctrine of reprobation. In the view of the Arminian, salvation is within the choice of the human will; in the view of the Calvinist, the human will is of little or no account—the decree of God is everything—and this decree (which Calvin admitted to be a '*decretum horribile*') absolutely determines some to everlasting life and some to everlasting death.—The separation has its source in the will of God, and not in the moral conditions of mankind.

It is obvious, in the mere statement of such views, how audaciously theology has sought to settle questions beyond all human scrutiny and settlement. In the nature of things, the relations between the divine and human will appear indeterminable; and, notwithstanding all the labor of inquiry devoted to such subjects in the past history of opinion, it cannot be said that any advance of thought has been made regarding them. If the mere logic of the question be kept in view, the Calvinistic opinion has the advantage over the Arminian—setting out, as it does, from the recognition of the divine will as absolutely supreme, and the source, consequently, of all subordinate action—a thought which is in the highest degree logically consistent. But then the moral perplexities which arise out of the practical application of this view, and the ease with which it may be perverted into a fanatical and dangerous error, will always repel many minds from its adoption.

Although the expressions elections, elect, &c., are frequent in Scripture, it cannot be said that what is known as the theological doctrine of election was acknowledged by the Christian Church till the time of Augustine. The Greek Fathers confined their attention almost entirely to questions purely theological—that is to say, relating to the character and constitution of the Godhead. Gnosticism and Arianism, the two main forms of heretical opinion before Augustine, indicate the channels into which theological discussion had previously run. It was not till the Latin mind had taken up this discussion, that the more practical question of the relation of the divine and human will in redemption came to receive special attention. The controversy between Pelagius and Augustine in the beginning of the 5th c., brought out almost all the aspects of the question which have since, at successive epochs in the history of the church, risen into renewed prominence. The contest between the Scotists and Thomists in the 14th c. between the Arminians and Calvinists, and, within the Roman Church, between the Jansenists and Molinists in the 17th c., are recurring expressions of the same radical conflict or divergency of opinion. The spirit of modern theology is adverse to the logical disputations engendered by such discussions, and finds its more appropriate and useful field of labor in the province of critical and historical inquiry.

ELECTION COMMITTEE. See PARLIAMENT.

ELECTION LAWS. See PARLIAMENT.

ELECTION OF SCOTTISH PEERS. See PARLIAMENT, PEER.

ELECTORS, in the German empire, were those great princes who had the right of electing the emperor or king. In the earliest times, under the Carolingians, the crown was hereditary; afterwards, Germany became formally an elective monarchy, but the



Elecampane (*Inula Helenium*).

zin, which resembles starch, but is deposited unchanged from its

election was practically almost limited to the reigning family. Under the Emperor Charles IV., the right of election became limited to the holders of the highest ecclesiastical and civil offices, some of which gradually became hereditary, and connected with territorial principalities, as in the case of the Hohenstaufens and of the Dukes of Bavaria, Saxony, Swabia, &c. Thus there arose seven electors, those of Mayence, Treves, and Cologne (as being the chief primates and chancellors of the empire), the electors of the Palatinate and of Bavaria long exercising the right by turns, and the electors of Brandenburg, Saxony, and Bohemia. From 1400 to 1708, the right was never exercised on the part of Bohemia, but otherwise no change took place from the middle of the 14th c. to the peace of Westphalia. By the peace of Westphalia, an eighth electorate was established, Bavaria and the Palatinate being each allowed the full right; and in 1692, a ninth was added, that of Brunswick-Lüneburg, but not without resistance by the electors and states of the empire, so that the new electorate was not fully recognized till 1710. In 1777, the number was again reduced to eight, the Elector Palatine inheriting Bavaria. The electors held a high and very peculiar position in the German empire. The Golden Bull describes them as 'the seven pillars and lamps of the holy empire.' They had certain important rights and privileges. They were leagued from the year 1338 for the maintenance of their freedom of election against the pope. They had royal dignities, only not the title of Majesty. The territories belonging to their electorates were indivisible.

The peace of Luneville, in 1801, made a great change in the German empire, and subsequent changes took place during the times of French ascendancy, which issued in the dissolution of the ancient German empire. The title of Elector, used by the Prince of Hesse-Cassel, an electorate which was added along with other new electorates in 1802, was the last relic of the old dignities, and was merely nominal even before 1866.



Electoral Crown.

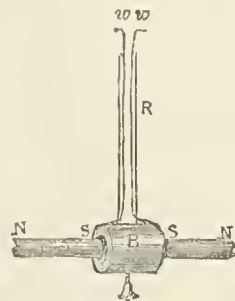
ELECTORAL CROWN, or, more properly, CAP, was a scarlet cap, turned up with ermine, which was worn by the electors of the Empire. It was closed with a demi-circle of gold, covered with pearls, and on the top was a globe with a cross on it, also of gold.

ELECTRIC BELLS. The ringing of bells is not a recent application of electricity, but it is only a few years since electric bells have been placed in many public and private buildings instead of the well-known bell-hanging arrangement with wires and cranks. The arrangement required to ring an electric bell, or system of bells, is simple. Some form of galvanic battery, requiring little attention, is placed in any convenient place, and from it an insulated wire with the necessary branches is conducted to the various rooms, thence to perhaps as many bells, and finally back to the battery to complete the circuit. Each single bell is rung in this way: beside it is fixed a break consisting of a small electro-magnet, by which a spring is attracted and released in rapid succession, as long as the automatically interrupted current of electricity is passing. On this spring a small hammer or knob is so placed that it strikes the bell as it oscillates to and fro. In every room which communicates with a bell there is a 'press-button,' or little spring, by which the current of electricity is put off or on as we may wish. It acts in the same way as if we were to cut the wire to stop the current, and then bring the ends of the wire together again to continue it, and so ring the bell. It will continue to ring only as long as we hold the ends together.

ELECTRIC CLOCK. The regularity of the clock depends, as is well known, on the action of the pendulum, which is isochronous—that is, has the property, within certain limits, of describing long and short arcs in the same time. See PENDULUM. The pendulum, however, left to itself, would, in consequence of the resistance of the air, and of the spring on which it hangs, soon come to rest. An impulse must therefore be given it occasionally, to keep it going. This impulse need not necessarily be exactly the same, for though it might cause the pendulum to make a longer swing at one time than another, at the time of oscillation would not differ. In ordinary clocks, these impulses are given by a heavy weight, and are transmitted to the pendulum through the wheel-work of the clock.

No moving power can be more steady than gravity, or less likely to tax the isochronism of the pendulum, but its action on the clock is limited by the distance through which the weight descends, so that the weight must be periodically wound up, to keep gravity in play. The trouble of winding, though small, still leaves room for the wish that a clock might be constructed going for long periods without external help. Such an instrument the electric clock professes to be; but an independent electric clock is not trustworthy as a timekeeper, and all that electric clocks are used for is to copy the time of a good gravity clock. This work the electric clock does to perfection. The electric clock was invented by Bain, an Edinburgh clock-maker in 1840, and his ideas, though improved

and modified, still form the basis of electric clock-making. In the ordinary clock, it is the clock that moves the pendulum; in Bain's clock it is the pendulum that moves the clock. As the construction of the pendulum is the only part connected with electricity, we shall confine our notice to a general description of the pendulum action. The lower part of the pendulum arrangement is shown in the figure. The bob B consists of a bobbin of insulated copper wire, and is hollow in the center, the wires *w, w* from both ends ascending the pendulum rod R (the lower part of which alone is seen), and are in metallic connection respectively with the two springs from which the pendulum hangs. Two magnets or bundles of magnetic rods, NS, N'S', are fixed at either side of the bob, and are of such dimensions that the hollow bob in its oscillation can pass a certain way over each without touching. The magnets have their like poles turned towards each other. The two springs of the pendulum rod are in connection with the two poles of a galvanic battery. The wire connecting one of them is made to pass round by a break (not shown in the fig.), worked by the pendulum rod. When the pendulum is made to move, say towards the right, it shifts a slider, so as to complete the connection between the poles of the battery. The current thereupon descends one of the wires of the pendulum, passes through the coil of wire forming the bob, and ascends by the other. In so doing, it converts the bob into a temporary magnet, the south pole towards the right, and the north pole towards the left. In this way, the south pole of the bob is repelled by the south pole S of the right-hand magnet; and its north pole is attracted by the south pole S' of the left-hand magnet, so that from this double repulsion and attraction both acting in the same direction, the bob receives an impulse towards the left. Partly, therefore, from this impulse, and partly from its own weight, the pendulum describes its left oscillation; and when it reaches the end of it, it moves the slider so as to cut off the battery current, and then returns towards the right, under the action simply of its own weight. On reaching the extreme right, as before, it receives a fresh impulse; and thus, under the electric force exerted during its left oscillation, the motion of the pendulum is maintained. So long as the electricity is supplied, will the pendulum continue to move.



Electric Pendulum.

The current required is exceedingly weak, and Bain considered that it could be sufficiently excited by a plate of copper and a plate of zinc sunk into the ground, and acted upon by the moisture usually found there. This earth-battery as he called it, was expected to act steadily for years; but the result proved far otherwise, for the soil not unfrequently dried up, leaving no trace of electrical action. The imperfection of the battery has led to a strong prejudice against these clocks—stronger, certainly, than they merit. Practice has, however, established that a clock driven by an electric pendulum under no control is not to be trusted, and clocks of this kind, so far at least as this country is concerned, are entirely abandoned. The next important step in perfecting the electric clock was made by Lewis Jones (patented 1857). All his clocks are ordinary gravity clocks. The standard clock is not an electric clock at all, but its pendulum makes and breaks contact in the battery circuit which controls the copying clocks. These last, though driven by weights, have Bain's pendulums, and the currents transmitted by the standard clock keep them oscillating in exact accordance with it, so that the standard clock and copying clocks have their pendulums always at exactly the same point in their oscillations. The copying clocks are adjusted to keep nearly the time of the primary, and the margin of error is wholly removed by electric control.

There are now two rival systems of electric clocks in this country—one invented by Wheatstone, patented 1869, and 'exploited' by the British Telegraph Company; the other invented by Ritchie, clock-maker, Edinburgh (patented 1872). Wheatstone's primary clock is a gravity clock with a pendulum bob like Bain's with fixed magnet or magnets coincident with the arc of the pendulum. When the bob is driven by the weights of the clock from the one end to the other, a current is induced in the coil of the bob, according to the well-known principles of Magneto-electricity (q. v.). When the bob returns, a current is created in the opposite direction. The copying clocks or dials have a mechanism similar to Wheatstone's step-by-step telegraph, and each oscillation of the primary pendulum, by generating a current, drives them one step onwards. The pendulum of the primary clock, along with the magnets, is a magneto-electric machine driven by the weight of the clock, and moving all the copying clocks. The work the pendulum has to do, however, interferes with its isochronism, and hence the primary clock has to be kept under the control of a standard clock by an ingenious contrivance.

Ritchie takes advantage of the important feature of Jones's system, viz., that of having a standard clock free from all electric impulses, an ordinary astronomical clock whose pendulum only makes and breaks contact in a galvanic circuit. Thus all the perfection of clock-making is fully utilized.

The standard clock, as in Jones's system, is placed in circuit with the copying clocks. But here his system differs. Instead of having weights, and a train of wheel-work in the copying clocks, he has simply a Bain's pendulum driving an escapement (also patented) similar to Bain's original clock. The mechanism is thus simple and cheap, and each clock has got in its pendulum a store-house, so to speak, of individual energy under electric maintenance and control, and cannot without a grave accident be put out of order. It is inferior to Wheatstone's system in having battery power to maintain. But this does not cost much. From 3 to 5 Daniell's cells will work a copying clock in any part of the same town, and need only to be renewed once in six months. Ritchie's system is in some respects more trustworthy than Wheatstone's. The delicate action of the step-by-step motion is liable to accidental derangement. Now Ritchie's sympathetic clock has a heavy pendulum, and can be used in public dials to withstand even the action of the wind on the hands. Again there is no need of a magneto-electric clock and a standard clock. The standard clock does all. The perfect success of Ritchie's system has been proved in Edinburgh and elsewhere. In Edinburgh, several public clocks on the sympathetic system have been in action for some years, and have not varied a second. The success of Ritchie's system is much indebted to an invention of Edward Sang, by which the length of the suspending spring of the standard pendulum can be altered, and the rate of the clock regulated without stopping it. Ritchie in 1864 also patented a magneto-electric system which, however, he has never worked.

ELECTRIC FISHES. See **ELECTRICITY, ANIMAL.**

ELECTRIC LIGHT. All known methods of generating electricity can produce light of greater or less steadiness and brilliancy. Cavallo, in his treatise published a century ago, refers to a light, different from the electric spark, produced by frictional electricity. A needle or wire presented to an insulated person, at the distance



Fig. 1.

of about one inch from his body, while he is actually rubbing the tube, will, he says, exhibit a lucid pencil of rays, seemingly issuing from the point and diverging towards the person; and other like experiments are described by Watson and other early writers. Light from battery electricity was first discovered by Sir Humphry Davy at the Royal Institution, London, in 1810, when, on the continuity of a current from 2000 cells being broken, a brilliant light was seen. To this the name of the 'voltaic arc' was given, and the points where the current was broken were termed 'electrodes.' Fig. 1 represents an early and simple arrangement for producing this light. The carbon-points P, N, are fixed into hollow brass rods, which are connected with the battery by wires entering at the binding screws s, s. The rods slide in the heads of the glass pillars A, A'. The wires from the battery being connected, the points are made to touch, and are then withdrawn a line or two, when a dazzling light appears, approaching the light of the sun in purity and splendor. Its intensity prevents the naked eye from examining its form, but this may be ascertained by projecting the images of the points on a screen, when they are seen as shown in the figure. The light is partly due to the incandescence of the tips of the carbon, and partly to an arch of incandescent particles extending from the one to the other. The positive pole is brightest and hottest, as may be proved by intercepting the current, when the positive pole continues red for some time after the negative pole has become dark.

During the maintenance of the light, a visible change takes place in the condition of the poles, and the positive pole becomes blunt by the loss of particles of carbon. The wasting away of the poles renders the distance between them too wide to allow of the passage of the current, and the light is thus suddenly extinguished, until again renewed by contact and removal. The heat of the *voltaic arc* is very intense. Quartz, the sapphire, magnesia, lime, and other substances equally refractory, are forced by it into a state of fusion. The diamond when placed in it becomes white hot, swells up, fuses, and is reduced to a black mass resembling coke. The electric light can be produced in a vacuum, and below the surface of water, oils, and other non-conducting liquids, and is thus quite independent of the action of the air.

In 1820, Oersted proved the identity of electricity and magnetism; but it remained for Faraday, in 1831, by his great discovery of induced currents, to render practicable the application of electricity to the production of good artificial light. It was not, however, until 1853 that the magneto-electric machine was actually applied to the purpose; and in 1857 the first great practical trial took place, when Faraday had the satisfaction of seeing his conception carried into effect. This trial of Holmes' machine resulted in the electric light being introduced into the South Foreland lighthouse on the 8th December 1858, and later the light was adopted at Dungeness. The French government adopted the light for two lighthouses near Havre in 1863.

The problems to be solved in the production of electric light, are to supply a constant and equal current (which battery electricity does not yield), and to provide a form of electrode which will not cause the light to blink or go out by wasting away. The first generating machines were 'magneto-electric,' revolving coils in front of permanent steel magnets (or contrariwise, revolving magnets in front of coils), but some later machines are 'dynamo-electric,' based on a discovery simultaneously made by Werner Siemens, Varley, and Wheatstone, that by revolving coils in front of soft iron electro-magnets, the residual magnetism in the iron would gradually be augmented, dynamic force being thus converted into electricity. The currents created by machines of either sort are alternate, but where, as in the case of some forms of lamp, the current must proceed in one direction, the alternate currents are made continuous by the use of a commutator. There are a large number of machines in use for generating currents for producing the electric light; and for details reference may be made to Shoolbred's *Electric Lighting* (1879).

The invention of methods of using this powerful light received a great stimulus in 1876, when Jablochhoff's 'candle' was in-



Fig. 2.

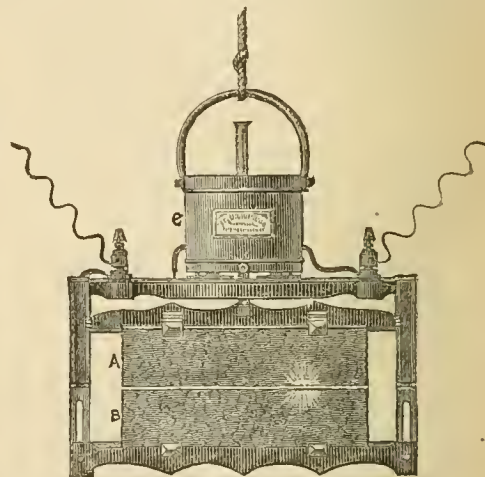


Fig. 3.

vented. The general form of this electrode is shown in fig. 2, where C, D, are carbon pencils, $\frac{1}{8}$ inch in diameter, separated by B, a body of kaolin or plaster of Paris. The current passes alternately up each carbon, forming the arc at A, the alternate currents causing each point to be in turn positive and negative, and thus to waste equally. The 'Wilde candle' has no separating medium, the inventor having found that the light would run to the points spontaneously. By means of a magnet introduced into the circuit, the points are drawn separate when the current passes, and the light springs into existence. Should the light go out, the pencils fall together, and as the circuit is thereby completed, the points are at once separated again and the light is re-established. Rapiéff's candle has the same merit of spontaneous lighting and regulation.

One of the most successful endeavors to solve the question of regulation of the light produced from the 'arc' is the Wallace lamp, shown in fig. 3. Here A and B are carbon plates, the upper plate being controlled by the magnet C, by which it is drawn up on the passage of the current, and the light springs out at the point between the plates that occupies the proper position. When this point wastes, the light travels to another, passing thus slowly backwards and forwards along the carbons. It is claimed for this lamp that it will burn continuously for 100 hours. The Serrin, Lontin, Rapiéff, and Brush lamps are different arrangements for the production of light by means of the 'arc,' the adjustment of the carbons being effected by an automatic electro-magnetic regulator. Of these the Brush lamp is perhaps the most successful, combining simplicity of structure with wonderful steadiness of light. The 'differential electro-magnet,' for keeping the carbon points at the required distance, and the 'cut-out,' for closing the

circuit when the lamp is not burning, are special features in its structure.

The above-described lamps and candles produce light in the form of the 'voltaic arc,' but of late the so-called *incandescent* lamps have acquired a great importance. They are simply applications of the well-known principle that the heating effect of a current in any part of a circuit is proportional to the resistance of that part. Edison, Lane, Fox, Maxim, and Swan have constructed such lamps which differ only in details. A thin carbon filament, inclosed in a hermetically sealed vacuum tube, so as to prevent oxidation, is made luminous by the passage of a strong current along it. By arranging a number of these lamps both in series and in multiple are, beautiful effects of illumination may be produced. The light is peculiarly mild and beautiful, not very intense, and admirably suited for such purposes as lighting rooms and halls, for which in general the arc-light is too intense. From recent comparisons, however, it would appear that economically the incandescent lamp is inferior to the arc-light; and both are still too expensive to be applied at all generally. Bearing in mind the rapid advance made within the last few years, we have every reason to look for even greater progress in the near future. Especially valuable as a means for comparing various systems in use, and thereby suggesting improvement, are the Electrical Exhibitions which have been such an attraction both in Paris (1881) and in London (1882). The motors (gas or steam engines as the case may be), the magneto-electric machines or dynamos, and the lamps, were there collected under one roof, and might be carefully studied in their mutual relations.

As mentioned above, one great disadvantage in electric lighting is its great cost as compared with other means of illumination. At present we depend mainly upon the energy stored up in coals as our source of power. The problem of successfully utilizing tidal energy and that of running water, though long ago suggested by Sir William Thomson and others, have not been solved. The Faure accumulator, an improved form of Planté's secondary battery, seems to open up a new way of arriving at this desired result; and the construction of a really effective secondary battery that could be charged by a dynamo worked by, say, a waterfall, would no doubt be a great step towards the general application of electricity to the affairs of life. For detailed information on electric lighting, see Urquhart's *Electric Light* (1880).

ELECTRIC LOOM. Bonelli's electric loom is an ingenious attempt to substitute for the costly perforated cards of a Jacquard loom an endless band of paper covered with tinfoil, on which the required pattern is traced with a varnish, rendering the parts thus covered non-conducting. This band of paper passes under a series of thin metallic teeth, each connected with a small electro-magnet, and these magnets act on a series of small pistons. According as these teeth come in contact with the metallic surface or the varnish, so is a series of holes in a perforated plate closed or opened when an electric current is passing. The perforations in the plate correspond to the punched holes in the cards of a Jacquard, and act in the same way upon its needles. See JACQUARD LOOM.

ELECTRIC RAILWAY. Seeing that dynamo-machines (see MAGNETO-ELECTRIC MACHINES), and electromotors (see section on Electro-Magnetic Machines in MAGNETISM) are now in such a state of efficiency, it becomes an important practical question how far they can be utilized as a means of transmitting power to a distance from one point to another. In 1872, it was suggested by Professor Blyth, that magneto-electric machines might be employed to utilize the water-power, at present running to waste, of mountain torrents, by first employing these torrents to generate current electricity by means of magneto-electric machines, and then transmitting that current, by means of wires, to drive an electro-magnetic engine wherever it was wanted. The idea has taken practical shape in the hands of Sir William Armstrong and Siemens; and the power of distant waterfalls has been transmitted and made to drive sawmills, and do other useful work. In 1881, Siemens showed at Berlin and at Paris a tramway-car driven by one of his machines, the current being got from a similar machine worked by a stationary steam-engine in the neighborhood of the tramway route. In this case the drawing current was conducted to the electro-motor placed below the car, either by means of the rails, or by means of conductors having sliding contact with two parallel conductors placed along the route, to which the current from the dynamo-machine was led. In the same year, a beginning was made of a tramway or railway for cars propelled by electricity, at Portrush, in the north of Ireland. An electric boat was tried successfully at London 1882. Tricycles lighted and propelled by special tricycle electro-motors, have also been used.

ELECTRIC TELEGRAPH. See TELEGRAPH.

ELECTRICITY, the name used in connection with an extensive and important class of phenomena, and usually denoting

either the unknown cause of the phenomena or the science that treats of them. Most of the phenomena in question fall under the three chief heads of Frictional Electricity, Galvanism, and Magneto-electricity. The present article is confined to the first.

Historical Sketch.—Thales, about 600 B.C., refers to the fact that amber (Gr. *elektron*), when rubbed attracts light and dry bodies. This was the only electric fact known to the ancients. The science of electricity dates properly from the year 1600 A.D., when Gilbert of Colchester published a book, entitled *De Arte Magnetica*, in which he gives a list of substances which he found to possess the same property as amber, and speculates on magnetic and electric forces. He is the inventor of the word electricity, which he derived from the Greek word *elektron*, amber. Otto von Guericke, burgomaster of Magdeburg, in his work *Experimenta Nova Magdeburgica* (1672), describes, among his other inventions, the first electric machine ever made, which consisted of a globe of sulphur turned by a handle, and rubbed by a cloth pressed against it by the hand. Hawksbee (1709) constructed a machine in which a glass cylinder, rubbed by the dry hand, replaced Guericke's sulphur globe. Grey and Wehler (1729) were the first to transmit electricity from one point to another, and to distinguish bodies into conductors and non-conductors. Dufay (1733—1745) showed the identity of electrics and non-conductors, and of non-electrics and conductors, and was the first to discover the two kinds of electricity, and the fundamental principle which regulates their action.

Between the years 1733 and 1744, much attention was given in Germany to the construction of electric machines. Up to this time, notwithstanding the inventions of Guericke and Hawksbee, the glass tube rubbed by a piece of cloth which Gilbert first introduced, was used in all experiments. Boze, a professor at Wittenberg, taking the hint from Hawksbee's machine, employed a globe of glass for his machine, and furnished it with a prime conductor. Winkler, a professor at Leipsic, was the first to use a fixed cushion in the machine. The Leyden jar was (1746) discovered accidentally at Leyden by Muschenbroek; but the honor of the discovery has been contested also in favor of Cuneus, a rich burgess of that town, and Kleist, canon of the cathedral of Camin, in Pomerania. Franklin (1747) showed the electric conditions of the Leyden jar, and (1752) proved the identity of lightning and electricity by his famous kite experiment. This last was performed with the same object about the same time, and quite independently, by Romas of the town of Nérac, in France. In 1760, Franklin made the first lightning-conductor. Canton, Wilke, and Zepinus (1753—1759) examined the nature of induction. Ramsden (1768) was the first to construct a plate-machine, and Nairn (1780) a two fluid cylinder-machine. The electrophorus was invented by Volta in 1775, and the condenser by the same electrician in 1782. In 1786, Galvani made the discovery which led to the addition of the new branch to the science which bears his name, and which now far exceeds the older branch in extent and practical value. See GALVANISM. In 1787, Coulomb, by means of his torsion-balance, investigated the laws of electric attraction and repulsion. In 1837, Faraday published the first of his researches on induction. Armstrong, in 1840, designed his hydro-electric machine.

Fundamental Facts.—Under the head CONDUCTORS (q. v.) it is stated that bodies which do not conduct electricity, or non-conductors, are capable of electrical excitation from friction, and are, in consequence, termed electrics, and that conductors not so affected are called non-electrics. The *fundamental principles* of electricity are illustrated by the *electric pendulum* (fig. 1). A glass tube bent at right angles, so as to project horizontally, is placed on a convenient stand. On the hook in which its upper end terminates, a cocoon thread is hung, to the end of which a pith-ball is attached. The ball is thus doubly insulated by the glass and the silk thread. If a tube of glass be rubbed by a dry silk handkerchief, and brought near the ball, the ball is at first briskly attracted, and then as briskly repelled; and if the tube be then moved towards it, it moves off, keeping at the same distance from it. The ball being so affected, or charged, as it is called, a rod of shell-lac or of sealing-wax, after being rubbed with flannel, attracts it, if possible, more briskly than before, and again sends it off exactly as the glass had done. If the glass tube be now again taken up and rubbed a second time, if necessary, the ball will act towards it as it did towards the sealing-wax.

The same series of attractions and repulsions would have taken place if we had begun with the sealing-wax instead of the glass tube. We interpret this experiment in the following way. When glass is rubbed with silk, and the silk removed, it is charged with what is called positive electricity. The ball is attracted by it, and becomes on contact also charged with positive electricity, and is then repelled. When sealing-wax is rubbed with flannel, and the flannel removed, it becomes charged with negative electricity, which is the counterpart of positive electricity, for it attracts the positively charged ball, and communicating its own electricity to it, finally repels it. From such an experiment as this we

conclude that bodies electrified either positively or negatively, attract neutral bodies and bodies affected with electricity of an opposite name to their own, but repel those affected with electricity of the same name; and that electricity can be communicated from one body to another by contact. For positive and negative (written also + and -), the terms vitreous and resinous are also employed, as glass and resin are the typical substances from which they may be obtained. Contact is not the only way in which electricity is communicated. We find, when we deal with larger bodies than the pith-ball of the experiment, and sometimes even with it, that the passage of a spark between two bodies without contact communicates the electricity of the one to the other. The part played by the rubbers in the above experiment must not be overlooked. The silk handkerchief employed to rub the glass assumes the resinous or - electrical state, and the flannel rubber of the sealing-wax the vitreous or +. This cannot, however, be clearly shown, as the experiment is performed, for the rubbers are in each case tightly

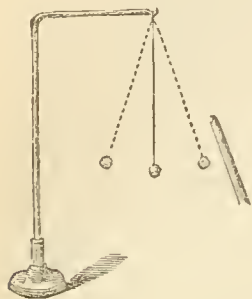


Fig. 1.

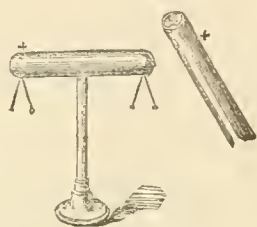


Fig. 2.



Fig. 3.

embraced by the hand, which neutralizes their peculiar electricity. We can perform our fundamental experiment in a way clearly to show this. Let us take for our rubbing and rubbed surfaces two india-rubber balloons inflated with air (such as children play with), and hold them tightly one in each hand. They may be in all respects perfectly alike. Let us then rub them briskly on each other, and then hold the rubbed sides closely together. On bringing the two in contact near the pith-ball, it remains indifferent to them; but if we pull them apart, and put one on each side of the pith-ball, the ball plays actively between them, being attracted and repelled by each in turn. The fact of no attraction occurring when the balloons are together, show that in the rubbing both electricities are generated in equal quantities, for they neutralize each other when brought near; and the fact that the balloons must be separated proves that all electric phenomena take place in an electric field, with positive electricity at its one termination, and negative electricity at its other. The non-conducting nature of the india-rubber prevents the electricities finally neutralizing in contact, and disappearing by the hands when apart. It is also instructive that as force is exerted and work is done in pulling them apart, we have the equivalent of that work in the form of an electric field capable of doing work. The motion of the pith-ball, and the heating caused by the tiny sparks which charge it, are evidences of the truth of the statement. It is again worthy of note that both balloons appear exactly alike, and yet they assume opposite electricities. That there must be some difference may be drawn from the next paragraph.

In most cases of friction, the nature of the rubbing and rubbed surfaces determines the kind of electricity which each assumes. Thus, if glass be rubbed by a cat's fur instead of silk, its electricity is - instead of +. In the following list, each body, when rubbed by any one preceding it, is negatively electrified; by any one succeeding it, positively: cat's fur, smooth glass, linen, feathers, wood, paper, silk, shell-lac, ground glass. When two pieces of the same material are rubbed together, the colder or smoother becomes positively excited. Metal filings rubbing against a plate of the same metal determine - electricity in themselves, and + electricity in the plate. When a white silk ribbon is rubbed by a black one of the same texture, the white one becomes +. A plate of glass becomes + when a stream of air is directed against it from a pair of bellows. The friction caused by steam of high tension issuing from a narrow pipe develops electricities in the steam and pipe which depend on the material of the latter. This fact has been turned to advantage by Armstrong in the construction of a boiler electrical machine of immense power.

Induction.—Free electricity has the power of inducing the bodies in its neighborhood to assume a peculiar electrical condition; this is exhibited in the following simple way: A brass cylinder, rounded at both ends (fig. 2), is insulated on a glass pillar. Two pith-balls, hung by cotton threads, are attached at either

extremity. When a glass tube is briskly rubbed, and placed within a few inches of the end of the cylinder, the balls at each end diverge, showing that each pair is charged with similar electricities. When the glass tube is withdrawn, the balls hang down as before, so that the electrical excitement of the cylinder is merely temporary, and dependent on the proximity of the excited tube. If, where the balls are apart, a *proof plane*, consisting of a small disc of gilt paper insulated at the end of a glass rod (fig. 3), be made to touch the end next the tube, and then transferred to an electrometer, the electricity is found to be -; if the same be done at the other end, it is +. The nearer end of the cylinder is thus induced by the + electricity of the glass to assume the negative electric state; and as no - electricity can be excited without as much + electricity, we find the other end positively electrified to the same extent. It appears, besides, from the positions taken up by them, that both electricities observe the same attractions and repulsions as the bodies affected by them. This action of the electricity of the tube inducing in the cylinder this peculiar electrical condition, is called induction; and the cylinder in this state is said to be *polarized*—that is, to have its poles or ends like a magnet, each having its similar, but relatively opposite force.

If the hand touch the cylinder, the balls next the tube diverge further than before, and the other two cease to be affected. In this case, electrically speaking, the cylinder is a portion of the ground, for the hand and body are conductors; the ground is thus brought nearer, more - electricity appears, and the + electricity is lost in the spark with the hand. The - electricity is kept fixed in the part of the cylinder opposite the tube by the + electricity of the latter; and when the hand is first removed, and then the tube, it causes the balls at both ends to diverge permanently. We thus see that electricity can be produced and insulated in conductors by the action of free electricity on them. The + electricity of the further half of the cylinder (fig. 2) is as free and insulated as if no - electricity existed within it. This is shown by placing a cylinder near the first, forming a continuation of it, as it were, without touching, when the second cylinder, under the induction of the + electricity of the first, is thrown into the same state as the first. This second can induce the same state in a third (fig. 4), and so on. As the excited tube is withdrawn, the whole series return to their natural condition without being in any way permanently affected. The moment, however, it is again brought near, there is manifested at the further termination of the last a + electricity, which exerts the same influence there as if a portion of the electricity of the tube had been actually communicated or transferred to it.

The air intervening between the tube and the cylinder is termed the *dielectric*, for it is through it that the electric action is propagated. In proof of this, we have only to place a cake of shell-lac between the tube and the cylinder (fig. 2), when the polarity of the cylinder will rise higher than before, as would be shown by the further divergence of the balls; and if this or a similar experiment be conducted with sufficient care, we find that the inductive action varies in amount for each non-conductor. Induction, therefore, we have reason to conclude, is not the direct action of one body on another, but an action transmitted through, or possibly residing in, the medium between them. In further proof of this, Faraday, who was the first to examine the function of the dielectric in induction, has shown that the action takes place through air in curved as well as in straight lines, which implies the action of an intervening medium. The relative powers of different substances in facilitating induction, are termed by this philosopher their *specific inductive capacities*. The following table by Sir W. S. Harris gives the specific inductive capacities of the more important non-conducting substances, taking that of air as unity:

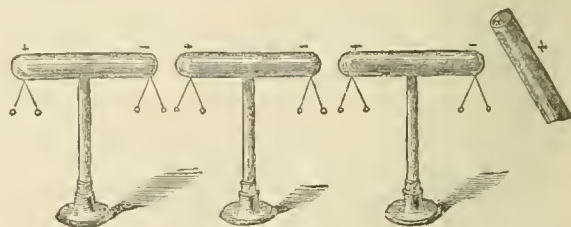


Fig. 4.

Air, 1.00; resin, 1.77; pitch, 1.80; bees'-wax, 1.86; glass, 1.90; sulphur, 1.93; shell-lac, 1.95; india-rubber, 2.8. All gases, whether simple or compound, have the same inductive capacity, and this is not affected by temperature or density. If a large plate of metal be placed between the glass tube and the cylinder, the polarization of the cylinder instantly vanishes, for the induction is diverted by it into the ground.

Theory of Induction.—Faraday, taking for granted that the dielectric is the essential medium of induction, suggests that the molecules of air and other dielectrics are conducting, but that they

are insulated from each other. We have already seen (fig. 4) that by induction, part of the electricity of an insulated body can be in effect transferred to a surface at some distance from it, without any loss experienced by the exciting body. If, now, we could imagine a series of insulated cylinders diverging in all directions from the glass tube in fig. 4, we have reason to expect that the whole of the electricity of the tube would be in effect transferred to their outer extremities without loss of electricity to the tube. To prove that such would be the case, Faraday took a pewter ice-pail, 10½ inches high, and 7 inches in diameter, and insulated it, placing the outside of it in a conducting connection with the knob of a gold-leaf electroscope. An insulated ball, charged with + electricity, was then introduced into it without touching. The pail was then subjected to polarization, the — electricity being on the inner, and the + electricity on the outer surface. The divergence of the leaves increased as the ball was lowered, until it sunk three inches below the opening, when they remained steadily at the same points. The ball was lowered till it touched the bottom, and communicated its charge to the pail, when the leaves remained in the same state as before, showing that the + electricity developed by induction on the outer surface was exactly the same in amount as that of the ball itself. He then altered the experiment so as to have four insulated pails inside each other, and the effect on the outmost pail was in no way altered. Here the action of the air between the pails was in effect the same as that of the pails themselves, and if the molecules of air were insulated conductors like these, they would have acted in no way different from what they did. The action of the molecules of air, in certain circumstances, appears to favor the idea that they are individually conducting. The discharge of electricity by spark through the air, shows that they can be forced to act as conductors; and the currents which proceed from points highly charged with electricity, appear to indicate that they can be attracted and repelled like the pith-balls of our first experiment.

Conductors, according to this theory, are bodies whose molecules have the power of communicating their electricities to each other with great ease, whilst non-conductors are those whose molecules only acquire this power under great force. Wheatstone has shown, as we shall afterwards see, that facility of discharge is not perfect even in the best conductors, as time is needed for its



Fig. 5.



Fig. 6.

propagation, and it has been found that the terminal laminae of non-conductors between two charged plates become penetrated with opposite electricities, which indicates the slow progress of conduction. The molecules of conductors and non-conductors, therefore, have the same power of mutual discharge, but in very different degrees, so that a good non-conductor may be regarded as an excessively slow conductor.

Potential, Density, Tension, Capacity.—Some idea of the meaning of the word *potential* may be got from the following comparison. Suppose we have a supply of water with a certain head, to fill an elastic bag: when the water is admitted, the bag will swell till the elasticity of the bag is equal to the head of water, and then the flow will cease. The potential is the head of water or elasticity of the bag, so many feet high, or so many pounds per square inch. The capacity of the bag is usually the amount it holds, but capacity in an elastic bag is a shifting quantity, and we must use the term in this way if we wish to compare the capacity of two elastic bags—viz., the ratio of the water it holds to the head that filled it. Thus, a bag holding 10 gallons, with a head 1 foot, would have a 10 times greater capacity than a bag holding 10 gallons with a head 10 feet; for if the first were pressed by a head of 10 feet, it would hold 100 gallons, the resistance of the bag being supposed to increase with its contents. Now, let us take a somewhat similar electric problem. An insulated ball is connected with a magazine of energy, ready to make electricity flow when occasion offers, such as a galvanic battery. Let the + pole of a gigantic battery be connected with the ball, and the other pole with the ground, electricity will flow to the ball till the air between the ball and the ground presents an electric reaction equal to the potential of the battery. The charge of the ball taken with reference to this potential gives the capacity of the ball. So much, then, for a popular view of these two words. The potential of a body, or

any point in the field, is defined thus—viz., the amount of work that would be expended in bringing a small quantity, a unit of + electricity, from an infinite distance to the body or point. If the body is positive, the work would be expended; if negative, the work would be done on the body and the potential —. The said unit of + electricity will always move from a point where the potential is high to one where it is lower; in other words, electricity will always flow between two points where there is a difference of potential, and will cease to flow when that difference ceases. If E be charge, V the potential, C the capacity, then $C = E \div V$. From the definition of potential just given, what we have called the potential of the battery in the preceding illustration is in reality its *electromotive force*, or the difference of potentials of its poles. As these



Fig. 7.



Fig. 8.

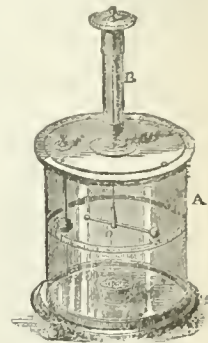


Fig. 9.

are alike in power, but different in sign, and as the difference of two quantities of unlike sign is their sum, the electro-motive force is twice the potential of one pole. If the charging line be withdrawn, the ball will be in all respects as if charged by an electric machine. The battery having, so long as it acts, an unlimited supply of electricity, its electro-motive force remains the same; but when balls charge one another, the potential falls just as when a limited supply of water has its head reduced when made to run into another vessel. Potential, then, must be estimated by the resistance of the field, or the work value of the unit of charge. The charge being the same, the potential rises with the smallness of the body, or the thickness of the dielectric. Density is the quantity of electricity on a unit of surface, and *tension* is the strain which Faraday supposes to exist in molecules of a dielectric when charged. Tension is commonly used in this country and abroad for potential, though our best writers never use it now in this sense.

Distribution of Electricity.—We might take it almost as a self-evident truth, that the greater the surface over which electricity is diffused, the less is its electric potential at any particular point, and so we are taught by experiment. When two equal balls are insulated, and a charge is given to one of them, and then communicated to the other by contact with the first, it is found that both equally divide the charge, but that the potential of the electricity of each is one half of that of the originally charged ball. When a watch guard-chain is charged and laid on the plate of an electroscope by means of a glass rod, the gold leaves diverge most when the chain lies in a heap on the plate; and as it is lifted up, the leaves approach each other, showing that as the exposed surface of the chain increases, the electric potential of each part diminishes. The reason of this is obvious. Let us begin with one ball with a certain charge, then take another equal ball and impart half the charge to it by making the two touch. A spark will be seen at the charge of the second ball. The quantity in both is still the same, but energy has been lost by the spark, and the heat generated by the spark is the measure of the loss. If we continue to add ball after ball until we have a very large surface, the quantity is the same as at first, but energy has been squandered in the sparks of each additional ball, and so the potential is lowered.

Experiment teaches us, that electricity is exhibited only on the surfaces of conductors; this is shown by the apparatus represented in fig. 5. A brass ball is suspended by a silk thread, and covered with two hemispheres, which can be held by insulating handles, and which exactly fit it. A charge is then communicated to the ball so compounded. When the hemispheres are withdrawn, they are found to take away all the electricity with them, not the slightest charge being left in the ball. The same fact is exhibited by a hollow ball placed on a glass pillar, with a hole in the top large enough to admit a proof plane to the inside. When charged, not the faintest evidence of electricity is found on the inner surface, however thin the material of the ball may be. The thinnest metal plate, when under induction, shows opposite electricities on its two faces. We learn from these and numerous other experiments, that *electricity is only found on the outer surfaces of conductors in an envelope of inappreciable thickness*. This

fact is quite in keeping with Faraday's theory of the action of dielectrics. Within a conducting body we cannot expect electricity, for the moment it appears in it, the particles communicate their electricities to each other, and the electric state ceases. In a dielectric they cannot communicate, and the charge remains. Hence the charge at the conductor only appears at the junction of a conductor and dielectric.

We are also taught by experiment that the distribution of electricity on the surface of insulated conductors is influenced materially by their form. An electrified ball, for example, exhibits the same density all round, for the resistance is sensibly the same on all sides of it. When, however, a conducting body is made to approach near enough to it, the density of the electricity is found to be greater on the side on which the approach is made. This is proved by the aid of a proof plane and an electrometer. When work is done in drawing away the proof planes from the charged body, its potential, as tested by the electrometer, is proportional to the density of the charge at the point where it touched. The reason of this unequal distribution is obvious, from the fact that the potential of the ball must be the same at every point. If, therefore, the resistance at one side be less than at another, the density there must be greater to maintain equality of potential. The disturbance of equal distribution here spoken of holds true only for short distances; the disturbing body, for instance, in the case under consideration, has to be brought very near before any inequality in the distribution of electricity on the ball becomes manifest. It is to this concentration of electricity on the side of the approaching conductor that we owe the electric spark; and it is as we near the striking or sparking distance that this disturbance is revealed. The concentration or fixing of electricity on the side of the thinnest and best dielectric, is particularly illustrated in the Condenser (q. v.) and Leyden jar, whose action depends upon it; but in these the dielectric must be very thin to secure decided effect. When a conductor somewhat in the form of a prolate spheroid (fig. 6) is charged, and the electric density of the several parts tested by the proof plane, it is found to be least at the thickest part, and to increase towards either end; and the difference is found to be all the greater as each end becomes more and more pointed. It is found likewise that the electric density on a point is so great with a considerable charge as to destroy the dielectric condition of the air, the particles of which become electrified, and carry by convection the charge of the point to surrounding conductors. We therefore learn that *electricity concentrates on points and projections*. A similar reasoning with regard to the relations of potential resistance and consequent density bears here as in the previous case. It may be here remarked that the density of charge at any point regulates the amount of tension at that point on the molecules of the dielectric. The constraint which they experience in being charged, and which Faraday calls tension, can only be carried to a certain limit. When that is reached, the molecules are forced to be conducting, and the tension ceases.

Electrometers and Electroscopes.—These words are generally taken as synonymous; electroscopes, however, should be applied to the instruments which give evidence of electrical potential without giving the exact measure of it; and electrometers to such as show both. Of late years, immense progress has been made in the construction of delicate electrometers, chiefly to meet the demands for such in the working or testing of submarine cables. Sir William Thomson's Quadrant Electrometer and his Absolute Electrometer, in point of exactness and delicacy, are a hundred-fold in advance of previous instruments. We shall here, meanwhile, describe the common forms of electric indicators. Fig. 7 represents the *quadrant electrometer*. It consists of a conducting-rod, generally of box-wood or brass, with a gradual semicircle attached above, in the center of which is a pivot for the rotation of a straw carrying a pith-ball at its outer end. It is used for a charge of high potential, such as that of the electric machine. When placed on the prime conductor of the machine, the whole becomes charged with + electricity, and the ball is repelled first by the electricity of the rod, and then by that of the prime conductor, the height to which it rises being seen on the semicircle. This is not an electrometer in the strict sense of the word, for although it tells us, by the straw rising and falling, when one potential is greater or less than another, it does not tell us by how much, the conditions of its repulsion being too complicated for simple mathematical expression. It can show us, however, by the indicator standing at the same point, when the electric potential of the machine is the same at one time as another.

The *gold-leaf electroscope* is a handy instrument for estimating roughly medium potentials. One of the best of its forms is shown in fig. 8. A glass ball about four inches in diameter, rests on a brass tripod, and its neck, about an inch in diameter, is enclosed by a brass collar fixed with shell-lac. A brass plate, with a hole of $\frac{1}{4}$ th of an inch in diameter in the middle of it, can be screwed air-tight into the collar. Before it is so fitted, a brass rod, $\frac{1}{4}$ th of an inch in diameter, is fixed by shell-lac or sealing-wax into the

hole in the middle, so as to be perfectly insulated from it. The upper end of the rod ends in a brass ball, and the lower end is filed on each side, to allow of two strips of gold-leaf, an inch in length, being attached to it. Before the plate and leaves are finally fixed, the interior of the ball is thoroughly dried, by passing hot dry air into it, so that the ball contains no moisture to carry away the charge of the leaves.

When the plate is screwed to the collar, there is no communication between the included and external air. The insulation of the leaves is complete; and they keep their charge, in dry weather, for hours together. When the instrument is used, it may be charged directly, by contact being established with the ball and the body whose electricity we would examine, or a charge may be carried to it by the proof plane, when the leaves diverge according to the charge communicated. When we would ascertain

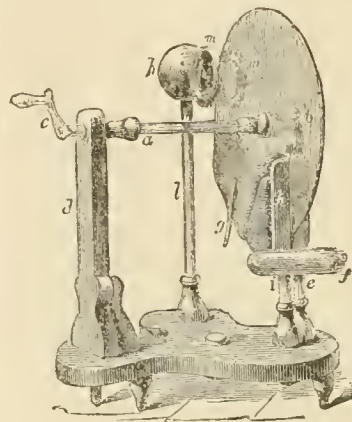


Fig. 10.—Electric Machine.

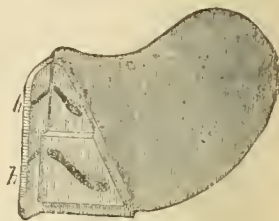


Fig. 11.

simply the kind of electricity with which a body is charged, we proceed in the following way. A glass tube is rubbed, and brought into the neighborhood of the brass knob; the leaves diverge by induction, and, when so diverged, the knob is touched with the finger, and the leaves fall to their original position, for they are then out of the line of action. In this state, —electricity is fixed by the action of the + electricity of the tube on the side of the knob next it, and the corresponding + electricity is lost in the ground. When the finger is removed, the + electricity is cut off, while the — electricity remains in the knob; and its presence is manifested by the leaves diverging permanently after the removal of the tube.—If, now, a positively electrified body be brought near the knob, it draws away the — electricity from the leaves, and they consequently fall in; but if a negatively electrified body be brought near, it sends the — electricity more to the leaves, so that they diverge further. We are thus enabled to distinguish between a + and a — charge. But it may be asked, why not charge the electrometer immediately with the glass? There are two difficulties in the way of this. If the glass is powerfully electrified, it gives too great a charge; and if feebly, contact between the knob and the glass cannot be effected, although its electricity acts powerfully by induction. We therefore bring the glass rod near the electrometer, and when the leaves diverge sufficiently, we touch the knob with the finger, and withdraw first the finger, then the rod, and the leaves diverge as before. For the more delicate use of the gold-leaf electroscope, see CONDENSER.

Coulomb's Torsion Balance (fig. 9) has played an important part in examining the laws of electric forces. A glass canister A, is placed on a wooden frame, and is covered above by a plate of glass or wood; in the middle of this plate a round hole is cut over which is fixed, by wooden fittings a long glass tube B, having the graduated rim of a circle attached at its upper end. A circular plate, resting on this rim, closes the upper end of the tube; and when it is turned round, a mark upon it tells the number of degrees through which it has been moved. A cocoon thread or very fine wire is tied to a hook in the center of the lower side of this plate, and thence descends to the body of the canister. It carries below a collar of paper or other light material, in which a needle of shell-lac is adjusted, having a disc of gilt paper placed vertically, or a gilt pith-ball at its one end, and a counterpoise at its other.

When the plate above is moved through any number of degrees, the needle below, impelled by the torsion of the thread, comes to rest at the same number on the scale below. This last consists of a strip of paper divided into degrees, pasted round the cylinder at the same height as the needle. In the cover of the canister there is another opening, for the admission of a ball insulated at the end of a rod of shell-lac, and which, when supported by the cover, is on a level with the paper disc of the needle. When the instrument is adjusted for observation, the mark on the upper plate and the

paper disc stand each at the zero-points of their respective scales, there being of course no torsion in the thread. The ball is removed, to receive a charge from the body under investigation, and is then placed in the cylinder, when the disc is first attracted, then repelled. Suppose that the disc be driven 40° , as shown by the lower scale, from the ball, and that the upper plate has to be moved in the opposite direction, through 160° of the upper scale, to bring it back to 10° , the total degree of torsion is $160^\circ + 40^\circ = 200^\circ$. If the ball and disc be now discharged, and another charge be given to the ball, which requires 250° of torsion to place the disc at 10° , we have the relation 200 to 250, as that of the repulsive forces of the two charges, for the amount of torsion in degrees is proportional to the twisting force. Without entering further into detail, we may state the two laws that Coulomb established by this instrument: *The intensities of the mutual repulsion or attraction of two invariable quantities of electricity of the same or different names, are in the inverse ratio of the squares of the distance at which these act. The intensities of the total repulsive or attractive action of two electrified bodies placed at an invariable distance, are proportional to the products of their electric charges.*

Electric Machine.—In the tube of glass and silk rubber of which we have made frequent mention, we have the embryo of the electric machine, viz., a body which, when rubbed, is positively electrified, and its rubber negatively. The first requisite we should expect in a machine of this nature is a large surface, to give a great amount of electricity. But there is another already casually referred to: glass being a non-conductor, the electricity formed on its surface has not a combined action, so that some arrangement is necessary to collect it, and render it available—to act, in fact, as its conducting reservoir. This portion of the machine is denominated the *prime conductor*.

The rubbed surface of the electric machines is either a cylinder or plate of glass; hence we distinguish them into cylinder machines and plate machines. The former, from their more compact form, are the more manageable; and the latter, from both sides of the glass plate being rubbed, are the more powerful forms of the instrument. The description of Winter's plate machine (fig. 10) will be quite sufficient to show the general requirements and construction of electric machines. It is one of the best existing forms of the machine. The glass plate is turned on the axis *ab* by means of the handle *c*. The long end of this axis, consisting of a glass rod, moves in the wooden pillar *d*, and the other rests in the wooden head of the glass pillar *e*. The plate is thus completely insulated, and little loss of its electricity can take place through its supports. The two rubbers, one of which is shown on the outside, in fig. 11, are triangular pieces of wood, covered with a padding of one or two layers of flannel, enclosed in leather, and they present a flat hard surface to the glass, so that friction between it and them takes place in every part. They are placed in a wooden frame on each side of the plate, and the pressure is regulated by metal springs, fixed to the outside between them and the frame. Before use, they are covered with an amalgam of mercury, zinc, and tin, which is made to adhere with the aid of a little grease, and which increases immensely the production of electricity. The surfaces of the rubbers are therefore conducting, and are made to communicate by strips of tinfoil with the *negative conductor*, *f* (fig. 10). To limit the electric field in the neighborhood of the negative conductor, or, which is the same thing, to keep the potential of the glass from rising too high, so as to cause a discharge back into the rubbers, each rubber has a non-conducting wing fastened to it, which is made of several sheets of oiled silk, kept together by shellac varnish, beginning at the rubber with several, and ending with one or two sheets. When the machine is in action, electrical attraction makes them adhere to the plate; but when it is out of action, they may be kept up by a split pin *g*. As the plate turns, the rubbers are kept in the frame by their ledges *h*. The whole framework of the rubbers and negative conductor is supported by the short glass pillar *i*, so that it can be insulated when required. The prime conductor *k*, is a brass ball insulated on the long glass pillar *l*, and to prevent the edges of the ball at the junction dissipating the electricity, the pillar enters the ball by a trumpet-shaped opening. The collection of the electricity from the glass is made by a row of points placed in the grooves, inside of the two wooden rings, *m, m*, which are attached on each side of the plate to a piece of brass projecting horizontally from the ball of the conductor. The grooves are covered with tinfoil, which conveys the collected electricity to the ball, and the points are kept out of the way of injury by not projecting beyond the grooves.

A section of the ball of the prime conductor is shown in fig. 12. There are four openings into it: the lower one for the head of the supporting pillar, the one at the right for the attachment of the collecting apparatus; the one at the left for the stalk of a small brass ball; and the upper one for admitting the lower end of a large wooden ring, removable at pleasure. This last forms the peculiar feature of Winter's machine. It consists of an iron wire bent into the shape shown in the figure, carefully covered all

round with polished wood, and communicating by a brass pin at the foot of the stalk, on which it stands with the prime conductor. To receive the sparks from the machine, an appendage (fig. 13) termed the spark-drawer is provided. This consists of a wooden pillar of the same height as the prime conductor, in the head of which a brass rod slides, with a large flat ball at the end and a small ball at the other. All the fittings of the machine are of wood, no metal being used but for the prime and negative conductors. On using the machine, it is first necessary to connect the negative conductor by a wire or chain with the ground. As the plate is turned, — electricity is developed on the rubbers, and led to the negative conductor; and + electricity is formed on the glass, which is collected by the points, and transferred to the prime conductor. If the negative conductor be insulated, the electric field would be limited to the space between the negative and prime conductors; but when uninsulated, the floor and walls of the room form part of it, and the field now lies between the prime conductor and any surrounding object. If —



Fig. 12.



Fig. 13

electricity is wanted, the negative conductor is insulated, and the prime conductor connected with the ground, when sparks of — electricity are given off by the negative conductor.

The various forms of *electric discharge* through the air, or, as it is termed, *disruptive discharge*, can be well seen with Winter's machine. The negative conductor being connected with the ground, with a two-foot plate, we may observe them in the following order. On turning the plate once or twice, a faint snapping sound is heard, and, when the room is darkened, a flickering spark is seen to be thrown out from the two-inch ball projecting from the prime conductor, which has the form of a bush, without leaves, with trunk, branches, and twigs, about ten inches in height. This is one form of what is called the *brush discharge*.

Its general direction is horizontal, or not much inclined from it, but it turns to the hand or other flat conductor brought near it. If it be received on a ball, its various branches concentrate on it. If the brush proceed from the end of a brass rod, instead of from a ball, it becomes very much diminished in size, and resembles a brush of feathers. The brush discharge, though apparently continuous, has been found by Wheatstone to consist of a series of successive brushes. When discharge is effected from a point, a star or *glow* of light marks its termination, while strong currents of air proceed from it, which are strong enough to blow away the flame of a candle. These currents accompany more or less the various forms of the brush discharge. The particles of air thus carry away the charge from a point to surrounding conductors, and hence a point is said to discharge itself by convection. If we connect the brass rod of the spark-drawer with the ground, or the negative conductor, and bring the flat ball opposite to the small ball on the prime conductor, straight brilliant sparks pass between them so long as the distance does not much exceed two inches. Beyond that distance, the sparks become somewhat crooked, and at about four inches the charge begins to take the form of a brush. If, now, the ring be placed in the conductor, the sparks again pass with readiness, and the brush does not again take place till the ball of the spark-drawer is eleven or twelve inches off. The long sparks thus obtained with the aid of the ring are decidedly crooked or forked, with strongly marked lateral branches, which become all the more marked as they lengthen. It would thus seem that the spark has a tendency to break up into branches. When the striking distance is small, this is not perceptible; it is then straight and undivided. As the distance increases, it is crooked, with well-marked offshoots; and when the distance is too great, it splits up entirely into a bush or brush.

The ring is merely an extension of the prime conductor, and keeps down its electric density till a sufficient quantity of electricity is collected, which can keep together in the form of a spark. Something similar occurs when water is driven out in

spray from a small syringe, and in a jet from a large one, under an equal head. All the forms of disruptive discharge are accompanied with the peculiar electric odor which arises from the production of Ozone (q. v.).

We may now make a short reference to the experiments performed by the machine, illustrative of the general properties of electricity. A wooden head with hair on it illustrates, when placed on the prime conductor, electrical repulsion, by the hairs standing on end. A spoon containing ether is held so as to receive a spark from the projecting ball, when the inflammation of the ether illustrates the heat of the spark.

A man standing on an *insulating stool* (a stool with glass legs), with one hand on the conductor, can send sparks, with his other hand, to everything and everybody about him. This illustrates communication of electricity by contact. A few pith-balls are enclosed in a glass jar, having its top and bottom of metal—the former in connection with the prime conductor, and the latter with the ground, when the pith-balls, by their rising and falling, show the attraction of unlike, and the repulsion of like electricities. A gas-jet may be lighted by a person wholly unconnected with the machine, and standing some eight or ten feet from it. If the person so situated holds the blade of a knife or other point over the gas-burner, at a distance only short of touching, at each long spark from the machine, a small spark passes between the blade and the burner, and this ignites the gas. The reason is as follows: The body of the person in question is electrified negatively by the extensive prime conductor of the machine acting inductively. When the spark passes, the electric tension of the ring falls, and the negative electricity of his body must return to the ground, and taking the easiest route, causes the spark in question. This is quite similar to what is known in thunder-storms as the *back-stroke*. A person in a prominent position, under a highly charged cloud, experiences a violent, sometimes fatal shock at the same time as a flash of lightning, although the flash was not at all near him.

Induction Machines.—In frictional machines there are two ways in which energy is expended—in friction, and in drawing away the two excited and attracting surfaces. Much of the force expended in friction results in heat, and only a fraction (sometimes a small one) in electricity. Of that spent in drawing away which is the less considerable, the whole results in increased potential. Machines are therefore very desirable where, with a small initial charge, a constant supply of electricity may be got by the latter method. The Electrophorous (q. v.) is a machine of this kind, and has been known since 1776, and Nicholson's doubler, another, since 1788. But the action of these has only been on a small scale. Lately, however, induction machines of great power have been made, the powers of which quite eclipse the older frictional machines. The best known of these is Holtz's machine (invented 1865), which will suffice to show the general construction of such.

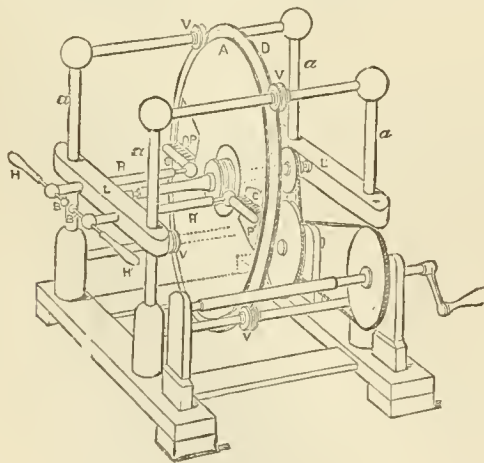


Fig. 14.

Holtz's machine consists of two glass discs, A and D (fig. 14), of very thin glass carefully covered over with shellac varnish. The one D, is somewhat larger than the other, A. The plate D, is stationary, and is kept in its place by four circular grooved rings of vulcanite V, V, V, V, placed in horizontal glass rods, which themselves are supported by upright glass pillars a, a, a, a. By this method of support the plate D may be turned round to rest in any position. The upright glass pillars rest on the sole of the instrument, and pass through two solid blocks of vulcanite L, L', which serve to knit the whole frame well together. In L two brass rods R, R', are fixed, which, on the end next the revolving plate A, each support a horizontal row of teeth facing the plate A; and on the other, two sliding rods with vulcanite handles H,

H', which can be adjusted to distance, and which form the poles of the machine. The revolving plate A is fixed in a vulcanite spindle, the ends of which move in the blocks L, L'. This plate is made to revolve at great speed by a handle and multiplying belts. It is unbroken, and revolves as close to the plate D as to keep clear of it. The stationary plate D, which is shown in fig. 15, has two holes cut in it like those at P and P'. The lower edge of the one opening, and the upper edge of the other, lie

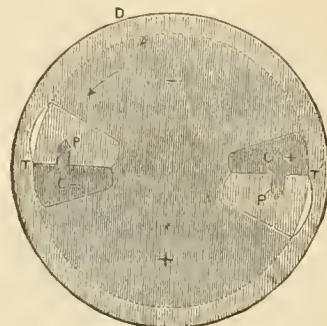


Fig. 15.

along the line of the teeth of the two poles already mentioned. On the side of the plate D, away from the revolving plate, are stuck two coolings or armatures of varnished paper C, C', and from those protrude two tongues, also of varnished paper, slightly turned into the openings of the fixed plate, and towards the revolving plate. The size of the revolving plate is shown in fig. 15 by a dotted circle.

Suppose now we have to work the machine, and let us take one whose plate (a usual size) is two feet in diameter. We first of all put the two poles B and B' in contact—we see that the teeth lie opposite the line TT', and that the revolving plate revolves in the opposite direction to the tongues P, P', or which is the same thing, that the revolving plate passes an opening before coming to the row of teeth.

We next take a sheet of vulcanite about the breadth of an armature, and rub it with cat's skin (making it —), and hold it close to the armature C, and then make the plate revolve. We at once know if the machine is working by a rushing sound. We now gradually withdraw the two balls at the poles, and a rush of straight, bright but not very dense sparks leap across between the two for the first two inches or so. When the distance becomes greater than that, brushes proceed from each end, and there is a fine purple glow in the central space. If we withdraw the poles to 5 or 6 inches, two well-defined brushes are seen, one at each pole, the larger and most fully formed being the + brush at B'. The — brush at B' is much smaller. If now the hand be placed on one pole and the other hand presented to the other, sparks of two inches are got which produce a most painful stinging sensation on the hand, but cause no twitching at the joints of the arm. When the poles are at a distance of half an inch, paper and other combustible substances may be kindled by the spark. On examination it is found that C, or the armature first touched by the excited vulcanite, is — (as shown in fig. 15), and that the other is +; that B, which is opposite C, is —, and B' +. If the machine be viewed in the dark, long + brushes are seen at P and at the tooth opposite it, and — stars at P' and at the tooth opposite or attached to B'. The plate is + below—that is, after passing the negative armature; and — above, after passing the + armature. If the motion of the plate be reversed, the electricity of the poles changes sign or ceases altogether, when the machine must be excited anew. If kept moving in the same direction, allowed to rest only for short intervals, it may be kept in action for hours together without renewed excitement.

In order to get long dense sparks, a small Leyden jar is hung on each of the rods R, R', with their outer coatings in metallic contact. With these condensers a splendid series of long, intensely brilliant sparks of 6 inches long are got, each accompanied with a snap painfully loud, quite eclipsing anything shown by friction machines. The condensed spark does not kindle paper, but gives a very powerful shock.

We have not space to enter into the theory of Holtz's machine. Indeed it may be questioned if, in all points, its action has been fully accounted for. We would only say that reciprocal action of the armatures on each other is common to all induction machines, and is quite similar to Siemens and Wheatstone's principle for magneto-electricity (see MAGNETO-ELECTRIC MACHINES).

Leyden Jar.—This is a glass jar (fig. 16), with a coating of tin-foil pasted carefully inside and out, extending to within a few inches of the mouth. This last is generally closed by a wooden stopper, through which passes the stalk of a brass knob or ball, surmounting the whole. The connection between the inside

coating and the ball is completed by a chain extending from the stalk to the bottom of the jar. If this jar be put on an insulating stool, so that sparks can pass from the prime conductor of a machine to the knob, when the jar is thus insulated, one or two sparks pass, and then the charge seems complete, for no more sparks will follow, though the action of the machine is continued; or if they do, they are immediately dissipated from the knob in a brush discharge. If then, however, the knuckle of the experimenter be brought near the outer coating, sparks begin again to pass freely; and for every spark of + electricity that passes between the machine and the knob, a corresponding spark of the same name passes between the knuckle and outer coating. This continues for some time, and then the jar appears to be again saturated. It is now said to be fully charged. The outside of the jar can, in this state, be handled freely, and if it be still on the insulating stool, so may also the knob, although, when the hand first approaches, it receives a slight spark. But if, when the experimenter has one hand on the outer coating, he bring the other hand to the knob, before it can reach it, a straight, highly brilliant



Fig. 16

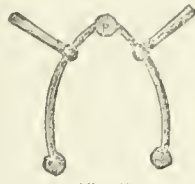


Fig. 17.

spark passes between the knob and his hand, and he experiences a shock of great violence. If he try the same thing again, a feeble spark and shock again ensue, and the jar is now thoroughly discharged. As it is highly inconvenient, if not dangerous, to discharge the jar through the body, *discharging tongs* (fig. 17) are used for that purpose, which consist of two brass arms ending in balls, and moved on a hinge by glass handles.

A very instructive experiment may be made when the coatings are fitted to the jar so as to be removed at pleasure. After the jar is charged, it is put on an insulating stand. The inside coating is lifted out by the knob, and a slight spark is got by the hand in doing so. The jar is now taken up by one hand, and the outside coating is removed by the other, and, as before, another feeble spark is got. The whole is now built up in inverse order and discharged, when the spark is nearly as brilliant as when it is discharged at once without such dissection. From this it may be argued that the charge of the jar lies in the glass and not in the coatings, and that it is likely that in all cases it is in the dielectric the charge resides; that the conductors, which are usually looked upon as the seat of the charge, are merely the limiting surfaces or exponents of it.

A portion of the total charge may reside in them, but no more than is found on two similar contiguous dielectric surfaces. Taking this for granted, it is easy to explain the action of the Leyden jar. The electrifying power of the charging machine is exerted on two dielectrics—the glass of the jar and the air—the external limit in both cases being the surrounding objects which constitute the ground. The action on the air through the inside coating or the knob is quite similar to what we find in the case of anybody to be charged. The action through the glass is peculiar, because we are shut out from it. The limits of this action are the inside surfaces of the inside and outside coatings. The air charge we participate in as we move in it. We are, however, quite external to the action on the glass; but if we could move about in it between the coatings, we should find things there exactly similar, so far, at least, as kind of action is concerned, to what we find in charged air. Seeing that the glass of the jar is a thin and good dielectric, and the air much thicker and more difficult to polarify, the charging power of the machine is exerted for the most part in the glass, the polarization in the air being comparatively slight. Assuming electricity to be a polarization of molecules, the electricity of the jar resides thus in glass, and to a much less extent in the air. The potential at the inner coating is the same as that at the knob, for any connected system of good conductors must be at the same potential. We judge of potential by the air charge, and thus we take the potential at the knob as the potential at the inner coating. The spark got from the knob of the insulated jar is small compared with that of the charging machine, and as sparking distance is, generally speaking, proportional to potential, the potential of the jar is much below that of the charging machine. Thus, a *Leyden jar is a contrivance for accumulating large quantities of electricity at a low potential*. The thinner the glass, the greater will be the accumulation of electricity, but the feebler will be the potential of the jar. When the

electric field is limited, as in the glass of the Leyden jar, it is sometimes said to be *bound*, as distinguished from the *free* charge of an ordinary air field.

When the knob of the insulated jar is touched, a spark is got, and if the finger be then removed to the outer coating, another spark, but of the opposite name, is obtained, and the knob is again prepared to give a spark, and this alternating process may be continued till the jar is emptied. When the inner coating is touched, the outer coating becomes insulated, and thus the potential always shifts to the insulated coating with an opposite name to what it had before. Each spark obtained by the finger in going from the one to the other consumes so much of the energy of the charge, and so the potential is gradually lowered. When the jar is discharged by the tongs, the charge of the dielectric glass is thrown into the dielectric air. The particles of the glass, though more easily electrified than those of air, having a higher specific inductive capacity, offer a much greater resistance to discharge than those of air.

At the same stage of polarization, the air gives way, while the glass still keeps polarized. Hence a jar with glass only a fraction of an inch in thickness can give rise to an air-spark of several inches; besides this, the charge in the glass is somewhat uniformly distributed. In the air, with the tongs, the force of the charge is concentrated on a certain region of it, and the breaking down of the conductive resistance of the air is more easily effected. The feeble *residual* spark from the jar, after the first main discharge, is due to what is called *electric absorption*. Somehow, the electricity given to a dielectric is not immediately available when a circuit is offered, the dielectric taking some time to recover itself. This is observable in all solid dielectrics, but no trace of such action is found in air.

The sparking or *striking distance* of the jar indicates the potential of the charge. The quantity may be measured by the turns of the charging machine. It is found that when the same quantity is given to two jars, one double the other in point of covered surface, the striking distance of the large jar is only half that of the small jar; and that to charge the large one so as to obtain the same length of spark, twice the quantity must be given. If two jars be taken of the same size, and one of them be charged, we find that, on connecting their outside coatings, a spark passes when their knobs are brought together, and that, when now the double jar is discharged, the spark is only half as long as was got from the single jar discharged directly. The quantity discharged finally in the double jar was the same as in the single jar, but the potential was half. The spark occurring at the participation of the charge accounts for the loss of potential.

For great power, large surfaces are necessary. This can be obtained either by constructing a large jar, or by uniting several small jars together so as to act as one. The latter method is pref-

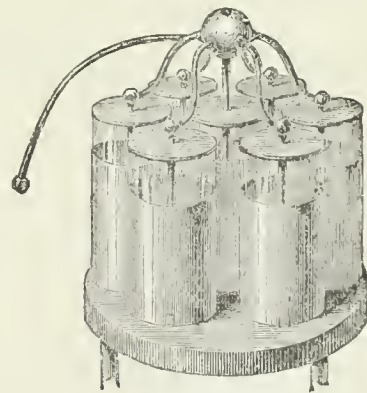


Fig. 18.

erable, as we can vary the surface according to the number of jars employed. A combination of small jars united together as one is called an *electric battery*. A very convenient form of electric battery is shown in fig. 18. The knobs of each jar communicate with a large central one by means of arms of brass moving on hinges, and the outer coatings are put on in conducting connection, by being placed on an insulated stool covered with tin-foil. The interior coatings are conveniently charged by a long projecting arm from the central knob, and the exterior ones by connecting the stool with the knob of the unit jar, or by a wire with the ground. Any jar can be thrown out of action by throwing back its arm.

By discharging the Leyden jar or electric battery through particular channels, we obtain some beautiful illustrations of the power of electricity. When the discharge is effected through thin wires of gold or platinum, the heat accompanying its passage is so great as to dissipate them in vapor. The expansion of the air

caused by the spark is shown by the *electric mortar*. This is a wooden mortar with two wires entering air-tight at the opposite sides of the breech, with a small wooden ball fitting closely in the muzzle. The spark passing between these wires in discharge causes a sufficient expansion of the air within the mortar to drive the ball to some distance off. When the discharge is made through gunpowder, it tosses the grains violently about, but causes no ignition; when, however, it is retarded by introducing an imperfect conductor, such as a wet string, into the circuit, the gunpowder is fired. When the discharge is made through glass by two points pressing against its opposite surfaces, a small hole is drilled into the glass.

Velocity of Electrical Discharge.—The velocity of electricity is found to vary with the nature of the circuit to the extent, indeed, of its inductive embarrassment (see TELEGRAPH). Thus, in air-lines of telegraph it is greater than in sea-cables. Wheatstone was the first to determine the velocity of electricity in an insulated copper wire stretched in air. He did this by the device of a revolving mirror. Any one who takes a mirror in his hand and makes it revolve, sees that objects are apparently displaced by it, and that the reflected image describes an angle the double of that of the mirror. If, while the small mirror rotates at 50 turns a second, the image of a spark should show a displacement of 90° , we know that the mirror has moved through 45° , and the time during which this takes place is $\frac{45}{360}$ of $\frac{1}{50} = \frac{1}{3600}$ of a second. If the duration of the spark, then had been $\frac{1}{3600}$ of a second, we should have seen its image move through 90° . The eye, however, during this time would not have been able to discern any difference between the beginning and the end of the spark, so that the 90° would have appeared as one arc of light. Examined in this way, however, the spark of a machine and of a Leyden jar were seen as if the mirror had been at rest. He arranged a Leyden jar circuit of half a mile with three breaks in it, two near the coatings, and one in the middle of the half mile, and had these breaks placed nearly side by side, so that the sparks at them, when discharge took place, could be seen together in the revolving mirror. He found that all three sparks had a duration of $\frac{1}{34000}$ of a second, and that the middle spark occurred so far behind the other two as to indicate a velocity of 194,000 miles per second in the wire.

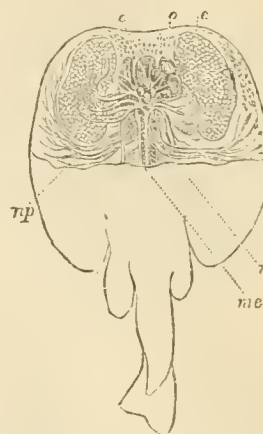
Electric Theories.—There are two theories which have played an important part in the history of the science—the two-fluid theory of Dufay, and the one-fluid theory of Franklin. According to the former, matter is pervaded with two highly elastic imponderable electric fluids—one, the vitreous; the other, the resinous. These are supposed to repel themselves, but attract each other. Neutral bodies give no evidence of their presence, for they are there neutralized the one by the other; but when by friction or other operation the fluids are separated, each body observes the attractions and repulsions of the fluid it happens to have. According to the latter, there is only one electric fluid which repels itself, but attracts matter. Friction determines a gain of the fluid to the positive, and a loss to the negative body. Faraday's theory of electric induction by contiguous molecules appears to be gaining ground. It explains satisfactorily how conductors and non-conductors are alike in kind; how the charge on a conductor can only reside at the boundary of the conductor and non-conductor, or—which is the same thing—the surface of the conductor; how the charge resides in the dielectric; how the polarity of the galvanic circuit is effected; how a battery current originates in and effects chemical decomposition, and how the velocity of discharge is dependent on the conformation of the circuit (see ELECTRICITY, THEORY OF). Professor Clerk Maxwell's classical work, *Electricity and Magnetism* (1873), gives to Faraday's views a mathematical significance and comprehensiveness hardly contemplated by the great philosopher himself.

ELECTRICITY, ANIMAL. In this article we shall notice (1) the electricity developed by the so-called electrical fishes; (2) the electric properties of muscle and nerve; and (3) the electric phenomena of membranes and glands.

1. Although the peculiar powers of the torpedo and of the gymnotus were well known to the ancients, the first scientific discovery in this department of electricity was the determination of the electrical character of the shock of the torpedo by Walsh in 1772 ('Of the Electric Properties of the Torpedo,' *Phil. Trans.* 1773). From that date to the present time, the electric organs of certain fishes, which will be immediately mentioned, have been made the object of special study by some of our greatest anatomists and physiologists, amongst whom may be named John Hunter, Galvani, Rudolphi, Knox, Valentin, Pacini, Matteucci, Goodsir, and Jobert de Lamballe, who has published a special work, entitled *Des Appareils Electriques des Poissons Electriques* (Paris, 1858), accompanied by a magnificent volume of Plates.

The species of electrical fish which has been the longest known, is the *Raja torpedo*, or electric ray, which has much the appearance of a skate. It is common in the Bay of Biscay and in the Mediterranean, but is seldom met with on the shores of Britain. It grows to a considerable size, and is often above 80 lbs. in weight.

It is now usually regarded as not a true ray, but as constituting a distinct genus, to which the terms *torpedo* and *narcine* have been applied by different naturalists—the latter name being derived from the Greek word *narke*, which was given to it by Aristotle. The electric organs or batteries are placed on each side, in the spaces between the pectoral fins, the head, and gills. See TORPEDO. Each battery consists of a number (varying according to the age of the animal) of hexagonal prisms, which extend perpendicularly between the dorsal and abdominal surfaces, and present



Electrical Apparatus of Torpedo;

e, the electric organs; o, hair; me, spinal cord; o, optic nerve; np, pneumogastric or eighth nerve; n, spinal nerves

somewhat of a resemblance in shape and arrangement to the cells of a honey-comb. Four nerves, which are branches of the fifth and eighth cerebral pairs, go to each battery; and the nervous center of the electrical apparatus is, therefore, the *medulla oblongata*. Several species of *narcine* are known, all of which possess the electric property.

The ordinary rays and skates possess an organ in the tail which closely resembles the electric organ of other fishes, but its function is still doubtful; and in opposition to the view of its electric nature, it may be mentioned that while Dr. Starke (to whom the discovery of this organ is due) found it in the tail of every species of true ray, both Professor Goodsir and M. Robin ascertained it to be wanting in the tail of the *torpedo*.

The *Gymnotus electricus*, or electrical eel, is little inferior in celebrity to the *torpedo*. It is common in all the streams which flow into the Orinoco, and is generally procured from Surinam. It is usually three or four feet in length, but may reach a length of six feet. The whole of its viscera lie close to the head, and the anal aperture is only two inches behind the mouth; all the rest of the body inferiorly is occupied by the electrical apparatus, which consists of four batteries—viz., two on either side, and one above the other—the uppermost or dorsal being the larger. These batteries consist of a number of piles placed horizontally in a direction from head to tail; and from this circumstance, as well as from their peculiar structure, they were compared by Redi to galvanic troughs. The number of these piles in the greater battery, is from thirty to sixty; in the lesser, from eight to fourteen. These batteries are supplied by about 224 pair of nerves on each side, derived from the inferior or motor roots of the spinal nerves.

Humboldt, both in his *Personal Narrative* and in his *Views of Nature*, gives a graphic account of the mode in which the Indians catch wild horses through the agency of the gymnotus. Faraday made numerous observations on a specimen, forty inches in length, which was exhibited in the Adelaide Gallery some years ago. He calculated that, at each medium discharge, the animal emitted as great a force as the highest charge of a Leyden battery of fifteen jars, exposing 3500 square inches of coated surface. The strongest shocks were obtained by touching the fish simultaneously near the head and near the tail; scarcely any shock being felt if the hands be placed one on each side of the fish, at the same distance from either extremity; the amount of the shock, as might have been expected, varying with the length of the column which produces it. The shocks have sufficient power to stun, or even to kill fish; and the same discharge produces a more powerful effect upon a large fish than it does upon a small one, since the larger animal exposes a larger conducting surface to the water, through which the electricity is passing, and, consequently, it receives a more violent shock. On one occasion, when a live fish was put into the tub, which was 46 inches in diameter, the animal was seen to coil itself into a semicircle, the fish lying across the diameter; this was the most favorable position for giving the strongest shock; an instant afterwards, the fish floated dead upon its side, and was then devoured by the *Gymnotus* (q. v.).

The shock of both the *torpedo* and the *gymnotus* gives rise to

momentary currents of sufficient intensity to deflect the galvanometer, to magnetize a needle, and to decompose iodide of potassium; and from both fish sparks have been obtained.

We next come to the electrical fishes of the genus *Malapterurus*. The only fish of this genus whose electrical organs have been examined and described, is the *M. electricus* of the Nile, called Raash or Thunder-fish by the Arabs. It has barbules dependent from the region of the mouth, like the common barbel; and its smooth skin is diversified with irregularly shaped spots. Its length is from eight to fourteen inches. The batteries are two in number, 'separated,' to adopt Professor Goodsir's description, 'but at the same time intimately connected to one another in the mesal plane along the dorsal and ventral margins of the body, so as to form a continuous layer of a gelatinous consistence closely adherent to the skin, and enclosing as in a sac the entire animal, except the head and fins.' The structure of these batteries is very complicated, and we shall not attempt to explain it.

In the year 1854, a new electrical fish became known to us, belonging to the same genus as the one just described. It is found in the muddy brackish water of the river Old Calabar, which empties itself into the Bight of Benin. The fish has, accordingly, been named the *Malapterurus Beninensis* by Mr. Andrew Murray, who has described and figured it in the *Edinburgh Philosophical Journal* for July 1855. It is much smaller than the Nile species, and the formulae of the number of fin-rays differ in the two species. We believe that this new species was dissected by the late Professor Goodsir, but we are not aware that the results were ever published. See MALAPTERURUS.

Our limits will not allow of our noticing the successive opinions which have been entertained regarding the action of the electric organs in fishes. Those of our readers who wish to investigate this abstruse subject, may be referred to 'Professor Goodsir's memoir, 'On the Present State of Organic Electricity,' in the *Edinburgh Philosophical Journal* for October 1855. We cannot conclude our notice of electric fishes without directing the attention of our readers to an extremely interesting memoir by the late Professor George Wilson, 'On the Electric Fishes as the earliest Electric Machines employed by Mankind,' which is contained in the *Edinburgh Philosophical Journal* for October, 1857, in which he discusses (1) the antiquity of the practice of using the electrical fishes as remedial agents, and (2) the extent or generality of that practice.

2. The study of the electrical properties of muscle and nerve dates from the period (1786-1794) in which Galvani made his great discoveries. Having first ascertained that contractions were produced by electricity in the muscles of a recently killed frog, he subsequently found that similar contractions occurred when two dissimilar metals in contact with one another were brought in contact with the nerve and muscles respectively of the frog's leg. The experiment may be readily made in the following manner:



Expose the crural nerve, N, of a recently killed frog; touch it with a strap of zinc, Z, and at the same time touch the surface of the thigh with one end of a bit of copper wire, C. At the moment that the other end of the wire is brought in contact with the zinc, the limb is convulsed;

but the convulsions cease when the two metals are separated from each other, though they are still in contact with the animal tissues; and they are renewed when the zinc and copper are again made to touch. At first, Galvani believed that the contractions were due to electricity evolved by the metals, but finally he concluded that it is produced by the animal textures themselves. No important step in this direction was afterwards taken till 1827, when Nobili, with his improved Galvanometer (q. v.), discovered the electric current of the frog. He found that when the circuit of the nerve and muscles of the leg is closed by the instrument, a deviation of the needle, to the extent sometimes of 30° , occurs, due to a current which passes in the limb from the toes upwards, and which could be increased when several frogs were simultaneously included in the experiment. Undoubted proof was thus afforded that electricity is developed in connection with muscle and nerve.

The researches of Matteucci, confirmed by the subsequent investigations of Dubois Reymond, have demonstrated the existence of what is termed the *muscular current* in living animals. They show that in the living animal an electrical current is perpetually circulating between the internal portion and the external surface of a muscle—a current due probably to the chemical changes which are always occurring in the animal tissues. This muscular current ceases in warm-blooded animals in a very few minutes after their death; but in cold-blooded animals, as in the frog, it continues for a much longer period. The following is perhaps the

best experiment for showing the existence of the muscular current. Five or six frogs are killed by dividing the spinal column just behind the head; the lower limbs are removed, and the integuments stripped off them; the thighs are next separated from the legs at the knee-joint, and are cut across transversely. The lower halves of these prepared thighs are then placed upon a varnished board, and so arranged that the knee-joint of one limb shall be in contact with the transverse section of the next, and thus a muscular pile is formed, consisting of ten or twelve elements; the terminal pieces of this pile are each made to dip into a separate small cavity in the board, in which a little distilled water is placed. If the wires of a sensitive galvanometer be attached to a pair of platinum plates, and these plates be placed simultaneously, one into each cavity in connection with the muscular pile, a deviation of the galvanometer needle will be observed in a direction which indicates the existence of a current passing from the center or cut transverse surface of the muscle towards its exterior.

Dubois Reymond has subsequently shown, by the use of extremely sensitive instruments, that even the smallest shreds of muscular tissues exhibit proof of the existence of such a current; and he has established the general law, that any point of the natural or artificial *longitudinal* section of a muscle is positive in relation to any point of the natural or artificial *transverse* section.

3. The electrical relation of membranes and glands have been especially studied by Mr. Baxter, whose 'Experimental Inquiry, undertaken with a View of ascertaining whether any or what Signs of Current Electricity are manifested during the Organic Process of Secretion in Living Animals,' is published in the *Philosophical Transactions* for 1848 and 1852.

His chief conclusions regarding the electrical condition of the intestinal mucous membrane are:

1. When the electrodes of a galvanometer are brought into communication—one with the mucous membrane of the alimentary canal, and the other with the blood flowing from the same part—a deviation of the needle takes place, indicating that the mucous secretion and the blood are in opposite electrical states.

2. The effect ceases after death, and may be considered as arising from the decomposition of the blood—viz., from the changes which occur during the formation of the secreted product and and venous blood.

His conclusions regarding the electrical relations of the secretions and blood of the liver, kidney, and mammary gland, are as follow:

1. During biliary secretion, the bile and the venous blood flowing from the hepatic veins are in opposite electrical states.

2. During urinary secretion, the urine and the venous blood flowing from the renal vein are in opposite electrical states.

3. During mammary secretion, the milk and the venous blood flowing from the mammary veins are in opposite electrical states.

For further information on this subject, the reader is referred to Matteucci's *Lectures on the Physical Phenomena of the Living Beings*, translated by Dr. Pereira; to his series of 'Electro-Physiological Researches,' published in the *Philosophical Transactions*; and to Dubois Reymond's *Untersuchungen über Thier-Electricität*.

ELECTRICITY, MEDICAL. Electricity, in its application to medicine and surgery, is employed in the following forms:

1. *Electrization*, by electricity of high tension, as obtained by friction of glass in the common electrical machine; 2. *Galvanization*, by current electricity of quantity, as set in motion by the voltaic battery; and 3. *Faradization*, by induced or interrupted currents, produced by magneto-electric or electro-magnetic induction coil machines.

Electrization.—Frictional electricity is now seldom employed in therapeutics, on account of the inconvenience experienced in the management and insulation of the glass or common electrical machines; yet the powerful stimulant and counter irritative effect of sparks drawn from the affected parts is still recommended in paralytic affections, in Chorea and other nervous diseases; and the succession produced by shocks from the Leyden jar is undoubtedly the most effectual remedy in Amenorrhœa.

Galvanization.—The effect of passing a voltaic current from a battery of many elements through the living body, is to cause a shock or contraction of the muscular tissues, succeeded with a distinct interval by a momentary sensation or flow of heat due to the electric and nervous (?) polarization of the circuit. During the continued passage of the current, slight tingling sensations and elevation of temperature are observed, especially in those parts in contact with the electrodes or poles, which become painful and congested, and finally inflamed and ulcerated. On opening the circuit, the depolarization of the tissues which ensues is accompanied by a second shock and subsequent glow of heat, which are powerful in proportion to the length of time the circuit has remained closed. The amount of contraction in the muscle has relation to the *intensity* rather than the *quantity* of electricity

passed through it—that is, to the rapidity with which the electric state is changed, rather than the amount of that change. The calorific effect of the current is proportionate to its *quantity*. Thus, a single pair of plates of platinum and zinc, an inch square (charged with chromic acid), will, under ordinary circumstances, exercise little or no physiological effect; but if the same pair be divided, so as to form a compound battery of twelve smaller pairs, its application will be attended with the shocks and calorific effects described. A further division into twenty-four or more pairs increases the shock, but the sensation of heat becomes less marked.

With certain limitations, therefore, the shock of the battery depends on the number of its elements, without regard to their size, its calorific effect to the area of its plates. The nerves of the organs of special sense, when subjected to galvanization, evidence phenomena peculiar to their proper function. Thus, the passage of the current through the retina is attended by the sensation of a flash of light, which is bluish when the positive pole is applied to the eye, and tinged with the complementary orange when the force is transmitted in the opposite direction. A faint sensation of light is also perceived when the skin of the face or mucous membrane of the mouth is galvanized, caused by reflex action from the sentient filaments of the fifth pair of nerves which are distributed to those parts. Galvanization of the ear gives rise to bubbling, ringing, or cracking sounds, and occasionally to distinctly musical tones; that of the tongue, to an acid taste under the positive pole, and an alkaline taste under the opposite one; that of the lining membrane of the nose, to sneezing and a peculiar smell, which differs with the direction of the current. The continuous gentle action of small single and compound voltaic arrangements has been more or less successfully employed in paralysis, amaurosis, and neuralgia, either by application to the surface of the body, or carried directly to the affected parts by needles thrust into them (galvano-puncture). More powerful batteries, consisting of six or eight cells of the carbon battery of Bunsen, the nitric acid battery of Grove, or the platinized zinc battery of Strethill Wright, have been used to coagulate the fibrinous contents of aneurismal sacs—to decompose calculi in the bladder (?)—and to render platinum plates or wires incandescent, for the surgical canterization of internal parts not otherwise easily accessible.

Faradization.—The instruments employed for the exhibition of interrupted or induced currents are the magneto-electric and the electro-magnetic coil machines. In the first, the electricity is set in motion in a long thin wire coiled round a bar of iron or keeper maintained in constant whirling motion before the poles of a permanent horseshoe-magnet, the magnet with every half revolution magnetizing the keeper alternately in opposite directions, while the constantly recurring magnetism of the keeper in its turn induces impulses of alternating currents in the coil-wire. The disadvantages of the magneto-electric machine, therefore, are, that it is not self-acting, and that its currents pass alternately in opposite directions. In the electro-magnetic machine, the thick coil-wire, wound over a core of iron, is made to conduct the current from a single voltaic pair which magnetizes the iron. When the battery-current is interrupted, the iron core becomes instantly demagnetized, and this change in its magnetic condition is attended with a rearrangement of the polarity of the coil-wire, and the passage through it of an impulse of induced electricity. By a simple arrangement, the magnetized iron is made to interrupt and renew the battery-current; and the machine thus rendered self-acting, furnishes a rapid succession of momentary currents passing in the same direction, and of much greater quantity than those of the magneto-electric machine. Currents higher in tension, less in quantity, and more resembling frictional electricity, may be obtained from an additional coil ('secondary coil') of very thin and long wire wound over the former one, but they are not of much importance in medical practice.

The physiological action of the coil-machines is equivalent to that of rapidly repeated discharges from a large Leyden jar weakly charged; and as the time engaged by the passage of each impulse in the succession of discharges is too short to permit the development of any decided polarization of the tissues, the distinct calorific effects which accompany the commencement and cessation of the *galvanic* discharge do not occur. The continued passage of the interrupted currents acts chiefly as a mechanical stimulant, first exciting, and after a time depressing the vitality of the part in the circuit; and its effects have been very closely imitated by vibratory impulses, produced altogether irrespective of electrical agency.

Faradization is applicable to a great variety of chronic diseases in which a deficiency of functional energy exists: in paralytic affections unconnected with active disease of the nervous centers, mercurial and lead palsy, and in that produced by rheumatic affection and exposure to cold; in nervous or hysterical Aphonia, or loss of voice; in Amaurosis (q. v.), when not connected with inflammatory or organic disease; in Nyctalopia, or night-blind-

ness; in Amenorrhœa, when uncomplicated with active disease of the uterus; in suppression of the lacteal secretion; in Constipation (q. v.) from deficiency in the peristaltic action of the intestines; in Paralysis of the bladder (?), and with very doubtful effect in the induction of uterine contraction; in suspended animation from drowning, narcotic poisons, &c. In spasmodic and neuralgic diseases, the benefit of Faradization is less to be depended on; but a very gentle and long-continued application of it has afforded relief in the distressing starting of the lower limbs which occurs in Paraplegia or Paralysis of the lower half of the body; in 'Writer's Cramp,' and spasmodic forms of Hysteria; in Tic-douloureux, Sciatica, and hysterical Neuralgia. Faradization by electro-puncture has been successfully employed to induce the union of non-united fractures, the currents being passed between the disjoined ends of the bones; and to excite absorption in Bronchocele and Hydrocele, though with more doubtful effect. The intense sparks from the 'secondary coil' have been used in place of those obtained by frictional electricity; and lastly, it has been proposed to employ the brilliant streams from powerful induction coils confined in fine 'vacuum tubes' of glass, to illuminate internal parts of the body, for the performance of surgical operations, &c.

ELECTRICITY, THE THEORY OF. What is electricity? is a problem still unsolved. Modern research has, however, indicated the lines along which increasing knowledge will probably lead to the true solution. The two aspects of this development, the mathematical and the experimental, call for a brief consideration.

The great advance in the mathematical treatment is due to the explicit introduction of the idea of the potential. This, as far as electrical science is concerned, we owe to Green, in whose memoirs (published 1828) we have the potential first so named; for though Laplace, in his *Mécanique Céleste*, had already pointed out its properties, yet to him and his immediate successors, it was merely a mathematical function, from which the forces of a system could be easily derived. Green, however, lived before his time. His memoir was not appreciated; and not until his theorems had been re-discovered independently by Gauss (1839), Charles, Sturm, and (more especially) Thomson, was his *Essay on the Application of Mathematical Analysis to the Theories of Electricity and Magnetism* brought before the scientific world by the last-named physicist. This was in 1845; and since that date the mathematical development of electricity has gone on rapidly along the lines so clearly laid down by Green. To Thomson, more particularly, is the present advanced state of the subject due; his method of electric images being especially worthy of mention. See his *Reprint of Papers on Electrostatics and Magnetism* (1872).

Meanwhile, in the hands of Faraday, the whole method of regarding electrical phenomena was being completely revolutionized. The older electricians had looked upon the *charged conductor* as the real seat of electrical action; Faraday was led by his classical researches to the conclusion, that this was to be sought for in the *dielectric* or medium separating the conductors. Through this medium, surrounding a given charged body, Faraday imagined lines of electric force drawn. These lines of force he conceived to start perpendicularly from the surface of the body, and to determine the direction, and, by their closeness, the magnitude of the force which would act at any given point upon a small quantity of electricity placed there. Such a region, with its lines of force, Faraday termed an electric field; and, in a precisely similar way, he treated the lines of magnetic force which he imagined to emanate from a magnet. The mathematicians could not at first accept Faraday's view, as they imagined their analysis could be based solely upon the conception of action at a distance, to which Faraday's views are opposed. Doubtless, in the first instance, the equations were established directly upon this hypothesis; but as pointed out in an early paper of Thomson's (see *Reprint*, page 29), Faraday's conceptions, expressed in appropriate mathematical language, will lead to the same results as far as analysis is concerned.

Faraday, indeed, was a mathematician in the truest sense of the word, and his method of representing electrical phenomena is intrinsically mathematical. But to give appropriate mathematical expression to these conceptions of action through a medium, required the genius of Clerk Maxwell, who, in his classical treatise on electricity and magnetism, has done more perhaps than any other man to clear the way of false notions. His treatment of electro-static induction, as developed from Faraday's point of view, is very lucidly given in the opening chapters of the *Elementary Treatise on Electricity* (1881), which was left by its author in an unfinished state. In it the idea of the potential is ever present. The notion of equipotential surfaces, with the tubes or lines of force cutting them at right angles, is made to yield, by a simple synthesis, theorems that were long supposed to be demonstrable only by means of abstruse analysis. Still following the lead of Faraday, Maxwell has, in his larger treatise, elaborated a theory of the *mechanical* action through the dielectric. He has shown that the hypothesis of a tension along the line of force at any point,

proportional to the square of the resultant electromotive force at the point, together with an equal pressure in directions at right angles, gives dynamical effects identical with those given by the ordinary theory of action at a distance.

Previous to the discoveries of Faraday relating to the induction of currents, the laws of electro-kinetics had been fully established, and the mathematical treatment given by Ampère. When Faraday's important researches were published, it became expedient to give a satisfactory theory from which these phenomena might be deduced. Weber's theory of the particles of electricity exerting a mutual force depending upon their relative motion, was such an attempt. The mere fact that the laws of induction could be deduced from it, gives the theory no claim to be a physical truth. For Helmholtz and Thomson had demonstrated that Faraday's laws of induction were a necessary consequence of the truth of Ampère's phenomena, taken in conjunction with the principle of the conservation of energy. Weber's hypothesis includes Ampère's, and is at the same time consistent with the conservation principle; and any other hypothesis satisfying these conditions would necessarily lead to the same results. Now, Weber's hypothesis is essentially one of action at a distance, the conductor carrying the current being the seat of the action; whereas, Faraday always looked beyond the conductor to the surrounding region, and asked himself what was going on there. Thomson early suggested that the kinetic energy of a current was the energy of vortical motions in the space surrounding the conductor; and this idea has been elaborated by Maxwell into his ingenious electro-magnet theory of light. The medium that transmits light is supposed to be the medium through which magnetic and electric action is propagated. One definite result of the theory as developed by Maxwell is, that the square root of the specific inductive capacity of a dielectric is equal to its refractive index for light of infinite wave length—a remarkable result, which is wonderfully borne out by Silow's and Boltzmann's experiments.

Also, the curious equality between the velocity of light, and the velocity which expresses the ratio of the electro-static to the electro-magnetic unit of electricity is, to say the least, not unfavorable to the theory. The special hypothesis on which Maxwell bases his electro-magnetic theory of light does not, of course, affect the beautiful manner in which he derives, from the conception of a medium, the dynamical equations of magneto-electric induction. By the application of Lagrange's general equations to the moving system, he develops the known laws of induction and the mechanical action of currents.

The close connection between electricity and magnetism requires us to mention, in conclusion, the splendid mathematical investigations of Sir William Thomson in the latter subject. Nearly one-half of the *Reprint* is taken up with his papers on magnetism, which, in power and logical sequence, have rarely been equalled. The theory of induction in crystalline and non-crystalline substances, the whole question of magnetic permeability, the distinction between paramagnetic and diamagnetic bodies, the various theoretical distributions of magnetism, the mutual action of magnets, the theory of electro-magnets, may be noted specially, inasmuch as they involve some of the deepest problems yet imagined in physical science.

ELECTRO-CHEMICAL ORDER OF THE ELEMENTS.

When two metals are placed in contact and immersed in a solution capable of acting on one of them, an electric current is produced, positive electricity passing from the metal acted on, through the liquid, to the metal unacted on. See GALVANISM. The former metal is said to be *electro-positive* to the latter. By experimenting with different pairs, we can arrange the metals in electro-chemical order. This order depends upon the readiness with which the metals are acted upon by the solution, and is not the same for all solutions.

The following is the electro-chemical order of the more common metals, the liquid being dilute sulphuric or hydrochloric acid: Sodium, magnesium, zinc, iron, copper, silver, platinum. When a compound of two elements is electrolyzed (see GALVANISM), the electro-positive element appears at the negative electrode, and the electro-negative element at the positive electrode. It is impossible to make a single table of the electro-chemical order of the elements, as this is not the same under all circumstances, but it may be generally stated that oxygen is the most electro-negative element, and that next to it are the elements chlorine, bromine, fluorine, sulphur, &c., which form stable compounds with the metals.

ELECTRO-METALLURGY. Within the last few years many advances have been made in the art of electro-metallurgy. Usually in electro-plating, the silver presents a dull appearance when drawn out of the trough, requiring to be polished by a burnisher and a scratch-brush. If, however, bisulphide of carbon be added to the bath, or, better, if the article be dipped into a bath containing this liquid after immersion in the usual solution of silver, a thin but hard and bright layer of silver is deposited on the

main layer, brilliant enough to do without polishing. There are certain difficulties in the process which render it only applicable under some circumstances.

Since 1869, the coating of other metals by an electro-deposit of nickel has been successfully carried out on a commercial scale, and is becoming extensively practised both in England and the United States. It is usually deposited from a solution of sulphate of nickel neutralized by ammonia. Nickel has the hardness of iron, and though it lacks the beautiful color of silver, it has nevertheless an agreeable grayish-white color, and does not tarnish like silver in impure air, besides being only about one-fifth part of its price. Numerous articles of iron, steel, brass, and German-silver, for household use, but especially for ships and hotels, have been plated with nickel in recent years.

Very beautiful electrotype copies of art objects can now be made of iron, and even, it is said, of steel. As a consequence of this, the art of engraving on steel will soon cease to be practised, as copper plates, which are less costly to engrave, can now be coated with an electro-deposit of iron, which can be renewed at will; thus practically yielding an indefinite number of prints. In the same way engraved zinc-plates can be coated with copper, in cases where a lesser number of impressions are required.

Attempts have often been made to coat iron with an electro-deposit of an alloy such as brass, bronze, or German-silver, and with all of these it has been attended with more or less success. The difficulty lies in getting the solutions of two metals to be of exactly equal conducting power. By employing a solution containing both the oxides and the cyanides of copper and zinc, along with some tartrate of ammonia, a very even and compact deposit of brass can be obtained.

There is a process now in use for purifying impure or blister copper by electrolysis. The blister-copper is cast into plates; these are placed in a solution of sulphate of copper, and form the anodes or positive poles of a battery. Particles of pure copper, by the action of the electric current, separate themselves from the crude plate of pimple metal, and attach themselves to the opposite or negative pole. By this means plates of pure copper are obtained, provided that the blister-copper contained no metals which will deposit along with it. The impurities fall down as a residue.

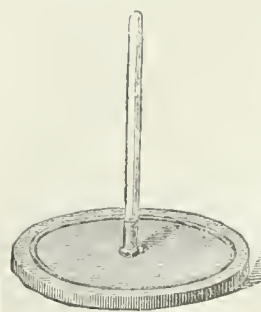
It sometimes happens that iron ores are found mixed with the ores of copper or zinc in the state of sulphides. In such a case there is a difficulty in separating them by the ordinary ore-dressing processes, owing to their being of merely the same specific gravity. If, however, the iron ore happens to be magnetic, or can be changed into the black oxide by roasting, then its particles can be conveniently extracted from the mixture by electro-magnets.

The making of large copper or 'bronze' statues by electro-deposit instead of by casting, is another department of the art which has made great strides. Messrs. Elkington have produced many statues in this way from 6 to 13½ feet high. One of the Earl of Eglinton weighs two tons. There is a trough or deposit-tank at the works of this celebrated firm, 15 feet long, 9 feet wide, and 9 feet deep, that will contain 6600 gallons of the copper solution.

The French are also making great progress in the art. M. Oudry has taken electro-casts of the bas-reliefs on Trajan's column at Rome, covering 700 square yards. He has also coated many thousands of the iron lamp-posts of Paris with copper by electro-deposit, as well as numerous fountains, &c., producing most of the good effects of bronze at a much smaller expense. This process of coating exposed iron with copper is not so much used as it might be. Few persons have any idea of the large extent of surface which even one halfpenny-worth of copper will coat when deposited by the action of a galvanic battery from its solution either in the cyanide or chloride of potassium.

ELECTROPHONE, a form of apparatus invented by Dr. Strehlitz Wright about the year 1864, for making audible to large audiences certain electrical effects. It is essentially a condenser, which, set (for example) in the circuit of a secondary coil, imparts a peculiar tone to the sound of the interrupted current. Apart from its interest in the historical development of the telephone and microphone, the apparatus is of little importance.

ELECTROPHORUS. This generally consists of a tin mould filled with shell-lac, and a movable metal cover, with a glass handle, as shown in the figure. The shell-lac is poured in when melted, and it is mixed with some other substance, to make it less brittle. Five parts of shell-lac, one of wax, and one of Venice turpentine, is given as a good mixture. When used, the surface of the cake of shell-lac is smartly beaten with a cat's



Electrophorus.

the surface of the cake of shell-lac is smartly beaten with a cat's

fur or foxtail. The cover is then put on, and touched with the finger, which receives a slight spark of — electricity, just before contact takes place; and after the finger is removed, the cover, when lifted by its insulating handle, gives a brisk spark of + electricity to anything presented to it. This can be repeated for several minutes without any apparent exhaustion of the source of electricity; and in dry weather, sparks can be got in this way hours, and frequently days, after the cake has been beaten.

The action of the electrophorus may be thus accounted for. When the surface of the cake of shell-lac is beaten, the friction excites — electricity on it. This acts inductively all round, but the tin mould being the nearest conductor, and shell-lac a good dielectric, the induction becomes concentrated on it, + electricity becoming fixed on the side next the shell-lac, and — electricity being sent to the ground. The — electricity of the upper surface of the shell-lac is thus fixed by the + electricity of the mould. When the cover is put on the cake, the contact between the two is not sufficient to allow the latter to communicate its charge to the former. The cover is thus acted on inductively, not conductively. The — electricity of the cake, then, has the choice of two channels for its induction, either through the cake to the mould, or through a very thin film of air to the cover. The latter, from its offering so short a passage through the dielectric, has the preference, and the inductive action of the charge is diverted from the mould to the cover, and the + electricity on the other side of the cake is thus liberated and lost to the ground. The cover being strongly polarized, + electricity is induced and fixed on its lower surface, and — electricity on its upper, this last being transmitted to the ground by the finger. When the finger is withdrawn, and then the cover, the + electricity of the latter is free to discharge itself by spark, and inductive action again takes the direction of the mould, once more attracting + electricity to it. The induced polarity of the cover is attended with no loss to the charge of the shell-lac, which can thus continue to act with the same efficiency. The loss of electricity that all charged bodies experience in air, and especially when moist, at length discharges the cake, but this takes place all the less readily, that when the electricity is not needed to act on the cover, it is kept bound by the + electricity induced by it in the mould. In order that the + electricity of the mould should have liberty, so to speak, to come and go, the electrophorus must not be insulated; and when it is so, the action on the cover is feeble, if at all perceptible.

ELECTROLYSIS, or ELECTRO-CHEMISTRY. See GALVANISM.

ELECTRO-MAGNETISM. See MAGNETISM; and MAGNETO-ELECTRIC MACHINE.

ELECTRO-MOTIVE MACHINES. See MAGNETO-ELECTRICITY.

ELECTRO-PLATING, ELECTRO-TYPE. See GALVANISM.

ELECTRUM is a term used to designate native gold as it is associated with silver. It is also applied to amber.

ELECTUARY (Lat. *eligere, electum*, I make choice), a form of medicinal preparation in which the remedy is enveloped or suspended in honey or syrup, so as to make a mixture of thick semi-fluid consistence.

ELIGIT, ESTATE BY, the right in lands which is enjoyed by one who has acquired the land under writ of *Elegit* (q. v.).

ELEGIT, WRIT OF, a writ whereby a creditor in England can seize the lands of his debtor in satisfaction of his claim. Before the reign of Edward I., a creditor could not enforce a claim of debt against the lands. But by statute of Westminster the second, 13 Edw. I. c. 18, it was enacted that the goods and chattels of the debtor should first be appraised, and if these were not sufficient, that the half of the freehold lands of the debtor should be delivered to the creditor, to be held by him until the debt was paid out of the rents and profits thereof. By 1 and 2 Vict. c. 110, the whole of the lands, including copyhold and customary lands, are made subject to the debt. A creditor who has seized the lands, is not entitled to take the person of his debtor; for, as imprisonment for debt is practically abolished, except where fraud was used, this and *Fieri Facias* (q. v.) are the only remedy of creditors.

E'LEGY (Gr. *elegia*), according to its derivation, signifies, exclusively, a song of lamentation, but the term was employed at an early period by the Greeks to designate any poem written in distichs. The alternation, peculiar to this measure, of the hexameter, or strictly narrative verse, with the more fiery pentameter, gives to this whole species of poetry its individual character, which consists in the connection of subjective feelings and emotions with external incidents or objects. The elegy, therefore, can often be chiefly, but never altogether narrative. The effect of the measure is further shown in the circumstance, that earnest, long sustained feelings, rarely violent passions, are expressed in the elegy. Of the numerous elegies of the Greeks, few have come down to us. Those still extant consist partly of encouragements

to patriotism, as in Callinus and Tyrtaeus, and partly of lessons of practical wisdom, as in Solon and Theognis. Sometimes also it expressed yearning desire or mild sorrow, or amorous complaints. This was especially the case at Alexandria. Among the Romans, Catullus was the first good elegiac writer; after him came Propertius, Tibullus, and Ovid. Tibullus, in particular, brought the erotic elegy to its highest perfection. All are marked by the absence of political or moral feeling. They lived at a time when it was dangerous to express the one, and unfashionable to express the other—viz., the Augustan age. In modern times, the term elegy is applied in England to any serious piece where a tone of melancholy pervades the sentiments, whether grief is actually expressed or not; as, for example, Gray's *Elegy*, written in a country churchyard.

ELEGY, in music, is a composition depicting feelings of mourning, sadness, longing or ardent desire, and love.

ELEMENTAL SPIRITS, beings who, according to the popular belief of the middle ages, presided over the four 'elements,' living in and ruling them. The elemental spirits of fire were called Salamanders; those of water, Undines; those of the air, Sylphs; and those of the earth, Gnomes. These imaginary beings play a part in Pope's mock-heroic poem, *The Rape of the Lock*.

ELEMENTS, CHEMICAL. The word elements has a very different signification in modern science from what it once had. The earliest of the Greek philosophers assumed either a single element, or several, the modifications and combinations of which they held to give rise to all the things that we see. The most common assumption was that of four elements—fire, air, water, and earth. This corresponds to the four forms under which modern science considers matter as existing—viz., imponderable, gaseous, liquid, and solid; while by elements are understood the simple component ingredients of bodies under whatever form they exist. Neither air, water, nor earth are elements in this sense, for they can be decomposed into simpler ingredients, and fire is a combination of light and heat. It is not pretended that any of the substances called elements are absolutely simple, that is, contain only one kind of matter; but only that hitherto they have not been decomposed. The number of so-called simple bodies, or elements, recognized by chemists is sixty-four, of which some have been known from ancient times, such as the metals gold, silver, lead, copper, tin, and mercury; others are of more recent date; whilst lately three new metallic elements have been added to the list. Cæsium and Rubidium were both discovered by Professor Bunsen of Heidelberg, by the aid of spectroscopic investigation; and Gallium was discovered in 1875 by a similar method. The elements are divided into two great classes—the *non-metals* and *metals*. The latter are the more numerous class, there being altogether fifty-one, whilst the non-metals number only thirteen. The following table gives the names of the elements (for their symbols, &c., see ATOMIC WEIGHTS):

TABLE OF THE ELEMENTARY SUBSTANCES.

<i>Non-metallic.</i>		
Oxygen.	Silicon.	Chlorine.
Hydrogen.	Sulphur.	Bromine.
Nitrogen.	Selenium.	Iodine.
Carbon.	Phosphorus.	Fluorine.
Boron.		
<i>Metallic.</i>		
Potassium.	<i>Lanthanum.</i>	<i>Thallium.</i>
Sodium.	<i>Didymium.</i>	<i>Palladium.</i>
Lithium.	Chromium.	<i>Rhodium.</i>
Cæsium.	Zinc.	<i>Iridium.</i>
Rubidium.	Manganese.	<i>Ruthenium.</i>
Barium.	Nickel.	<i>Osmium.</i>
Strontium.	Cobalt.	<i>Antimony.</i>
Calcium.	Iron.	<i>Tin.</i>
Magnesium.	Lead.	<i>Tungsten.</i>
Aluminium.	Silver.	<i>Molybdenum.</i>
Beryllium (<i>Glucium</i>).	Mercury.	<i>Vanadium.</i>
Zirconium. [<i>ium</i>].	Copper.	<i>Tantalum (Columbium).</i>
Thorium.	Bismuth.	<i>Indium.</i>
Yttrium.	<i>Calmium.</i>	<i>Niobium.</i>
Erbium.	<i>Uranium.</i>	<i>Titanium.</i>
Gallium.	Gold.	<i>Tellurium.</i>
Cerium.	Platinum.	<i>Arsenic.</i>

The more rare elements are printed in *italics*. Although the classification adopted above is a convenient one for the study of the elements, yet there is no decided line of demarcation between the metallic and non-metallic (otherwise called metalloïd) series. The metals are generally recognized (1) by their power of reflecting light, as exhibited in the lustre of burnished gold, and even in ordinary mirrors, which owe their power of reflecting light to the

amalgam of the metals mercury and tin, present on the glass; (2) by their power of conducting heat; and (3) by their ready transmission of electricity. The non-metals or metalloids are regarded as not possessing all these three attributes. The non-metals carbon and silicon, however, in certain forms conduct electricity, whilst the metals arsenic and tellurium very closely resemble the metalloids in many of their properties. In the combinations of the various elements with each other, the non-metals constitute the electro-negative ingredient, and, as a rule, are insulators in the galvanic current; whilst the metals form the electro-positive element of the combination, and are conductors of the electric fluid. Again, in their combination with oxygen, the non-metals form more or less powerful acids, whilst the metals produce more or less powerful bases. At ordinary temperatures, five of the elements are gaseous—viz., oxygen, hydrogen, nitrogen, chlorine, and fluorine; two are liquid—viz., bromine and mercury; whilst the remaining fifty-seven are solid.

ELEMENTS, in Astronomy, are those numerical quantities, and those principles deduced from astronomical observations and calculations which are employed in the construction of tables exhibiting the planetary motions. They include the greatest, least, and mean distances of the planets from the sun, the eccentricities of their orbits, their mean motions, daily and annual, with the motions of their apheia, and the inclinations of their orbits to the ecliptic; their masses and densities, &c. The elements of the different planets and of their satellites will be found under their names. The reader will find tables of the elements of all bodies in our system in most books on astronomy. See in particular Herschel's *Elements of Astronomy*.

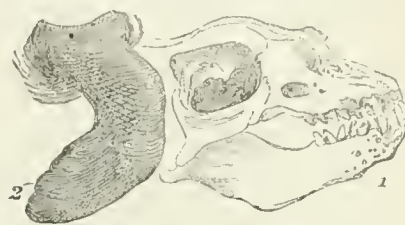
E'LEMI, a fragrant resinous substance, obtained from different species of the natural order *Amyridaceæ*. It was formerly brought chiefly from Egypt or Ethiopia, and was referred to a tree called *Amyris elemifera*. Part of the E. of commerce is now brought from America, and is obtained from trees of other genera, but of the same natural order, particularly *Icica Icicariba*, which grows in Brazil and other warm parts of America. In dry weather, incisions are made in the bark, from which the resinous juice flows abundantly, and hardens in the sun. It is collected once a day, and put into casks. It is at first soft and unctuous, but becomes hard and brittle by age. *Elaphrium elemiferum* is believed to yield the greater part of the E. of Mexico. E. is usually in large, pale-yellow, semi-transparent masses, fragile, softening by the heat of the hand, with a smell somewhat resembling that of fennel. It is soluble in alcohol, except a white crystallizable residue, which is very light, inodorous, and tasteless, and which is called *Elemine*. The properties of E., however, chiefly depend on a volatile oil, which may be obtained from it by distillation. E. is used in the preparation of stimulant plasters and ointments.

E'LEPHANT, a geographical term of obvious origin, indicates various localities in Asia and Africa.—1. Elephant point, a promontory of Pegu, in Further India, marks the west extremity of the month of the Rangoon, the most easterly arm of the Irrawaddy. It is in lat. 16° 28' N., and long. 96° 25' E.—2. Elephant Bay, an inlet of the Atlantic, on the coast of Benguela, South-west Africa, in lat. 13° 14' S., and long. 12° 33' E., has excellent anchorage, but no fresh water.—3. Elephant Island, in Senegambia, is about 100 miles up the Gambia.—4. Elephant River, in the Cape Colony of South Africa, enters the Atlantic after a course of 140 miles, about lat. 31° S., and long. 18° E.

ELEPHANT, SEA (*Macrorhinus proboscideus*), also known as the **ELEPHANT SEAL**, the **PROBOSCIS SEAL**, &c., is the largest of the Seal family (*Phocidæ*), an inhabitant of the seas of the southern

rarely blackish brown. The whole body is covered with very short hair, distributed in patches, giving it a spotted appearance somewhat like watered silk. The swimming paws are large and powerful; the fore-paws have five nails, the thumb-nail easily distinguishable from the others; the hind-paws have not even the rudiments of nails, but are beautifully constructed like the webbed foot of a bird, so as to expand, and increase the power of swimming.

The true tail is very short, not more than six inches long. The head is larger in proportion than in many seals; the eyes are very large and prominent, with eyebrows of coarse hair; the whiskers are composed of very long and coarse spirally twisted hairs; there are no external ears; the canine teeth are remarkably large and



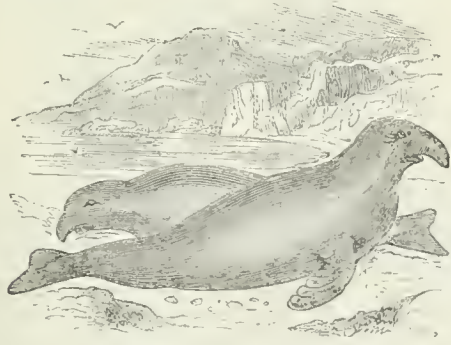
1, Skull and Teeth of Sea-Elephant; 2, Swimming-paw, or Flipper.

massive, somewhat assuming the character of tusks. The nose of the males is very remarkable, being prolonged into a kind of proboscis of about a foot long, which, however, is not at all an organ of prehension, and, indeed, seems to serve no purpose whatever analogous to those which are served by the proboscis of the elephant, but in its ordinary state hangs flaccid on the face, becoming distended like the wattle of a turkey when the animal is roused to passion of any kind, and in particular presenting this distended appearance during the rutting season. At that season, also, the males have furious combats, the victor winning for himself a whole herd of females. When the proboscis is dilated, the voice of the sea-elephant, which usually is like the lowing of an ox, is completely changed, and becomes a loud and extraordinary gurgling.

Sea-elephants are found on Kerguelen's Land, Juan Fernandez, South Georgia, the States Islands, South Shetland, the Falkland Islands, &c. They migrate southwards at the beginning of summer, and northwards at the approach of winter, thus avoiding the extremes of heat and cold. A single individual sometimes yields 1400 or 1500 pounds or 70 gallons of excellent oil, on account of which these animals are pursued to an extent that seems to have already much reduced the numbers of the species. They are either shot or killed by means of long lances. Cuttle-fish and other cephalopods seem to be their principal food; but remains of marine plants have also been found in the stomach.

The skin of the sea-elephant is not at all valued on account of its fur, but its thickness and strength make it very useful for harness-making and similar purposes. The flesh is black, oily, and indigestible; the tongue (salted) alone being esteemed a delicacy. The principal product, however, is the oil, which burns slowly, with a clear flame, and without smoke or disagreeable odor.

E'LEPHANT (Gr. *Elephas*), a genus of quadrupeds, of the order *Pachydermata* (q. v.), and of the section *Proboscidea*. Elephants are the largest existing land animals. The ordinary height at the shoulder is about eight feet, but sometimes exceeds ten feet. The weight of a large E. is about five tons, the body being very bulky in proportion to its height. To sustain this weight, it is furnished with limbs of colossal thickness and strength, which are also remarkably straight, each bone resting vertically on that beneath it. From the appearance of inflexibility presented by the limbs, arose the notion prevalent among the ancients, and throughout the middle ages, that the limbs are destitute of joints, and that consequently an E. cannot lie down to rest like another quadruped, and if it were to lie down, could not rise again, but always sleeps standing, or leaning against a tree. It is indeed true that the E. often sleeps standing, and when fatigued, falls asleep leaning against a rock, or tree, against which it may have been rubbing itself. The flexibility of the limbs is, however, sufficient to permit elephants to run with speed nearly equal to that of a horse, to indulge in playful gambols, and to ascend and descend steep mountains. Elephants are more sure-footed and serviceable than either horses or mules, in difficult mountain roads. On the very steepest declivities, an E. works his way down pretty rapidly, even with a *howdah* and its occupants upon his back, his chest and belly on the ground, and each fore-foot employed in making a hole for itself, into which the hind foot afterwards follows it, and to which the weight may be trusted, that another step may be ventured with safety. In lying down, the E. does not bring his hind-legs under him, like the horse and



Sea-Elephant (*Macrorhinus proboscideus*).

hemisphere. It is more than twice as large as an elephant, being sometimes thirty feet in length, with a circumference of about eighteen feet at the thickest part, which is at the chest, immediately behind the fore-flippers or swimming-paws; the body tapering towards the tail. The color is grayish, bluish gray, or more

other quadrupeds, but extends them backwards (as man does when he assumes the kneeling position), an arrangement which, 'by enabling him to draw the hind-feet gradually under him, assists him to rise almost without a perceptible effort.' The E.'s pace, when exceeding a walk, is neither a trot nor a gallop, which would be too violent a motion for its conformation and huge body, but a sort of shuffle, the speed of which is increased or diminished without other alteration. The E. is incapable of springing like the deer, horse, and other animals which have the bones of their shoulders and hocks set at an angle.

The head in elephants is large; the neck is short and thick, the long flexible proboscis compensating both for the shortness of the neck, and for the inflexibility caused by the largely developed processes of its vertebrae, and enabling the animal readily to reach objects on the ground, or to a height of several feet above its head, or on either side.

A great extent of bony surface in the head affords attachment for muscles destined to move and give power to the proboscis or trunk. This extent of bony surface is provided in a remarkable manner, which at the same time makes the head, heavy as it is, lighter in proportion to its bulk than is usual in quadrupeds; a great space separating the internal and external tables of all the bones of the skull, except the occipital bones, so that the space occupied by the brain is but a small part of the whole head. The space between the tables of the bones is occupied by cells, some of which are four or five inches in length; others are small, irregular, and honeycomb-like; 'these all communicate with each other, and through the frontal sinuses with the cavity of the nose, and also with the tympanum or drum of each ear; consequently, as in some birds, these cells are filled with air.' The huge and extraordinary bones of the skull, besides affording attachment for muscles, afford mechanical support to the tusks.

The nasal bones of the E. are scarcely more than rudimentary; but the tapering proboscis, to the very extremity of which the

which is described by Aristotle as resembling the hoarse sound of a trumpet, and from which this organ received its French name *trompe*, corrupted in English into trunk. With the trunk also, they sometimes, when angry, beat violently on the ground.

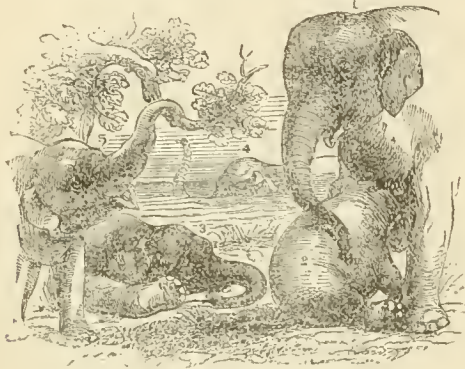
The sense of smell is very acute in the E., as is also that of hearing. The ears are large and pendulous, the eyes are small.



1, elephant drinking; 2, elephant gathering long herbage; 3, elephant spouting water over its back.

Elephants have no canine teeth, nor have they any incisors in the lower jaw. The upper jaw is furnished with two incisors, which assume the peculiar character of tusks, and attain an enormous size, a single tusk sometimes weighing 150 or even 200 lbs. The tusks are, however, often imperfectly developed, ten or twelve inches in length, and one or two in diameter. These stunted tusks are often used for such purposes as snapping off small branches and tearing climbing plants from trees. Those elephants which possess great tusks employ them also for such other uses as loosening the roots of trees which they cannot otherwise tear from the ground; or in a state of domestication, for such labors as moving great stones, and piling or carrying timber. A powerful E. will raise and carry on his tusks a log of half a ton weight or more. The tusks of the E. surpass in size all other teeth of existing animals, and are the largest of all teeth in proportion to the size of the body. They consist chiefly of that variety of *dentine* called *IVORY* (q. v.), and continue to grow—like the incisors of the rodents, to which they are in some respects analogous—even when the animal has attained a great age, if not to the very end of its life.

The young E. is at first furnished with deciduous incisors, which are shed between the first and second year, and are succeeded by the permanent tusks.—The molar teeth of the E. are developed in succession; and at least in the Indian E., never more than two are to be seen in the same side of a jaw at one time. The first molars cut the gum in about two weeks after birth, and are shed about the end of its second year. The sixth

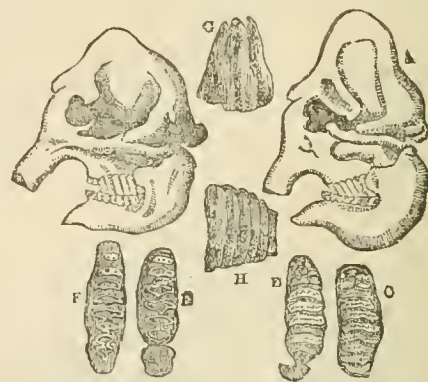


Various positions of the Elephant's Trunk:

1, female elephant suckling her young one; 2, the young one; 3, elephant reposing; 4, elephant swimming; 5, young elephant browsing.

nostrils are prolonged, is nearly eight feet in length. Besides the great muscles connected with it at its base, it is composed of a vast multitude of small muscles variously interlaced, but chiefly either longitudinal, and divided into successive arcs, of which the convexity is outwards, or transverse, and radiating from the internal to the external membrane. Cuvier states the number of muscles having the power of distinct action as not far short of 40,000. The trunk can be coiled round a tree, and employed to tear it from its roots; it is a formidable weapon of offence or defence, and is far more employed in this way than the tusks, even by those elephants which have tusks of great size; its extremity can be wound around a small handful of grass or a slender branch; it is even capable of plucking the smallest leaf, or of lifting a pin from the ground. To fit it for such actions as those last mentioned, and for many such as might be performed by a hand, it is furnished at the extremity with what may be likened to a finger and thumb; on the upper side, an elongated process—strong, soft, and flexible, like the rest of the trunk, and endowed with the most delicate sense of touch—on the under side, a kind of tubercle against which this process may be pressed.

All the food of the E. is gathered and conveyed to the mouth by the trunk, by means of the trunk, also, it drinks, sucking up into it a quantity of water sufficient to fill it, and then discharging the contents into the mouth. Valves at the base of the trunk prevent the water from going too far up the nostrils. The trunk is constantly employed by elephants in providing in many ways for their comfort or enjoyment, as in throwing dust over their backs, or in fanning themselves and switching away flies with a leafy branch, two practices to which they are greatly addicted. Their mutual caresses are also managed by means of the trunk, and through it they make a loud shrill sound, indicative of rage,



A, skull of Indian elephant; B, skull of African elephant; C, D, upper and lower molar teeth of Indian elephant; E, F, upper and lower molar teeth of African elephant; G, the original state of the grinders when the laminae of which they consist are as yet unconnected together; H, the laminae as they are attached in parallel one to the other by cortical substance.

molars, which are also believed to be the last, are supposed to appear about the fiftieth year of the E.'s life. The molar teeth of the E. are remarkable for their great size, and for the extreme complexity of their structure, to which the nearest resemblance is found in some of the small rodents. They are composed of vertical plates of bony substance, separately enveloped with enamel, and cemented together by a third substance, called *crusta petrosa*, cortical, or cement, more resembling bone than enamel. Each succeeding tooth is not only more complex, but occupies a greater space in the jaw than its predecessor. Although formed from a

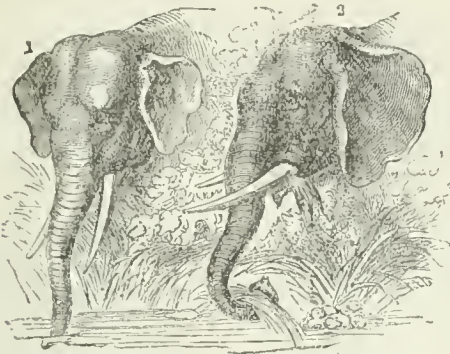
single pulp, the molar tooth of an E. resembles an aggregation of teeth; and in the earlier stages of its growth, when the cement is not yet deposited, it seems as if many separate teeth were soldered together. As the surface of the tooth is worn down by mastication, the harder enamel is exposed in elevated ridges. The whole of a tooth is not in employment at once. From the peculiar manner of its growth, the anterior part begins to be employed, and to be worn away, whilst the latter part is still in process of formation.

The digestive apparatus of the E. is similar to that of the other pachydermata; but the stomach, which is of a very lengthened and narrow form, exhibits a peculiarity which assimilates it to that of the camel; the internal membrane, at the extremity beyond the cardiac orifice, forming thick wrinkles and folds, the broadest of which, and nearest to the gullet, seems to act as a valve, making that end of the stomach a reservoir for water, capable of containing about ten gallons; whilst a peculiar muscle, connecting the windpipe and gullet, enables the animal to open this reservoir at pleasure, for the regurgitation of the fluid, which is then sometimes received into the trunk, and squirted over the body, to free it from the nuisance of flies, or the heat of a tropical sun.

The female E. has only two teats, situated between the fore-legs. The young suck with the mouth, and not with the trunk. They are suckled for about two years. The period of gestation is also nearly two years, and a single young one is produced at a birth.

The skin of the E. is very thick, of a dark-brown color, and in the existing species, has scarcely any covering of hair. The tail does not reach to the ground and has a tuft of coarse bristles at the end. The feet have in the skeleton five distinct toes, but these are so surrounded with a firm horny skin, that only the nails are visible externally, as on the margin of a kind of hoof. The foot of the E. is admirably adapted for steep and rough ground, the protective skin which covers the toes allowing them considerable freedom of motion.

Only two existing species of E. are certainly known, the Indian (*E. Indicus*) and the African (*E. Africanus*), although differences have recently been observed in the E. of Sumatra, which may



1, Head of Asiatic Elephant; 2, Head of African Elephant.

perhaps entitle it to be ranked as a distinct species. Elephants are found in all parts of Africa, from the Sahara southwards, where wood and water are sufficiently abundant; also throughout India and the south-eastern parts of Asia, and in some of the tropical Asiatic Islands. They extend northwards to the Himalaya; and Chittagong and Tiperah vie with Ceylon in the superior excellence of the elephants which they produce. The Indian E. is distinguished by a comparatively high oblong head, with a concave forehead; whilst the African has a round head and convex forehead. The ears of the African E. are much larger than those of the Indian, covering the whole shoulder, and descending on the legs. A marked distinction of the two species is also found in the molar teeth; those of the Indian E. exhibiting *wavy parallel transverse ridges*; whilst those of the African species have the divisions of the crown of the tooth fewer, broader, and *lozenge-shaped*.

Elephants live in herds, not generally numerous, but several herds often congregate together in the same forest or at the same place of drinking. Each herd has a leader generally the largest and most powerful animal. The leader seems to exercise much control over the movements of the herd, gives the alarm in case of danger, and seems to examine and decide for the whole herd as to the safety of proceeding in any particular direction. On account of his tusks, the leader is very often the animal against which the efforts of the hunter are directed; but the rest of the herd do their utmost to protect him, and when driven to extremity they place him in the center, and crowd so eagerly to the front of him that some of them must often be shot ere he can be reached. A family resemblance is usually very visible among the elephants of the same herd; some herds are distinguished by greater stature,

and others by more bulky form and stronger limbs; some by particularly large tusks, some by slight peculiarities of the trunk, &c. In the East Indies, distinctions of this kind have long been carefully noticed, and particular names are given to elephants according to them, some being considered as *high-caste*, and others as *low-caste* elephants. An E. which by any cause has been separated from its herd, seems never to be admitted into another, and these solitary elephants are particularly troublesome, in their depredations exhibiting an audacity which the herds never exhibit; they are also savage and much dreaded, whilst from a herd of elephants danger is scarcely apprehended. The E. is generally one of the most inoffensive of animals, although in a state of domestication, it shows, as is well known, a power both of remembering and resenting an injury.

The favorite haunts of wild elephants are in the depths of forests—particularly in mountainous regions—where they browse on branches, and from which they issue chiefly in the cool of the night to pasture in the more open grounds. They are ready to plunder rice or other grain-fields, if not deterred by fences, of which, fortunately, they have, in general, an unaccountable dread, even although rather imaginary than real. A fence of mere reeds will keep them out of fields, where, as soon as the grain is removed, they enter by the gaps of the fence, and may be seen gleaning among the stubble.

When the E. eats grass, 'nothing can be more graceful than the ease with which, before conveying it to his mouth, he beats the earth from its roots by striking it on his fore-leg.' A cocoa-nut is first rolled under foot, to detach the outer bark, then stripped of the fibrous husk, and finally crushed between the grinders, when the fresh milk is swallowed with evident relish. The fruit of the palmyra palm is another favorite food of elephants, and they seem to have an instinctive knowledge of the time of its ripening. Sugar-canes are also a favorite food; indeed, elephants are very fond of sweet things. Those which are brought to Britain are generally fed on hay and carrots. The amount of daily food necessary for the E. in a state of domestication may be stated, on an average, at about two hundred pounds in weight.

Elephants delight in abundance of water, and enter it very freely, often remaining in it for a considerable time and with great evident enjoyment. They sometimes swim with not only the body but the head under water, the only part elevated above it being the extremity of the trunk.

The habits of the African E. appear in no important respect to differ from those of the Indian elephant. It is the latter only that is at the present day domesticated; but it is certain that the African species was anciently domesticated, and the figures on many Roman medals attest it.

Elephants rarely breed in a state of domestication, although, a few years ago, the birth of an elephant took place in the Zoological Gardens of London, an occasion of much interest not only to the scientific but to the general public. They are generally tamed within a few months after they are captured; some degree of severity being employed at first, which, however, as soon as the animal has begun to respect the power of man, is exchanged for kindness and gentleness of treatment. Elephants intended for domestication are captured in various ways. It was formerly common to take them in pitfalls, but in this way they were often much injured.

Another method frequently practised is by the aid of tame elephants. Male elephants chiefly are captured in this way, the decoy elephants employed being females, trained for the purpose. With these the hunters very cautiously approach the animal they mean to capture, and he generally permits them to come up to him, and is so pleased to make the acquaintance of the females, that he takes no notice of their riders and other human attendants. Two of the females take their places, one on each side of him, and whilst he is occupied with them, men, the profession of whose lives it is, and who display a wonderful expertness in the work, contrive to get beneath their bodies, and to pass ropes round the legs of the intended captive. His two hind-legs are fastened together by six or eight ropes in the form of the figure 8, another rope keeping them tight at the intersections, and a strong cable with a running noose is attached to each hind-leg. About twenty minutes are usually spent in fixing the necessary ropes, profound silence being maintained if the process goes on unobserved, or some of the other hunters distracting the attention of the E. from those who are engaged in this work; and when at last, becoming sensible of his danger, he tries to retreat, an opportunity is soon found of tying him, by means of the long cables which trail behind him, to some tree strong enough for the purpose. His fury then becomes ungovernable, and he makes violent and prodigious efforts to get free, throwing himself on the ground, and twisting himself into the most extraordinary positions. It is not until he has thoroughly exhausted himself, and begins to suffer severely from fatigue, thirst, and hunger, that the next steps are taken towards taming him and making him a willing servant of man.

Still more wonderful is the capture of a wild E., sometimes by

not more than two hunters, who for this purpose will go into the woods, without aid or attendants, their only weapon a flexible rope of hide. With this they secure one of the E.'s hind-legs, following his footsteps when in motion, or stealing close up to him when at rest, or spreading the noose on the ground, partially concealed by roots and leaves, beneath a tree on which one of the party is stationed, whose business it is to lift it suddenly by means of a cord. When arrested by the rope being coiled around a tree, the E. naturally turns upon the man who is engaged in making it fast, but his companion interferes on his behalf, by provoking the animal; and thus not only is the first rope made fast, but noose after noose is passed over the legs, until all are at last tied to trees, and the capture is complete; upon which the hunters build a booth for themselves in front of their prisoner, kindle their fires for cooking, and remain day and night till the E. is sufficiently tamed to be led away.

But these huge animals are not always captured singly; whole herds are often taken at once. This is accomplished by means of an enclosure, towards which the elephants are driven by great numbers of men encircling a considerable space, and contracting the circle by slow degrees. Weeks, or even months, are spent in this operation, and at last the elephants, hemmed in on every side except the mouth of the enclosure, enter it, and the gate is immediately closed. The modes of constructing the enclosure are different in different parts of the East. Tame elephants are sometimes sent into it, and the captives are in succession made fast to trees there, in a way somewhat similar to that practised in capturing single elephants.

The E. first became known in Europe from its employment in the wars of the East: 'in India, from the remotest antiquity, it formed one of the most picturesque, if not of the most effective, features in the armies of the native princes.' Elephants have been taught to ent and thrust with a kind of scimitar carried in the trunk, and it was formerly usual for them to be sent into battle, covered with armor, and bearing towers on their backs, which contained warriors. But the principal use of the E. in war is for carrying baggage, and for dragging guns. An E. will apply his forehead to a cannon, and urge it through a bog, through which it would be almost impossible for men and cattle to drag it; or he will wind his trunk round it, and lift it up, whilst horses or cattle drag it forwards. Elephants are used in the East for carrying persons on their backs, a number being seated together in a *howdah*, whilst the driver (*mahout*) sits on the E.'s neck, directing it by his voice and by a small goad. Elephants have always a conspicuous place in the great processions and state displays of Eastern princes, and white elephants—albinos—are peculiarly valued. Elephants are also employed in many kinds of labor, and display great sagacity in comprehending the nature of their task and adapting themselves to it. In piling timber, the E. 'manifests an intelligence and dexterity which is surprising to a stranger, because the sameness of the operation enables the animal to go on for hours disposing of log after log, almost without a hint or direction from his attendant.'

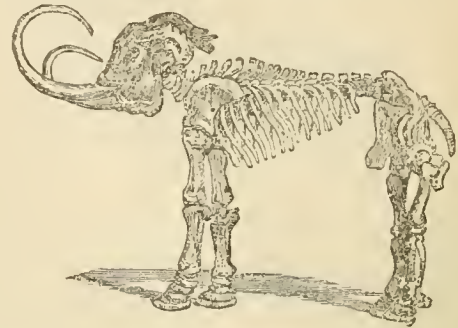
Of the sagacity of the E., many interesting anecdotes are on record, as every reader of books of travels and of natural history knows. But Cuvier refuses, and apparently with justice, to ascribe to it a degree of sagacity higher than that of the dog. In a state of domestication, the E. is a delicate animal, requiring much watchfulness and care, although naturally it has a very long life, and instances are on record of extreme longevity in domestication, extending not only to more than one hundred, but almost to two hundred years.

The numbers of wild elephants in some parts both of the East Indies and of Africa, are being gradually reduced as cultivation extends, and many are shot for no other reason than a desire to reduce their numbers, and put an end to their ravages on cultivated grounds. A reward of a few shillings per head was claimed for 3500 destroyed in part of the northern province alone of Ceylon, in less than three years prior to 1848. It is for the sake of ivory that the greatest slaughter of elephants takes place. A ball of hard metal, skilfully planted in the eye, base of the trunk, or behind the ear, generally ends an E.'s life in an instant; and expert sportsmen have been known to kill right and left one with each barrel.

Fossil Elephants.—The E. makes its appearance in the Pleistocene strata. Its near ally, the mastodon, whose remains are found associated with it, began life earlier; it has left its traces in Miocene deposits. Ten species of fossil elephants have been described, the remains of three of which are found in Europe. The best known of these is the *Elephas primigenius*, or Mammoth, the tusks of which are so little altered as to supply an ivory which, though inferior to that of the living species, is still used in the arts, especially in Russia. Its tusks are, on this account, regularly searched for by 'ivory hunters' in Siberia, where, in the superficial deposits of sand, gravel, and loam, the remains occur in enormous abundance. They are also found in similar strata all over Europe. In Britain, the localities that have supplied these

remains are very numerous. They are especially abundant in the Pleistocene deposits of the east and south-east of England. Woodward, in his *Geology of Norfolk*, calculates that upwards of 2000 grinders of this animal had been dredged up by the fishermen off Happisburgh in thirteen years. The bone-caves also yield remains of this gigantic animal.

The mammoth truly belongs to the geological history of the world; it died out at the close of the period represented by the Pleistocene beds. It is the only fossil animal that has been preserved in a perfect condition for the examination of man. In all other remains we have to deal with the hard portions only—the bones, teeth, scales, &c., and frequently only with fragmentary portions, requiring the skill of a Cuvier or an Owen to make from them an approximation to the perfect animal. But the mammoth



Skeleton of Mammoth.

has been preserved so that its flesh has been eaten by dogs, bears, and wolves. In 1799, a Tungusian, named Schumachoff, while searching along the shores of Lake Oncon for mammoth tusks, observed among the blocks of ice a shapeless mass, but did not at the time discover what it was. The heat of succeeding summers gradually melted the ice around it, and, in 1803, the mammoth fell on a bank of sand. In March of the following year, the hunter visited it, cut off, and carried away the tusks, which he sold for fifty rubles. In 1806, Mr. Adams visited the locality, and examined the animal, which still remained on the sand-bank where it had fallen, but in a greatly mutilated condition. The Jakutski of the neighborhood had cut off the flesh to feed their dogs, and the wild beasts had almost entirely cleared the bones. The skeleton was, however, entire, excepting one of the fore-legs, and some of the bones of the tail. Many of the bones were still held together by the ligaments and by parts of the skin. The head was covered with dry skin; one of the ears was well preserved; it was furnished with a tuft of hairs. Three-fourths of the whole skin were procured, which was so heavy that ten persons found great difficulty in transporting it to the shore, a distance of 150 feet; it was of a dark-gray color, and was covered with a reddish wool, and long black hairs or bristles. The wool was short, and curled in locks; the bristles were of different lengths, varying from 1 to 18 inches. Some of this covering still remained attached to the skin, but the great mass was entirely separated from it.

Mr. Adams collected 36 pounds, although much of it had been destroyed from the dampness of the place where it had lain so long. The animal was a male, and had a long mane on the neck. The entire carcass was removed to St. Petersburg, where it is now preserved. The tusks were repurchased, and added to the animal. It measures from the forepart of the skull to the end of the mutilated tail 16 feet 4 inches; the height to the top of the dorsal spines is 9 feet 4 inches; the length of the tusks along the curve is 9 feet 6 inches. Portions of the hairy covering have been brought to this country, and may be seen in the British Museum.

Taking the teeth as exhibiting clearly a marked difference in the recent species, the mammoth is easily separated from both by its broader grinders, which have narrower, and more numerous, and close-set plates and ridges. The existence of the E. and other genera, whose representatives are now found only in the warmer regions of the earth, in the north of Europe and Asia, led to the belief, that at the recent period in the world's history when they were its living inhabitants, a tropical temperature existed in the temperate zone, and stretched further north towards the pole; but the discovery of this perfect animal showed that these huge elephants were adapted by their clothing to endure a cold climate, and by the structure of their teeth were able to employ as food the branches and foliage of the northern pines, birches, willows, &c. There are few generalizations more plausible at first sight than to predicate of an unknown species of a genus what is ascertained regarding the known members of the same genus. It required a striking case, such as that supplied by the discovery of the mammoth, to show clearly the fallacy of deductions which were almost universally received by scientific men not many years ago, which

still occasionally mislead, and which may even now be met with in some popular hand-books of science.

ELEPHANT. An order of the elephant was instituted in Denmark, by King Frederick II. The badge was a collar of elephants towered, supporting the king's arms, and having at the end the picture of the Virgin Mary.

ELEPHANTA, an island of six miles in circuit, stands in the harbor of Bombay (q. v.), about seven miles to the east of that city, and about five miles to the west of the mainland. It takes this its European name from a huge figure of an elephant near its principal landing-place, which, however, appears to have gradually crumbled away. This colossal animal has been cut out of a detached rock, which is apparently of basaltic origin. Further towards the interior, three temples, dug out of the living mountain, present themselves—the roofs being supported by curiously wrought pillars of various forms and magnitudes, and the walls being thickly sculptured into all the varieties of Hindu mythology. The largest of the three excavations is nearly square, measuring 133 feet by 130½ feet; and immediately fronting its main entrance stands a bust or third-length of a three-headed deity, with a height of 18 feet, and a breadth of 23. These monuments of superstition, like the quadruped which guards, as it were, the approaches to them, are said to be rapidly decaying—a state of things which, besides in some measure accounting for the execution of such works, seems to be inconsistent with any very high antiquity. The island is in lat. 18° 57' N., and long. 73° E.

ELEPHANTINÉ, a small island of the Nile, lying opposite to Assuan (q. v.), the ancient Syene, on the confines of Egypt and Nubia, in 24° 5' N. lat., and 32° 34' E. long. From this island, the Greek mercenaries were sent by Psammetichus I. to recall the Egyptian deserters, and it was garrisoned in the time of the Pharaohs, Persians, and Romans. The island was anciently called *Abu*, or the 'Ivory Island,' from its having been the entrepôt of the trade in that precious material. The most important ruins are a gateway of the time of Alexander, and a small temple dedicated to Khnum, the god of the waters, and his contemplar deities, Anueis and Sate. This temple was founded by Amenophis III., and embellished by Rameses III. Another remarkable edifice is the ancient Nilometer, formerly mentioned by Strabo, and which appears to have been built in the time of the Cæsars; and several remaining inscriptions record the heights of inundation from the time of Augustus to Severus. This island had the honor of giving a dynasty (the 5th) to Egypt, and was evidently an important place, the inscriptions on the rocks attesting the adoration paid by Sethos I., Psammetichus II., and other monarchs, to the local deities. Other interesting monuments have been found on this island; amongst which may be cited part of a calendar recording the rise of the Dog-star in the reign of Thothmes III. (1445 B.C.), and numerous fragments of pottery—principally receipts in the Greek language—given by the farmers of the taxes in the reign of the Antonines. The island is at present inhabited by Nubians.—Wilkinson, *Topography of Thebes*, p. 460; Champollion, *Notice Descriptive*, p. 215; Champollion, *Lettres Ecrites*, pp. 111, 157, 171, 382.

ELEPHANT'S FOOT, or HOTTENTOT'S BREAD (*Testudinaria elephantipes*), a plant of the natural order *Dioscoreacea*, of which the root-stock forms a large fleshy mass, curiously truncate, or abruptly cut off at the end, so as somewhat to resemble an elephant's foot, and covered with a soft corky, rough, and cracked bark. From this springs a climbing stem, which bears the leaves and flowers. The root-stock is used as food by the Hottentots. The plant is not unfrequently to be seen in hothouses in Britain.

The name **ELEPHANT'S FOOT** (*Elephantopus*), is also given, on account of the form of the root-leaves, to a genus of plants of the natural order *Compositæ*, sub-order *Corymbifera*, one species of which (*E. scaber*) is common in elevated dry situations in all parts of India, and is used in Indian medicine in affections of the urinary organs.

ELETTA'RIA. See **CARDAMOMS**.

ELETZ. See **JELETZ**.

ELEUSINE, a genus of Grasses, chiefly natives of India and other warm climates, several of which are cultivated as grains. This is especially the case with *E. corocana*, an Indian species, called Natchee and Nagla Ragee, also Mand and Murwa, which has aggregated digitate spikes finally incurved. The Tibetans make a weak sort of beer, much in use amongst them, from this grain. *E. stricta* is cultivated as a grain-crop in the same parts of the world, and is, like the former, extremely productive. The grain called Toccusso in Abyssinia is also a species of this genus. *E. Toccusso*.—A decoction of *E. Egyptiaca* is used in Egypt for cleansing ulcers; and a drink made from the seeds is regarded as useful in diseases of the kidneys and bladder. A decoction of *E.*

Indica is also administered to infants in Demerara, to prevent or cure convulsions.

ELEUSINIAN MYSTERIES, the sacred rites with which the annual festival of Ceres was celebrated at Eleusis. Many traditions were afloat in ancient times as to the origin of this festival. Of these, the most generally accepted was to the effect that Ceres, wandering over the earth in quest of her daughter Proserpine, arrived at Eleusis, where she took rest on the *sorrowful stone* beside the well Callichorus. In return for some small acts of kindness, and to commemorate her visit, she taught Triptolemus the use of corn on the Rharian plain near the city, and instituted the mystic rites peculiarly known as hers. The outward method of the celebration of these mysteries is known with considerable accuracy of detail. Their esoteric significance is very variously interpreted. The ancients themselves generally believed that the doctrines revealed to the initiated gave them better hopes than other men enjoyed, both as to the present life and as to a future state of existence. Modern speculation has run wild in the attempt satisfactorily to explain these mysteries. As reasonable a solution as any other seems to be that of Bishop Thirlwall, who finds in them 'the remains of a worship which preceded the rise of the Hellenic mythology and its attendant rites, grounded on a view of nature, less fanciful, more earnest, and better fitted to awaken both philosophical thought and religious feeling.' The festival itself consisted of two parts, the greater and the lesser mysteries. The less important feast, serving as a sort of preparation for the greater, was held at Agræ, on the Ilissus. The celebration of the great mysteries began at Eleusis on the 15th day of Boëdromion, the third month of the Attic year, and lasted over nine days. On the first day (called *agurmos*, the assembling), the neophytes, already initiated at the preparatory festival, met, and were instructed in their sacred duties. On the second day (called Haladé, *mystæ*, *To the sea, ye initiated!*), they purified themselves by washing in the sea. On the third day, sacrifices, comprising, among other things, the mullet-fish, and cakes made of barley from the Rharian plain, were offered with special rites. The fourth day was devoted to the procession of the sacred basket of Ceres (the Kalathion). This basket containing pomegranates, salt, poppy-seeds, &c., and followed by bands of women carrying smaller baskets similarly filled, was drawn in a consecrated cart through the streets, amid shouts of 'Hail, Ceres!' from the onlookers.

The fifth day was known as the 'day of the torches,' and was thought to symbolize the wanderings of Ceres in quest of her daughter. On it the *mystæ*, led by the 'daduchus,' the torch-bearer, walked two by two to the temple of the goddess, and seem to have spent the night there. The sixth day, called Iacchus, in honor of the son of Ceres, was the great day of the feast. On that day the statue of Iacchus was borne in pomp along the sacred way from the Ceramicus at Athens to Eleusis, where the votaries spent the night, and were initiated in the last mysteries. Till this stage of the proceedings, they had been only *mystæ*; but on the night of the sixth day they were admitted into the innermost sanctuary of the temple, and, from being allowed to behold the sacred things, became entitled to be called 'epoptæ,' or 'ephorî,' i. e., *spectators*, or *contemplators*. They were once more purified, and repeated their original oath of secrecy with an imposing and awful ceremonial, somewhat resembling, it is believed, the forms of modern free-masonry. On the seventh day, the votaries returned to Athens with mirth and music, halting for a while on the bridge over the Cephissus, and exercising their wit and satire against the spectators. The eighth day was called Epidauria, and was believed to have been added to the original number of the days for the convenience of those who had been unable to attend the grand ceremonial of the sixth day. It was named in honor of Æsculapius, who arrived on one occasion from his native city of Epidaurus too late for the solemn rites, and the Athenians, unwilling to disappoint so distinguished a benefactor of mankind, added a supplementary day. On the ninth day took place the ceremony of the 'Plemochœæ,' in which two earthen vessels filled with wine were turned one towards the east, and the other towards the west. The attendant priests, uttering some mystic words, then upset both vessels, and the wine so spilt was offered as a libation.

Initiation into the Eleusinian mysteries was compulsory on every freeborn Athenian; but slaves, prostitutes, and persons who had forfeited their citizenship were excluded from the rites. During the period of the festival, none of those taking part in it could be seized or arrested for any offence. Lycurgus, with a view to destroying distinctions of class, forbade any woman to ride to the Eleusinia in a chariot, under a penalty of 6000 drachmæ. The mysteries were celebrated with the most scrupulous secrecy. No initiated person might reveal what he had seen under pain of death, and no uninitiated person could take part in the ceremonies under the same penalty. The priests were chosen from the sacred family of the Eumolpidæ, whose ancestor, Eumolpus, had been the special favorite of Ceres. The chief priest was called the

'Hierophant,' or 'Mystagogue,' next in rank to him was the Daduchus, or Torch-bearer; after whom came the 'Hieroceryx,' or sacred Herald, and the priest at the altar. Besides these leading ministers, there was a multitude of inferior priests and servants.

ELEUSIS, a celebrated town in ancient Attica, stood near the northern shore of the Gulf of Salamis, and not far from the confines of Megaris. It was famous as the chief seat of the worship of Ceres, whose mystic rites were here performed with great pomp and solemnity from the earliest authentic times till the era of Alaric. See **ELEUSINIAN MYSTERIES**. The temple of the goddess, designed by Ictinus, the architect of the Partheon, was the largest sacred edifice in Greece. The site of the old Eleusis is now occupied by the little village of Lefsinia or Lepsina.

ELEUTHERA, one of the Bahamas (q. v.), is, next to New Providence, the most populous island in the whole chain. Including its dependent *cayos* or *keys*, E. has a population of 5209. It is more fertile than most of its neighbors, more especially surpassing all of them in the growth of fruit, such as the pine-apple, the orange, and the lemon.

ELEUTHERIA BARK, a name not unfrequently given to the bark of the *Croton Eleutheria*, also known as Cascarilla Bark. See **CASCARILLA**. It is called Eleutheria (or Eleuthera) Bark, because it is chiefly gathered on the island of Eleuthera.

ELEVATED. Wings turned upwards are described in heraldry as elevated.

ELEVATION, in Architectural Drawing, is a representation of the flat side of a building, drawn with mathematical accuracy, but without the slightest attention to effect. In Art, again, elevation is a raising of the subject beyond its ordinary character in real life. A very good instance of elevation in this sense is given by Fairholt in his *Dictionary of Terms in Art*, in Rembrandt's 'Adoration of the Shepherds.' The whole of the objects and surroundings of the infant Saviour are of the most homely description; and still the light which is represented as issuing from his person gives an elevation to the scene which takes off from it entirely the character of being commonplace or vulgar.

ELEVATION, in Astronomy and Geography, means generally the height above the horizon of an object on the sphere, measured by the arc of a vertical circle through it and the zenith. Thus, the elevation of the equator is the arc of a meridian intercepted between the equator and the horizon of the place. The elevation of the pole is the complement of that of the equator, and is always equal to the latitude of the place. The elevation of a star, or any other point, is similarly its height above the horizon, and is a maximum when the star is on the meridian.

ELEVENTH, in Music, is the interval of the octave above the fourth.

ELF, a fairy, pl. **ELVES**. See **FAIRIES**.

ELF-ARROW-HEADS, **ELFIN-ARROWS**, **ELF-BOLTS**, **ELF-DARTS**, **ELF-SHOT**, and **ELF-STONES**, names popularly given in the British Islands to the arrow-heads of flint which were in use at an early period among the barbarous tribes of this country and of Europe generally, as they are still in use among the American Indians, the Esquimaux of the Arctic regions, and the inhabitants of some of the islands in the Pacific Ocean. It was believed that elves or fairies, hovering in the air, shot these barbs of flint at cattle, and occasionally even at men. Thus, Robert Gordon of Straloch, an accomplished country gentleman of the north of Scotland, writing in 1654,



Elf Arrow-Head.

tells how one of his friends, traveling on horseback, found an elf-arrow-head in the top of his boot, and how a gentle-woman of his acquaintance when out riding, discovered one in the breast of her habit. He remarks that, although they are got by chance in the fields and on the highways, one who goes to look for them on purpose will search in vain. He adds that they are most commonly met with after showers—a circumstance which probably helped them in Germany to their names of 'thunder-bolts' and 'thunder-stones,' and is easily enough explained.

The rain, by washing away the earth in which they have been imbedded, makes them more readily perceptible to the eye, especially if the sunshine happens to fall upon them. Cattle dying suddenly in the fields were believed to have been struck by elf-arrows—a belief which yet lingers in Ireland, and perhaps in some secluded parts of Scotland. 'Thus, when cattle are sick,' writes Mr. W. R. Wilde, in his *Catalogue of the Antiquities in the Museum of the Royal Irish Academy* (Dub. 1857), 'and the cattle doctor, or fairy doctor, is sent for, he says the beast has been "elf-shot," or stricken by fairy or elfin darts; and he forthwith proceeds to feel the animal all over; and, by some legerdemain, contrives to find in its skin one or more poisonous weapons, which, with some coins, are then placed in the water which is given

it to drink; and so a cure is said to be effected.' The elf-arrow head was occasionally set in silver, so as to be worn on the person as a talisman, or had a hole drilled through it, so that it might be dipped in water, which, being thus endowed with healing virtue, was used sometimes as a wash, more commonly as a draught. As a talisman, the elf-arrow-head was believed to be most efficacious as a preservative from poison and witchcraft. The ascription of the flint arrow-head to the elves or fairies, is but one of several instances of the disposition of a people to elevate or degrade the earlier races whom they vanquished or dispossessed into mythical beings, better or worse than mankind. Thus, in Greece and Italy, the remains of the rude strongholds built by the Pelasgi came to be regarded as works of the fabled Cyclops, or one-eyed giants. So also, in Scotland, the sepulchral mounds of the aboriginal inhabitants were called 'elf-hillocks;' and the vestiges of ancient ploughshares which may be traced on heath and hill-tops were called 'elfin-furrows.' Examples of 'elf-arrow-heads' may be seen in most museums of antiquities. They fall to be more particularly described in a following page, under the head of **FLINT IMPLEMENTS AND WEAPONS**.

ELGIN, a royal burgh, the county town of Elgin or Moray-shire, and a station on the Inverness and Aberdeen Junction Railway, situated on the right bank of the river Lossie, about five miles from the sea. Pop. (1881) 7533. E. joins with Banff, Peterhead, Inverury, Cullen, and Kintore, in returning a member to parliament. It was probably a royal burgh so early as the reign of King David I. (1124—1153), and had its privileges confirmed by several of his successors. Its trade is now almost wholly retail. E. has 12 yearly fairs, and a weekly grain market. It has a parish church, which is collegiate, 2 Free Churches, 2 United Presbyterian Churches, 1 Baptist Church, 1 Original Secession, 1 Independent, 1 Episcopal, and 1 Roman Catholic, with 10 schools. Gray's Hospital for the sick poor, built and endowed from a bequest of £20,000 by the late Dr. Alexander Gray of Bengal, and opened in 1819, with a lunatic asylum attached, now the Elgin District Asylum; and the Elgin or Anderson's Institution for the support of old age and the education of youth, built and opened 1831—1833, on the foundation of £70,000 bequeathed by the late Major-general Anderson, H.E.I.C.S.—are the principal of many public and private charities. E. is chiefly remarkable for the beauty of its situation, lying placidly in a gentle curve of the Lossie, for the salubrity of its climate, and for its history as the see of the Bishop of Moray. Its appearance, about sixty years ago, was that of a little cathedral city with an antique fashion of building, and with 'a certain solemn drowsy air about the town and its inhabitants.' That appearance is fast giving way to that of a gay modern county town, surrounded by elegant villas. The old town was partially burned in 1390 by the notorious Wolf of Badenoch (Alexander Stewart, Earl of Buchan); in 1402, by Alexander, the son of the Lord of the Isles; and in 1452, by the Earl of Huntly—this last calamity originating the proverb, 'Half done, as Elgin was burned.' Its once magnificent cathedral church, partly of Early English and partly of Middle-pointed architecture, dedicated to the Holy Trinity, was begun by Bishop Andrew Moray in 1224, on the transference of the see from Spynie; was injured by fire in 1270; was nearly burned down by the Wolf of Badenoch in 1390; was restored under Bishops Bur, Spyny, Innes, and Leighton (1390—1424); and from subsequent accident and dilapidation is now a mere ruin. The other religious buildings of the olden time were the church of St. Giles, a picturesque example of our old parish churches, replaced 1826—1828 by the modern less interesting structure; the monastery of the Black Friars, long since demolished; the convent of the Gray Friars, the walls of whose church remain; the hospital of the Maison Dieu, on the site of which is Anderson's Institution; the Leper House, still commemorated by the grounds called the Leper Lands; and the chapel of St. Mary of the Castle, which gave name to the Lady Hill and Lady Well on the west of the town. The castle itself, styled of old the Manor of Elgin, whose ruins, surmounted by an obelisk—erected to the memory of George, fifth and last Duke of Gordon—crown the Lady Hill, was a residence of the Earls of Moray, for some time superiors of the burgh under our Scottish Kings.

ELGIN AND KINCARDINE, EARL OF, Governor-general of India. James Bruce, eighth Earl of E., was born in Park Lane, London, in 1811. He was educated at his father's seat in Fife-shire, and afterwards went to Christ Church, Oxford, where he was first-class in classics, 1832; became Fellow of Merton, and graduated M.A. 1835. He entered public life in 1841, when, as Lord Bruce, he was returned at the general election on the Conservative interest for Southampton. A petition was presented against the return, and the election was declared void. Before, however, a new writ could issue, Lord Bruce had succeeded his father (who enriched the British Museum by the invaluable collection of sculpture known as the 'Elgin Marbles,' q. v.) as Earl of Elgin. Those who remember his early parliamentary and pre-

colonial career, state that he gave early promise of oratorical distinction, and assert that if he had thrown himself into the politics of the day, he would have taken a high position as a parliamentary debater. By succeeding to a Scotch peerage, however, he was, in his own words, 'expelled from the House of Commons without being admitted into the House of Peers.' Being offered the governorship of Jamaica, in March 1842, by the Earl of Derby—then Lord Stanley—he went to Jamaica, where he administered the affairs of the island with so much ability and success, that in August 1846, the Governor-generalship of Canada was rendered to him by Earl Grey, then Secretary of State for the Colonies in the administration of Lord J. Russell. Lord E., still finding himself in the same position as a Scottish peer, accepted the office, and went to Canada. His administration of the government of Canada will ever be a bright spot in our colonial history, and a model to future governors of English dependencies. He found Canada governed by cliques, and torn by intestine feuds. With admirable tact and entire success, he inaugurated a system of self-government, which has rendered the provinces of British America a support to the British throne, in place of being a source of weakness. Under his government, Canada made such strides in importance and prosperity, that between 1847 (in the beginning of which year he entered upon his government) and 1855, when he returned to England, the revenue of that great British possession quadrupled itself. During his administration, he successfully negotiated a treaty of reciprocity of trade between British America and the United States, which admitted the whole produce of British North America to be brought into competition with the products of the United States in their own markets. This treaty, till it was renounced by the United States in 1866, put an end to the risk of collision as to the fisheries between this country and America, which Lord E. described as the most serious risk which had presented itself during his public service. His popularity was great, not only in Canada but the adjacent states, the citizens of which offered him ovations. He was now a peer of the United Kingdom (having been summoned to the House of Lords in 1849), and was appointed lord-lieutenant of Fifeshire.

In 1857, the affair of the *lorcha Arrow*, and the bombardment of Canton by Sir John Bowring, led Lord Palmerston to invite Lord E. to go to China as Plenipotentiary Extraordinary. An army was equipped to carry out the policy prescribed by the British government, and he started on his mission. But before he could approach his destination, and when he had barely left England a month, the Indian mutiny broke out. Lord E. did not hesitate a moment in preferring the safety of India to the success of his Chinese negotiations. He despatched the Chinese expedition to Lord Canning's assistance, and the English in India were thus enabled to hold their ground until further reinforcements arrived. After thus consigning himself to an inaction of several months, Lord E. proceeded to China, and in 1858, in conjunction with Baron Gros, the French plenipotentiary, he negotiated the treaty of Tien-tsin, which promised to give Great Britain a freer access to China than she had ever enjoyed before. He found time, before his return, to negotiate a treaty with Japan, under which English manufactures are admitted at low rates of duty, and a British minister is permitted to reside at Jeddo. On his return home, he was appointed Postmaster-general. He had scarcely time to become acquainted with his duties, before the treachery of the Chinese, in firing upon the British squadron from the Taku forts, led to the organization of another Chinese expedition, and to Lord E.'s second mission to China. A combined English and French force penetrated to the capital, and enabled Lord E. and Baron Gros to dictate a peace under the walls of Peking. On the expiration of Viscount Canning's term of service, the governor-generalship of India was offered by Lord Palmerston to Lord E. (1861), and accepted by him. He died in India, November 1863. Lord E. (who was the representative in the male line of the great Scottish House of Bruce) was twice married: in 1841, to the daughter of Mr. Cumming Bruce, M.P. (she died 1843); and in 1846, to the daughter of the first Earl of Durham, by whom he had a son, Victor Alexander, present earl, born 1849, and other issue. Lord E. was K.T. (1847), privy councillor (1857), G.C.B., civil extra (1858).

ELGIN MARBLES, a celebrated collection of ancient sculptures, brought from Greece by Thomas, seventh Earl of Elgin, and acquired from him by the nation for the British Museum in 1816, at the sum of £35,000.

These sculptures adorned certain buildings on the Acropolis of Athens; the chief portions, which are from the Parthenon or Temple of Minerva, were designed by Phidias, and executed by him, or under his superintendence. They consist of—1. Portions of several of the statues that were placed in the east and west tympana or pediments, the most important of which are the Theseus or Hercules, Ilissus or river-god, upper portions of the torsos of Neptune and Minerva, Iris, torso of Cecrops, Ceres, and Proserpine, the Fates, heads of the horses of Hyperion, and one of the horses of Night.

Of all these, the Theseus, and the head of the horse of Night, are the most perfect, the former wanting only the hands and feet and part of the nose, while even the surface of the latter is very little injured. But however mutilated, the greatness in style of these magnificent works is clearly manifest, and from the merest



Theseus.

fragment valuable instruction in art may be obtained. 2. Fifteen metopes, executed in high relief, representing the battle of the Centaurs and Lapithæ. A metope is the interval between the triglyphs on a Doric frieze—in the Parthenon, there were ninety-two, fourteen on each front, and thirty-two on each flank of the temple—and on every metope, a Centaur engaged in conflict with one of the Lapithæ is represented in a style of the highest excellence in point of spirit and truthfulness. 3. A large portion of the frieze of the outer walls of the cella. This remarkable work



Metope :—From the Parthenon.

represents the solemn procession to the Temple of Minerva during the Panathenaic festival, and has never been equalled for elegance of composition and the variety and gracefulness of the figures. It is executed in low relief, in order to adapt it to the light, for placed within the colonnade, it received its light between the columns, and by reflection, from the pavement below. This exquisite frieze occupied, slab after slab, a space of 524 feet in length. The remains of it in the British Museum on slabs and fragments



Portion of Panathenaic Frieze.

of marble are to the extent of upwards of 249 feet, besides 76 feet in plaster casts.

Although the Elgin Marbles are now acknowledged to be the most precious collection existing of specimens of Greek art in its purest state, yet it was only after very considerable hesitation that government consented to purchase them, and then the sum

awarded was not only far short of anything like a fair value, if indeed a value could be put on such treasures, but Lord Elgin was left largely out of pocket after all his exertions.

Again, from petty jealousy, some of the connoisseurs of the day, who had earned a sort of reputation from their collections—of whom Mr. Payne Knight may stand for the type—made strong efforts to underrate these great works; while others, like Lord Byron, from feelings apparently generous, but quite mistaken, because not based on fact, heaped obloquy on Lord Elgin, and opposed their acquisition. But it has been clearly proved that Lord Elgin, so far from destroying, has saved these masterpieces from destruction. It was not to be expected but that foreigners would grudge this country such an acquisition, but certainly it is remarkable that such opinions should have been expressed in this country. The view adopted by a foreigner, who has devoted much attention to the subject, M. Viardot, author of *Les Musées d'Europe*, may be accepted as that generally taken abroad; and it is very different from that at one time so pertinaciously maintained by many in this country. M. Viardot remarks: 'It is said that, to justify the appropriation of the Lahore diamond, the English allege that if they have taken it, it was merely to prevent its appropriation by others. They may give the same excuse for their appropriation of the marbles of the Parthenon. No doubt, Lord Elgin has carried them off; and the Greeks of the present day, seeing the old temple of their Acropolis despoiled of all its ornaments, have a good right to curse the spoiler. But when we think of the devastation these works have so often experienced, to the total destruction of the principal statues, and the shameful mutilation of the others, and the risk these last ran of being entirely destroyed in their turn—when we consider that these precious relics of art are conserved in a place of surety, and placed in the center of artistic Europe, one loses the desire, and almost the right to charge the English with piracy and robbery. For my part, if, in the course of my long devotion to the marbles of Phidias, a regret has come to trouble the ardent pleasure of my admiration, it was, that the robber of these marbles was not a Frenchman, and their resting-place the Museum of Paris.'—*Vision on the Sculptures in the Collection of the Earl of Elgin* (John Murray, London, 1816). *Library of Entertaining Knowledge—British Museum* (London, Charles Knight).

ELGINSHIRE, MO'RAYSHIRE, or MURRAYSHIRE, a maritime county in the north-east of Scotland, on the Moray Firth. It contains 531 square miles, and is 30 miles long and 20 miles broad. About a third part was formerly cut off on the south by a detached part of Inverness-shire; but by an act of parliament passed in 1870, this part was annexed to Inverness-shire, and a part of the intervening portion of Inverness-shire, of about the same extent, rental, and population, was annexed to Elginshire. In the south are the high and rugged Monadhliadh Mountains of Inverness-shire, dividing the basins of the Spey and Findhorn, and forking in the north to include the basin of the Lossie. In the south, gneiss predominates, with a little granite; and in the north, sandstone with fish and reptilian remains, and small patches of oolitic and Wealden strata. West of the Findhorn mouth are the sand-dunes of Culbin, three square miles in extent, some of them rising 118 feet. Great masses of peat and trunks of trees are often cast ashore near the mouth of the Findhorn. The climate is mild and dry, and the county has been called the Devonshire of Scotland, the mountains of Aberdeenshire and Banffshire protecting it from the cold moist wind of the German Ocean. The soil is open, sandy and gravelly, and very fertile in the north, with some deep loams and clays. In 1881 nearly a third of the county—105,236 acres—was under crop, the chief crops being oats, barley, and turnips. Pop. (1871) 43,612; (1881) 43,788. The chief exports are grain, cattle, salmon, and timber. There are some manufactures of woollens and malt liquors. E. unites with Nairnshire in sending one member to parliament. It contains 14 entire parishes, and 8 parts of parishes. In 1871, 84.87 per cent. of children, from 5 to 13 years, were receiving education. The total valuation of E., including the burghs of Elgin and Forres, was, for 1879—1880, £227,852: this includes railways. The ancient province of Moray included the counties of Elgin and Nairn, and parts of those of Inverness and Banff. Scandinavians early settled in it. About 1160, Malcolm IV. subdued it. The chief antiquities are Elgin Cathedral, Spynie Castle, Duffus Castle, Pluscarden Abbey, Kinloss Abbey, and the Norman parish church of Birnie. Burghhead, on the coast, is supposed by many to have been a Roman station, but its ramparts and ditches, now almost destroyed, were probably of more recent origin. It was the last stronghold of the Norsemen in this part of Scotland. E. was overrun in the civil wars of Montrose, 1645, &c.

ELI'AS. St., a lofty mountain which occupies a conspicuous position on the north-west coast of America, in lat. 60° 18' N., and in long. 140° 30' W. It rises about 17,860 feet, or almost 33 miles above the sea, being visible to mariners at a distance of 50 leagues. Physically, it marks pretty nearly the point where the shore, after

trending in a north-west direction, turns due west, and politically it divides itself between the United States territory of Alaska and the Dominion of Canada.

ELI'JAH (in the Greek form, occurring in the New Testament, Elias), the greatest of the prophets of Israel, was born at Tishbe, in Gilead, on the borders of the desert. He comes upon the scene in the time of Ahab, about 920 B.C. When that monarch, to please his Phœnician wife Jezebel, had introduced, on an extensive scale, the worship of Baal, E. pronounced a curse on the land. The prophet had to flee. He took refuge by the brook Cherith, probably one of the torrents that cleave the high table-land of his native region. Here he was miraculously fed by ravens. He then went to Zarephath, a town lying between Tyre and Sidon. Here he lodged with a widow woman, prolonged her oil and meal, and brought back her son to health from the brink of the grave. Subsequently, he made a temporary reconciliation with Ahab, and on Mount Carmel executed dreadful vengeance on the prophets of Baal, slaying 400 with his own hand. Such a deed enraged Jezebel to the utmost. She swore to destroy the prophet, who once more took refuge in flight. He rested not till he reached Beersheba in the far south, on the edge of the desert that leads down to Sinai. The brief allusion in Scripture to his weary wanderings is very touching. At last he comes to Horeb, where he has an interview with Jehovah. The passage in which this is recorded is one of the grandest and most significant in the whole of the Old Testament. He then receives certain instructions from Jehovah, among others that he should select Elisha to be prophet in his room. E.'s next appearance is when Ahab rides forth to take possession of Naboth's vineyard: he denounces the murderous monarch, and utters an awful prophetic curse on him and his wife. After the death of Ahab, he rebukes the idolatries of his son Ahaziah in a solemn and bloody fashion; and after the death of Ahaziah, we find him interfering in the affairs of the king of Judah, who had married a daughter of Ahab, and had begun to 'walk in the ways of the kings of Israel.' He denounced his evil doings, and predicted his death. The closing scene of his life on earth is exquisitely narrated. A chariot of fire and horses of fire appeared after Elisha and he had crossed the Jordan, and 'Elijah went up by a whirlwind into heaven.'

ELIMINATION is a process by which, where we have a number of statements concerning several quantities, we can obtain a separate statement concerning each. Thus, in Algebra, elimination is the operation which consists in getting rid of a quantity or letter which is common, say, to two equations, by forming out of the two a new equation, in such a way as to make the quantity in question disappear. If three unknown quantities, for instance, are to be found from three independent equations, the first step is to form out of the three given equations two new equations, so as to eliminate one of the unknown quantities; from these two equations another of the quantities is eliminated in the same way, giving one equation with one unknown quantity, the value of which is then found. In complicated equations, elimination becomes difficult, and often impossible.

Elimination is an important process in other sorts of reasoning besides the mathematical; in this larger acceptance, it means the setting aside of all extraneous considerations—of everything not essential to the result. In astronomical observations the elimination of errors of observation is often effected by repeating the observations several times in such a way as to cause the errors to be of opposite kinds, then adding the observed values, and taking their average.—The word to 'eliminate,' is often erroneously used in the sense of to 'elicit,' or bring to light.

ELIOT, GEORGE. See EVANS, MARIAN.

E' LIS, one of the ancient divisions of the Peloponnesus, bounded N. and N.-E. by Achaia, E. and S. by Arcadia, and W. by the Ionian Sea. It was originally divided into three districts—Cele or Hollow Elis, Pisatis, and Triphylia. Of these, the first-named was by far the largest and most valuable, comprising as it did the broad and fertile plains watered by the Peneus and the Ladon, and producing excellent crops of corn, cotton, and flax; while the pastures by the river-banks reared cattle and horses of proverbial excellence. This district, from its fertility, was called 'the milk-cow of the Morea.' Pisatis is drained by the Alpheus, and is separated from Cele Elis by Mount Pholoë, a spur of Erymanthus. The low grounds of this division possess great natural fertility. Most of the surface of Triphylia is hilly, being occupied with offshoots from the great Arcadian ranges. It is separated from Pisatis by the Alpheus, on whose banks were the grove and temple of Olympic Jove, and the plain in which the great Olympic games were celebrated. Though E. had few facilities for preventing invasion, it yet suffered less from war than any other of the Greek states—an advantage chiefly due to the sacred character of the country, as the seat of the greatest of the national festivals. Their prerogative of holding the Olympic games gave the Eleans a prestige which they continue to enjoy in greater or less degree till the games themselves were suppressed by the Emperor Theo-

dosins in 394 A.D.—ELIS, now *Kaloseopi*, the capital of the foregoing country, stood on the Peloponnesus, and was long famous as one of the most splendid and populous cities of Greece. It was at one time strongly fortified, and contained many magnificent buildings, conspicuous among which was the Gymnasium, in which it was necessary that all athletes intending to take part in the Olympic games should go through a month's training before they were allowed to compete. See Leake's *Morea*, and Curtius's *Peloponnesus*.

ELI'SHA, a prophet of Israel, the successor of Elijah, who found him at the plough, and consecrated him to the sacred office by throwing his mantle over his shoulders. He exercised his functions for a period of 55 years. When Elijah was carried up into heaven, E. returned to Jericho, where he dwelt for some time. He then proceeded to Bethel, where the perplexing miracle occurred of the destruction of the 42 children by the two she-bears. After this period, he seems, besides performing an extraordinary number of miracles, to have taken an active part in the religious politics of his country, but he exhibited nothing of the fiery and sanguinary zeal of his master. Mild, tolerant, conciliatory, we hardly ever, if at all, find him rebuking the Baal-worship that was still prevalent in Israel.

Many of the incidents in his history recall the creations of eastern fancy, such, for example, as those of the horses and chariots of fire round about E. on the hillside, of the smiting of the Syrian host with blindness, so that the prophet led them all unconsciously into Samaria captive, &c. With Elijah, it has been said (see Smith's *Dictionary of the Bible*: Art. 'Elisha'), the miracles are 'introduced as means towards great ends, and are kept in the most complete subordination thereto. But with E., as he is pictured in the Hebrew narrative, the case is completely reversed; with him, the miracles are everything, the prophet's work nothing. The man who was for years the intimate companion of Elijah, on whom Elijah's mantle descended, and who was gifted with a double portion of his spirit, appears in the Old Testament chiefly as a worker of prodigies, a predictor of future events, a revealer of secrets, and things happening out of sight or at a distance.' The difficulties that thus beset the literal acceptance of the narrative of E.'s miracles have been felt by most modern commentators, and to evade these difficulties various methods, more or less satisfactory, have been employed. For several years, E. was the chief theocratical counsellor of Jehoram. Under the reign of Jehu and his successors, he gradually withdrew from public affairs, and died in Samaria in the reign of Jehoash, grandson of Jehu (about 840 B.C.). It has been customary to draw a parallel between E. and Christ; and his mildness and gentleness—always excepting the story of the destruction of the children at Bethel, which has perplexed all humane readers of Scripture—seem to justify this. E. is canonized in the Greek Church; his day is the 14th of June.

ELI'XIR (Lat. *elixare*, to extract by boiling), a term in pharmacy, which has come down from the days of alchemy, and is applied to various preparations, consisting mostly of solutions of aromatic and bitter vegetable substances in spirits of wine. The term tincture is now more common. ELIXIR OF VITRIOL, or Aromatic Sulphuric Acid, is prepared from $1\frac{1}{2}$ fluid ounces of sulphuric acid (oil of vitriol), 10 fluid ounces of rectified spirit, $\frac{1}{2}$ oz. cinnamon in powder, 1 oz. ginger in powder. The acid is gradually added to the spirit, and the mixture being placed in a closed vessel, is allowed to digest at a gentle heat for three days; the cinnamon and ginger are then added, and after being allowed to stand about six days, the whole is strained through cloth. The elixir of vitriol is useful for quenching thirst, sharpening the appetite, checking profuse perspiration, and often reducing the action of the pulse. The dose may range from 10 to 40 minims, and is administered in a wine-glassful of water, or some mild liquid, as infusion or conserve of roses.—ELIXIR VITÆ OF MATHIOLUS is composed of alcohol, and upwards of twenty aromatic and stimulating substances, and was at one time administered to patients suffering from epilepsy.

ELI'ZABETGRAD, a town of South Russia, is in a plain about 130 miles north of Kherson. It is well built, its streets straight, wide, and adorned with avenues of trees. E. has a large arsenal within the walls, and is protected by bastions. A brisk trade is carried on here; and an annual fair is held. E. is a great military center. Pop. (1875) 35,179. In 1881 there were murderous assaults on the Jews, very numerous here.

ELI'ZARETH, a city of New Jersey, U.S., at the mouth of the Elizabeth River. It is regularly and handsomely built, and has wide streets shaded with trees. Many New York merchants live here, and the place is noted for wealth, refinement and good schools. There are some manufactures in Elizabethport, the part of E. bordering on Newark Bay. Pop. (1870) 20,832; (1880) 28,229.

ELI'ZABETH, Queen of England, was the daughter of Henry VIII. and the unfortunate Anne Boleyn, and was born 7th September 1533. While she was yet in her third year, her mother was beheaded. After her mother's execution, she was sent to the country, where, in comparative poverty and seclusion, under the care of ladies who leaned to the 'new learning,' and sometimes, though seldom, with the companionship of her brother Edward, or her sister Mary, the greater part of her early youth was spent. When Catharine Parr became queen, E., who was a favorite with her, was more seen at court; but from some unknown cause, she incurred her father's displeasure, and was again sent to the country. Her father died when she was thirteen years old. During the reign of her brother Edward, her life passed quietly and peacefully. She was then remarkable for a great demureness and sobriety of manner, discoursing with her elders with all the gravity of advanced years. Edward used to speak of her as his 'sweet sister Temperance.' During her sister's reign, this demureness was exaggerated into prudery, and the vanity which, in after-years, with ampler means at its command, displayed itself in the utmost profusion of personal decoration, then sought for distinction by excess of plainness. Her Protestantism, and the way in which court was paid to her by the Protestant nobility, caused uneasiness to Mary and her council. On her sister's command, she conformed to papacy, but the insincerity of the conformity imposed upon no one. Upon the pretext of having been concerned in Wyatt's rebellion, she was sent in 1554 to the Tower. She entered it with all the gloomy forebodings which the fate of so many royal ladies who had been recently within its walls could suggest. In daily fear for her life, many months passed. Indeed, the warrant for her execution was at one time prepared; and it is unquestionable that the stern bigotry of Mary and her councillors, Gardiner and Bonner, would have sacrificed E., but for the fear of popular commotion. The people, however, regarded E. with great favor, and many already looked forward to the time when the death of Mary should free the court from foreign influence, and give room for a milder government. Thus the life of E. was saved, but for some time longer she was kept a prisoner at Woodstock. During the remainder of Mary's reign, E., though occasionally at court, resided chiefly at her residence of Hatfield House, in Hertfordshire, where she occupied herself with feminine amusements, and the study of classical literature, under the learned Roger Ascham.

When Mary died (17th November 1558), E. was twenty-five years of age. Her accession was welcomed alike by Catholic and Protestant. The former were, outwardly at least, the majority in Mary's reign; but among them there were few who really cared for the peculiar doctrines of the Roman Church, and there were many who were weary of priestly interference, foreign dictation, and cruel persecution. Like E. herself, there were many who conformed merely to save themselves from trouble. They had obeyed the Six Articles in Henry's time; had agreed to the Protestant settlement of Edward; had turned with Queen Mary, and were now ready to turn again with Queen Elizabeth. The Protestants, of course, who had never believed the sincerity of E.'s conformity, welcomed her to the throne. E. then began, amidst dangers and difficulties, a reign which, contrary to the expectation of all, was of unexampled length and prosperity. It would be wrong not to attribute to her influence some effect in producing the great changes which, during the next forty-four years, took place in England; but so far as these changes were not produced in the natural course of the development of the nation's powers, and so far as they bear the mark of an individual mind, they bear much more the impress of the bold yet cautious judgment and clear intellect of the great minister, Cecil, than of the sovereign's will. It is to the highest praise of E. that her first act on succeeding was to consult with such a man, and that to the very last she could bend her capricious temper to his control.

How the government influence was to be directed, was not long in being shown. Till parliament should meet, E. issued a proclamation that the English language should be used in the greater part of the church service, and that the Host should not be elevated by the priest during mass. This sufficiently indicated into what hands power had passed, and was enough to throw the mass of the indifferent to the side of the Protestants, and to cause a Protestant majority to be returned to E.'s first parliament. The acts of this parliament must be ever memorable in our history. It was then that England took its position as a Protestant power. The Book of Common Prayer, retaining, doubtless, some mixture of medieval thought, but still vivid with new energy, was appointed to be used in all churches; the Thirty-nine Articles were settled as the national faith; the queen was declared to be head of the church. Thus all allegiance to Rome was thrown off. This revolution was soon accomplished, and with little turmoil. The bishops, with one exception, refused to conform; but as a sign of the times, marking how thoroughly the priesthood must have become demoralized before their power was lost, it is noteworthy that of the 9000 clergymen who had livings in England, there were

fewer than 200 who resigned, rather than obey the new order of things.

The policy of E.'s ministers was one of peace and economy. They found the nation at war with France and Scotland, and one of their first acts was to secure peace upon favorable terms. Ever afterwards, they followed the same path. No war was undertaken in her reign for the sake of territorial conquest. To strengthen her own throne, E. secretly succored the Protestants in Scotland, France, and in the Low Countries; but she had few open wars. To be at peace with a government, nay, apparently to be upon the most amicable of terms with it (as E. was with the French court, while she sent assistance to the Huguenots at Rochelle), and at the same time to aid its rebellious subjects, was in those days thought only part of the politic dissimulation without which, it was believed, no nation could be safely ruled. To maintain the security of her own throne, and to prevent foreign interference in English matters, was the mainspring of E.'s foreign policy; and she lost no opportunity of weakening and finding occupation abroad for any foreign power that unduly threatened her authority.

The one great blunder of England's policy was the treatment of Mary Queen of Scots. Had E. pursued a straightforward course, when her rival was thrown into her hands, much evil

The news roused all England, and every man who could carry arms—Protestant and Catholic from 18 years of age to 60—was enrolled in the forces. The old queen herself rode at Tilbury, energetically encouraging the army. A fleet of 200 vessels and 15,000 seamen gathered itself on the southern coasts, and waited the attack. Superior skill and courage gained the victory for the English; and what these had begun, the force of the elements completed. The splendid Armada was broken and destroyed before it could join the land-army, not a soldier of which ever left foreign ground; while not a seaman of the fleet save those whom shipwrecks sent, ever set foot on English ground.

E. died on 24th March 1603, having lived nearly 70, and reigned nearly 45 years. If the life of her rival, Mary of Scotland, read somewhat like a tragedy, the private life of E. might afford abundant materials for comedy. Always parading her wish to live an unmarried life, E. coquetted with suitor after suitor till long after that period of life when such proposals verge upon the ridiculous. Of her father's schemes to marry her to the Scotch Earl of Arran or to Philip the son of Charles V.—afterwards husband of Mary—it is unnecessary to speak, for E. had personally little to say in regard to them. But she was scarcely more than a child when her flirtations with the handsome Lord Admiral Seymour—the brother of the Protector Somerset—had

Fac-simile of Queen Elizabeth's Signature.

might have been spared. Some of the English ministers were prepared to take effectual measures to remove a life which might be turned into so dangerous a tool in the hands of Catholics. E. shrank from that course, but had not the courage and generosity to set Queen Mary at liberty. Had this course been taken, Mary would have gone to France or Spain, would have made a foreign marriage, and as a foreigner would have lost the only sources of her real power—the sympathies of the Scotch and English Catholics. As it was, E. retained her a prisoner, and thus for years gave cause to conspiracy after conspiracy among the English Catholics. For a rebellion incited to set Mary free, the richest and most popular of the English nobility, Norfolk, was executed. The discovery of every new plot led to demands, on the part of parliament, for the execution of Mary. The plots then took a graver aspect. The assassination of E., and the placing of Mary on her throne, became the object. On the discovery of Babington's conspiracy for this purpose, the popular cry was irresistible, and was joined in by Cecil and Walsingham, and others of E.'s ministers, who had sinned too deeply against Mary to run the risk of her succession to the throne. With reluctance and hesitation, the sincerity of which need not be questioned, E. consented; and Mary, after long years of confinement, was condemned and executed.

This led to new evils. The participation of the Catholic party in the plots was retaliated by persecution. Many suffered under an act passed in 1585, making it treason for a Catholic priest to be in England, and felony to harbor one. These cruel measures were the ultimate means of bringing upon England the most menacing foreign attack which she had suffered. Philip of Spain had long meditated vengeance against England. The greatest state in Europe, enriched by splendid acquisitions in the New World, could ill brook that a power of the second rank should incite rebellion among her subjects in the Netherlands, should aid the Protestants in their desperate struggle against Alva, and allow its ships (little better than pirates, it must be confessed) to enter the Spanish harbors, and cut out the rich laden galleons. These were the real reasons: to restore the Catholic faith, and to revenge the death of a Catholic queen, furnished ostensible reasons. Years had been spent in preparation. In 1588, the 'Invincible Armada' sailed from the Tagus, manned by 8000 sailors, and carrying 20,000 soldiers. To aid these, a land-army of 100,000 men was to be transported from the Netherlands under the Duke of Parma.

passed the bounds of decorum. In Mary's reign, E. was flattered with the attentions of her kinsman, the Earl of Courtenay, and she declined the hand of Philibert of Savoy, pressed on her by her sister's council. When queen, with some hesitation she refused the offer of Philip II., who was desirous of perpetuating his influence over England, and she began that connection with Leicester, which so seriously compromised her character.

It is certain that she loaded him with honors as soon as she had them to bestow; allowed him to become a suitor for her hand within a few days after the sudden death of his wife, Amy Robsart, attributed by all England to his agency; and allowed him to remain a suitor long after his open profligacy had disgusted the nation, and had even opened her own eyes to his worthlessness. If we credit the scandal of the times, the intimacy was of the most discreditable kind. If we credit those sources of information, recently turned to more profit by Mr. Froude than by any of his predecessors, which are found in the dispatches of the Bishop of Aquila, ambassador of Philip II. in London, preserved in the archives of Simancas, not only was the moral character of E. sullied with the darkest crimes, but even the quality for which she has ever been most honored, her English patriotism, was mere affectation. These dispatches represent her as accessory—at least, after the fact—to the murder of Amy Robsart, and as offering to Spain to become a Catholic, and to restore the Spanish ascendancy in England, if Philip would support her on the throne as the wife of Leicester; and they represent her as being restrained from giving way to the fatal consequences of her wild passion only by Cecil's control. That there is some basis of truth in this revelation, it is scarcely possible to deny; but the hatred with which Philip regarded E., after her refusal to marry him, has undoubtedly led the courtly bishop to gross exaggerations. It is undeniable, however, that had E. followed her own inclinations, she would have married Leicester. Her ministers, wisely for the nation, prevented this, but E. never seriously entertained another proposal. Cecil could prevent her marrying whom he would not, but he could not force her to marry whom he would. Among less distinguished suitors, the Archduke Charles of Vienna, and Prince Eric of Sweden, pressed their suit in vain. Petitions from parliament to the queen to marry, only excited her maidenly wrath, and produced dignified replies that she would attend to the matter when the time came. Years passed on, and she remained a spinster. Catharine of Medici, queen-mother of France, intrigued to marry

her to one of her sons, Henry of Anjou (afterwards Henry III.), or the Duke of Alençon, afterwards Duke of Anjou. When the foreign envoys pressed the suit of the latter, E. was 38 years of age, and her suitor 19; but they ingeniously flattered her that she and he looked of the same age, for she, by her good preservation, looked nine years younger than she was; while the duke, by his wisdom, gravity, and mature intellect, looked nine years older. This flattery, with more plausible attractions, was without effect.

E.'s position gave too much scope for the development of the unamiable and ridiculous features of her character. The personal vanity displayed in her extravagant dress, her conversation, her 'high and disposed' dancing, excites a smile, not lessened when we read of the irritable mistress boxing the ears of her councillors, cuffing her attendants, indulging in expressive masculine oaths, and amusing herself with rough masculine sports. The assertion that she was of a cruel disposition is false. That she could do cruel things when her vanity was concerned is sufficiently attested by her ordering the right hand of a barrister, named Stubbes, to be struck off for writing a remonstrance against her marriage with the Duke of Alençon, which she thought unduly reflected on herself; but in her reign, the reckless waste of human life which marked the reigns of her predecessors was unknown. She was not, however, of fine feelings. Her brother could compliment her on the calm mind and elegant sentences with which she replied to the communication of the death of her father. On the news of her sister's death, she burst out with rhapsodical quotations from the Psalms; and when she heard of the execution of her lover Seymour, she turned away the subject with something like a jest. By her attendants, she was more feared than loved. The one quality which never failed her, was personal courage; and when she chose, her demeanor was stately and royal. Religion was with her, as with a great proportion of the nation at that time, a matter more of policy and convenience than of feeling or principle. She preferred Protestantism, from early associations, because it gave her the headship of the church, freed her from foreign interference, and was more acceptable to her ministers and to the nation. But she had conformed in Mary's time to Catholicism with little difficulty; and, had there been necessity for it, she would rather have reigned a Catholic than not have reigned at all. To the last, she retained in her private chapel much of the ritualism of the Roman Church; and while refusing her Catholic subjects the exercise of their religion, she entertained the addresses of Catholic suitors. How thoroughly incapable she was of appreciating a matter of religious principle may be gathered from the fact, that she looked upon the great Puritan movement, destined soon afterwards to play so important a part in the nation's development, as some frivolous controversy about the shape of clerical vestments. Of toleration, then well enough understood by Bacon and the more advanced spirits of the age, she had no conception.

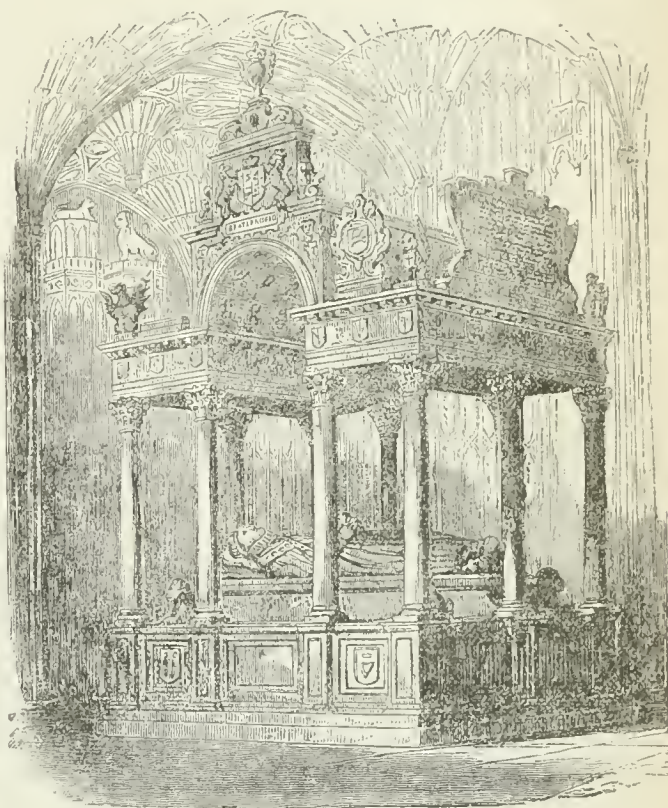
What makes the name of E. so famous, was the splendor of her times. In her long reign, the true greatness of England began. Freed from the possession of those French provinces which rather harassed than enriched—with little domestic commotion—with no great foreign wars—with an almost complete immunity from religious persecution, the nation turned to the arts of peace. An unequalled literature arose. The age that produced Spenser, Shakspeare, and Bacon, could not be other than famous.

Under Frobisher and Drake, maritime adventure began, and the foundations of our naval force were laid. Commerce, from being a small matter in the hands of a few foreign merchants, developed itself largely. The Exchange of London was opened in E.'s time; and in the charter which she granted to that Company of Merchant Adventurers, which afterwards took the name of the East India Company, may be seen one of the small beginnings of our vast colonial empire. The social condition of the people also greatly improved in her reign. The crowds of vagabonds which the monastic institutions had fostered, and who had pillaged the country in all ways on the secularization of the monastic property, died out, or were absorbed in industrious employments. The last traces of bondage disappeared. Simultaneously with the growth of greater comfort and intelligence in the people, parliament began to assert, with great vigor, its constitutional rights. The right of the Commons to free speech, and to initiate all money-bills, was steadily asserted; and the right of the Crown to grant monopolies, or to issue proclamations having the force of law, vigorously assailed. In the later years of her reign, the attempts of E. to gain arbitrary power, and her caprices, had forfeited the popularity which she so anxiously cultivated. But after her death, her fame revived; and during the time of the Stuarts, amid the jealousy of the Scotch, the troubles of the civil wars, and the hatred of a Catholic sovereign, the nation looked back with fond regard to the long reign of the 'Good Queen Bess,' when peace had prevailed, and the government had been thoroughly English.

ELIZABETH, ST., daughter of Andreas II., king of Hungary, was born at Presburg in 1207. At the age of four, she was affi-

anced to the Landgraf of Thuringia, Louis IV., called the Pious, and brought to his court to be educated under the eyes of the parents of her future husband. She early displayed what may be called a passion for the severities of the Christian life, as it was conceived in those days.

She despised pomp, avarice, ambition; cultivated humility, and exhibited the most self-denying benevolence. Her conduct, even as a girl, astonished the Thuringian court; but such was the grace and sweetness of her disposition, and the excellence of her beauty, that Louis—though her affections seemed to be given wholly to God—still wished to marry her. They were united when E. was only 14. Louis himself, far from blaming the devout girl whom he had made his wife for her long prayers and ceaseless almsgiving, was himself partially attracted to a similar mode of life. A boy and two girls were the fruit of their union; but the happiness of E., in so far as it depended on anything earthly, was shattered by the death of her husband in 1227, when absent on the crusade headed by Barbarossa. Her confessor,



Queen Elizabeth's Tomb:
In the North Aisle of Henry VII.'s Chapel, Westminster Abbey.

Conrad of Marburg, a narrow fanatical monk (to whose miserable teaching E. mainly owed her perverted idea of life and duty), had trained her to stifle the emotions of her nature as sinful, and the poor widow hardly dared to bewail her loss. Great misfortunes soon befell her. She was deprived of her regency by the brother of her deceased husband, and driven out of her dominions on the plea that she wasted the treasures of the state by her charities. The inhabitants of Marburg, whose miseries she had frequently relieved, refused her an asylum, for fear of the new regent. At last she found refuge in a church, where her first duty was to thank God that he had judged her worthy to suffer. Subsequently, after other severe privations, such as being forced to take up her abode in the stable of a hostelry, she was received into the monastery of Kitzingen by the abbess, who was her aunt. When the warriors who had attended her husband in the crusade returned from the East, she gathered them round her, and recounted her sufferings. Steps were taken to restore to the unfortunate princess her sovereign rights. She declined the regency, however, and would only accept the revenues which accrued to her as landgravine. The remainder of her days were devoted to incessant devotions, almsgivings, mortifications, &c. There is something mournfully sublime in her unnatural self-sacrifice. We shudder even in our sympathy when we read of this beautiful tender-hearted creature washing the head and the feet of the scrofulous and the leprous. Murillo has a painting (now in the Museum at Madrid) of this act of evangelical devotion. The solemn tragedy of her brief life assumed towards its close a ghastly intensity

through the conduct of her confessor, Conrad, who, under pretence of spiritual chastisement, used to strike and maltreat her with brutal severity. The alleged cause of this was Conrad's aversion to her 'squandering' her money among the poor. Perhaps he thought it should have gone to him. At last her health gave way; and on the 19th November 1231, at the age of 24, E. died, the victim partly of ill-usage and partly of a mistaken theory of religious life, but as gentle and saintly a soul as figures in the history of the middle ages. She was canonized four years after her death. See Montalembert's *Histoire de Sainte Elisabeth de Hongrie* (Paris, 1836). The Rev. Charles Kingsley's dramatic poem, entitled *The Saint's Tragedy* (London, 1848), is founded on the story of E.'s life.

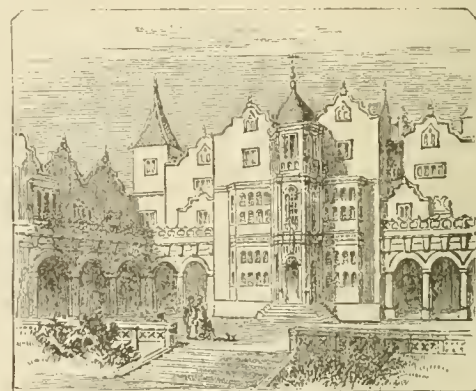
ELIZABETH PETROVNA, Empress of Russia, daughter of Peter the Great and Catharine I., was born in the year 1709. On the death of Peter II. in 1730, she allowed Anna, Duchess of Courland, to ascend the throne, she herself being apparently indifferent to anything but the indulgence of her passions. Anna died in 1740, and Ivan, the son of her niece (also called Anna), an infant of two months, was declared emperor, and his mother regent during his minority. Shortly after this, a plot was formed to place E. upon the throne; the two principal agents in it were Lestocq, a surgeon, and the Marquis de la Chetardie, the French ambassador. The officers of the army were soon won over; and on the night of the 5th December 1741, the regent and her husband were taken into custody, and the child Ivan conveyed to Schlüsselburg. The leading adherents of Anna were condemned to death, but pardoned on the scaffold, and exiled to Siberia. By eight o'clock in the morning, the revolution was completed, and in the afternoon all the troops did homage to the new empress, La Chetardie was handsomely rewarded; and Lestocq was created first physician to the empress, President of the College of Medicine, and privy councillor. E., however, did not possess the qualities requisite in a ruler. She wanted energy, knowledge, and love of business, and allowed herself to be guided by favorites. In order to strengthen her position, E. took pains to win over her nephew, the young prince Peter, the son of her sister, the Duchess of Holstein-Gottorp. She summoned him to Petersburg in the year 1742, and proclaimed him her successor. E. took part in the Austrian War of Succession, and in spite of the opposition of France, despatched an army of 37,000 men to the assistance of Maria Theresa, and thereby hastened the conclusion of the peace of Aix-la-Chapelle in 1748. E. showed herself less placable towards Frederick II., against whom she cherished a personal enmity, excited by some severe expressions he had employed respecting her. At the commencement of the Seven Years' War, she allied herself with Austria and France, and marched her troops into the Prussian States. Her troops gained the victory in the battles of Grossjägerndorf and Kunersdorf, and took possession of Berlin, but without any decisive result. E. died before the expiration of the war, 5th January 1762. She founded the university of Moscow and the Academy of Art at St. Petersburg. Though no person was put to death during her reign, the most shocking punishments were inflicted, and thousands were exiled to Siberia and Kamchatka. E. had several illegitimate children. Profligacy, espionage, and persecution reigned in her court, the administration of justice was restrained, and the finances neglected; but E. was nevertheless extremely strict in the observance of the public ordinances of religion.

ELIZABETH STUART, Queen of Bohemia, remarkable not only as a heroine, but as forming the connecting link between the ancient royal families of England and Scotland and the present reigning dynasty, was born in the palace of Falkland (q. v.) on the 19th of August 1596. On the accession of her father, James VI. of Scotland, to the crown which fell to him by the demise of Queen Elizabeth, in 1603, she accompanied the family to England, where she was educated. On the 14th of February 1613, E. was married to Frederick, Elector-Palatine, whom she soon after accompanied to his residence, the castle of Heidelberg (q. v.); see also **PALATINATE**. When the Protestant princes of Germany sought for a fitting person to fill the throne of Bohemia, they made choice of Frederick, who accepted the perilous honor, partly, perhaps, from the ambition of his wife, who is alleged to have longed for the title of queen. The Palatine removed with E. and three children to Prague, which they entered, October 21, 1619. Frederick and E. occupied the throne of Bohemia only about a year. By the forces of the Catholic League, the army of Frederick was routed at the battle of Prague, November 8, 1620, and the royal family fled into exile, for already the Palatinate was laid waste. With her husband and children, and a few faithful attendants, E. took up her residence at the Hague, and ever afterwards the family lived in a state of dependence. E. was the mother of thirteen children, the eldest of whom was accidentally drowned in Holland, and three others died young. The next were Charles-Louis and Rupert, and, following in order, were Elizabeth, Maurice, Edward, Philip, Louisa, Henrietta-Maria, and Sophia.

From this numerous offspring, E. derived little comfort in her misfortunes. Charles-Louis was a selfish, calculating person, with low disreputable habits. Rupert (q. v.), the 'mad cavalier,' and his brother, Maurice, fought in England during the civil war, and, after the loss of the royalist cause at the battle of Naseby they betook themselves to the sea, and for some time were little better than pirates. Edward, in 1645, abjured Protestantism, and was admitted into the Roman Catholic Church. Philip committed an assassination at the Hague, fled from justice, became a soldier of fortune in France, and was slain in the civil wars. Elizabeth accepted the office of superior of the Lutheran abbey of Hervorden, Henrietta-Maria was espoused by Ragotzi, Prince of Transylvania, but died shortly after her marriage. Louisa fled to France, and died as abbess of Maubisson. Previous to these events, E. became a widow by the death of Frederick, February 17, 1629, when his right to the Palatinate devolved on Charles-Louis, who, by the treaty of Westphalia, was restored to the family inheritance, October 24, 1648. This favorable turn of affairs did not mend the fortunes of E., who was scandalously neglected by her son, the young Elector-Palatine; and all he would do for the family was to give a shelter to his youngest sister Sophia, until she was married to Ernest-Augustus, a scion of the House of Brunswick, who ultimately succeeded to the electorate of Hanover.

Deprived, in one way or other, of all her children, the Queen of Bohemia—by which title she continued to be known—resolved to quit Holland. Relieved of her debts by the sale of jewels, and by aid of a pecuniary subsidy from the British parliament, she embraced an invitation from her nephew, Charles II., to come to England. She arrived May 17, 1661. From this time she was in a great measure indebted to the hospitality of Lord Craven, in a mansion which he had purchased from Sir Robert Drury, in Drury Lane, London. Charles II. paid her little attention; but at her death, which occurred February 13, 1662, he caused her remains to be interred in Westminster Abbey. Charles-Louis, her son, died in 1680, leaving a son, who died without issue, and the Palatinate then went to a distant branch of the family; he left also a daughter, Charlotte-Elizabeth, who, in 1671, had married Philip, Duke of Orleans, only brother of Louis XIV. In 1674, she gave birth to a prince, who became the noted Regent of France during the minority of Louis XV. She died at St. Cloud in 1722. The late Louis-Philippe, king of the French, was her lineal descendant. When, in 1708, the question of succession to the crown of Great Britain was debated, it was found that all the descendants of James I. were either dead or were Roman Catholics, except Sophia, Electress of Hanover, and her family. By act of parliament, that year, the crown was accordingly secured to her and her descendants, 'being Protestants;' and in virtue of this act of settlement, on the death of Queen Anne, Sophia would have ascended the throne, but she predeceased the queen three months, and her son became sovereign of these realms as George I., August 12 1714. In this extraordinary and unforeseen manner did a grandson of the unfortunate queen of Bohemia become king of England, and originate the dynasty of the reigning monarch. The *Memoirs of Elizabeth Stuart, Queen of Bohemia*, by Miss Benger, 2 vols., may be perused as an accurate and pleasing piece of biography.

ELIZABETHAN ARCHITECTURE, a term applied to the mixed style which sprang up on the decline of Gothic architecture.



Holland House.

By some it is called the Tudor style, but that name belongs more correctly to the Perpendicular, or latest kind of Gothic. The Elizabethan is chiefly exemplified by mansions erected for the nobility in the reigns of Elizabeth and James I., and originated in the first attempt to revive classic architecture, influenced, no doubt, by Holbein, who was patronized by Henry VIII., and fur-

nished several designs in this manner. John of Padua succeeded him, and built in the mixed style a palace for the Protector Somerset (for which purpose the cloisters of St. Paul's were taken down), and the mansion of Longleat for his secretary, Sir John Thynne. The vast dimensions of the apartments, the extreme length of the galleries, and enormous square windows, are the leading characteristics of this manner of building. The ornaments both within and without were cumbersome; nothing could exceed the heaviness of the cornices and ceilings wrought into compartments; in short, the architecture was just in keeping with the dress of the period, rich and gorgeous, rather than elegant, graceful, and comfortable. The following examples of mansions of the 17th c. may be still seen near London: Holland House, Campden House; and the following in Kent: Sir T. Willow's at Charlton, the Marquis of Salisbury's at Hatfield, and Knowle, the property of the Duke of Dorset. The most eminent architects of those times were John Thorpe, Gerard Christmas, Rodolph Symonds, and Thomas Holt.

ELIZABETOPOL, a town of Russian Transcaucasia, is situated in lat. $40^{\circ} 42' N.$, long. $46^{\circ} 20' E.$ The town consists of three parts, one of which is fortified with a bastioned wall. Its principal buildings are its churches and mosques, of which there are many. The town is remarkable for its numerous fruit-gardens and vineyards. Horticulture, the rearing of silk-worms, bees, and cattle, with agriculture and mining, are the chief occupations of the inhabitants. Pop. (1867) 14,971, principally Tartars and Armenians.

ELK, MOOSE, or MOOSE DEER (*Alces Melchis*, or *Cervus alces*), the largest existing species of the *Cervidae*, or deer family, is a native of the northern parts of Europe, Asia, and America. When full grown, it is about six feet in height at the shoulders, and sometimes weighs 1200 pounds. The body is round, compact, and short; the neck is short and thick, unlike that of deer in general, but thus adapted for sustaining the great weight of the head and horns. The head is very large, narrow, about two feet long. The horns in males of the second year are unbranched, not flattened, and about a foot long; as the animal becomes older, they begin to display a blade, with more numerous snags, and in mature elks the blade becomes very broad, the snags sometimes fourteen on each horn; a single antler has been known to weigh about sixty pounds. The horns have no basal snag projecting forwards. The ears are long, and have been compared to those of the ass. The eyes are small. The limbs are long, and very graceful. The tail is only about four inches long. The body is covered with coarse angular hair, which breaks when it is bent. On the neck and withers there is a heavy mane, and the throat is covered with long hair. A large goitre-like swelling under the throat of the younger elks has a very curious appearance. The hoofs of the E., like those of the reindeer and of the buffalo, are so constructed as to part widely, and to afford a better footing on soft marshy ground or on snow; they make a clattering when it



Elk (*Cervus alces*).

runs. In running, it carries its muzzle forward, with the horns thrown back upon the neck, so that they may not be caught by branches. Its shoulders being higher than the croup, its common gait is a shambling trot; but it can also gallop with great rapidity. The color of the elk is brownish black, darker in winter than in summer; the limbs, the sides of the head, and the mane are of a lighter color than the body. Elks are sometimes seen in small herds, but often singly; they are now very rare in Europe, and are no longer found in parts of North America in which they were once common. They formerly extended as far south as the Ohio. They are sometimes seen even on the shores of the Arctic Ocean. They delight in marshy districts and in forests. When compelled to eat grass, they must get down on their knees to reach it: their proper food consists of the branches and foliage of shrubs and trees. They are very timid and inoffensive, except during the rutting season.

A single stroke of an elk's fore-foot is sufficient to kill the strongest dog. It is also an extremely wary animal, and is with the greatest difficulty approached by the hunter. Its sense of smell is very acute, and the slightest sound excites its alarm. It is, however, much sought after in North America. In Sweden, its destruction is prohibited; and in Norway is placed under legal restrictions. The flesh of the elk is esteemed a good kind of venison; the fat is remarkably soft; the nose and the tongue are reckoned delicacies. The skin is used for a variety of purposes.

The elk is easily domesticated, and was at one time employed in Sweden for conveying couriers, being capable of traveling more than 200 miles in a day when attached to a sledge.

The elk of Ceylon is a deer of the group to which the name *Rusa* has been given.

ELK, IRISH (*Megaceros Hibernicus*), a large deer found in the Pleistocene strata. There is a double error in its popular name, for it is a true deer, between the fallow and reindeer, and



Fossil Elk.

though abundant in Ireland, it is not peculiar to that country being found also in England, Scotland, and on the continent of Europe. In Ireland, it occurs in the shell marl underlying the extensive turbaries. In England, lacustrine deposits and brick-clay contain its remains, and, associated with the mammoth and rhinoceros, they are found also in ossiferous caves. The most striking feature in this animal was its enormous antlers. A straight line drawn between their extreme tips in one specimen measured ten feet ten inches. The form of the antler differs from that of any living species of deer. The beam enlarges and flattens into a palm; a brow snag exists as in the fallow-deer, but in adult specimens, this bifurcates and expands somewhat as in the reindeer—a peculiarity never observed in the fallow-deer group. The antler is also furnished with a back snag. Some idea of the enormous size and weight of the antlers may be formed from the fact that, in a specimen where the head weighed $5\frac{1}{2}$ pounds, their weight was 81 pounds. To sustain this, the vertebrae of the neck and the limbs are very much larger and stronger than in any other deer. A fine and almost perfect specimen of this animal, from the Isle of Man, exists in the Edinburgh Museum.

EL-KHA'RGEH, capital of the Great Oasis, Upper Egypt, is situated in lat. $25^{\circ} 28' N.$, long. $30^{\circ} 40' E.$ In the vicinity of the town are numerous ruins, among which are those of a temple; there is also a remarkable necropolis. Pop 6000.

ELL (allied to *elbow*, Ger. *ellenbogen*, Lat. *ulna*, the fore-arm or arm in general) is a measure of length now little used. It was originally taken in some vague way from the arm, and hence has been used to denote very different lengths. The Latin *ulna* appears to have denoted sometimes the measure from the elbow to the tips of the fingers, sometimes that between the outstretched hands. The English ell, as a measure of cloth, is equal to five quarters of a Yard (q. v.).

ELLENBOROUGH, EARL OF. Edward Law, first Earl of E., son of the first baron (many years Chief-justice of the King's Bench), was born 1790; educated at Eton and St. John's College, Cambridge, where he graduated M.A., 1809; succeeded his father in the barony in 1818; was Lord Privy Seal in the Duke of Wellington's administration, 1828—1829; President of the Board of Control during the short-lived Peel administration of 1834—1835; and appointed, on the return of Sir Robert Peel in September 1841, to the same office, which he relinquished a month afterwards for the post of Governor-general of India. He received the thanks of parliament in 1843 for his 'ability and judgment' in supporting the military operations in Afghanistan. In many other respects, his Indian administration was open to censure. He was charged with reserving his favor for the military, and inflicting undeserved slights upon the civil servants of the Company. He

made showy progresses; addressed proclamations to the rulers and natives of India which appeared to sanction idolatry; and finally, in his proclamation concerning the sandal-wood gates of the temple of Juggernaut, when brought back from Ghuznee, he reached the climax of a series of extravagances, which induced the directors of the East India Company to exercise a power only used in extreme cases, and to recall him. The ministry, however, stood by him, and he was created by the crown an earl and a viscount; he also received the distinction of G.C.B. In 1846, Sir R. Peel made him first Lord of the admiralty, an office which he resigned in July of the same year, when the disruption of the Peel administration took place. In the Derby administration of 1858 he was again Minister for India, and the author of an Indian Bill, which failed to obtain the sanction of parliament. Having permitted a dispatch to see the light, in which he had administered a severe and caustic rebuke to Viscount Canning, Governor-general of India, an outcry was raised against him, which threatened the existence of the Derby government. To avert this result, Lord E. resigned. He afterwards took a frequent and influential part in the debates of the Upper House. He was styled, by no less a judge than M. Guizot, 'the most brilliant of the Tory orators.' He was twice married—first to a daughter of the Marquis of Londonderry, and second to the daughter of Admiral Digby. His divorce from the latter made some noise at the time. E. died without issue, December 2, 1871, when the earldom and viscountcy became extinct.

ELLENRIEDER, MARIE, a female painter of very high excellence, was born at Constance in 1791, studied in Munich, and in 1820 went to Rome, to perfect her knowledge of art. Her admiration of the old German masters gave a religious bent to her genius. On her return to Germany, she resided for some time at Carlsruhe, where she painted a 'Martyrdom of St. Stephen' as an altar-piece for the Roman Catholic Church. She was afterwards appointed court-painter at Munich, but she chose to fix her residence at Constance, and devoted herself exclusively to her profession. Among her principal pieces are the 'Transfiguration of St. Barthelemy,' 'Christ Blessing Little Children,' 'Mary and the Infant Jesus,' 'Joseph and the Infant Jesus,' 'St. Cecilia,' Faith, Hope, and Charity, and a Madonna. Marie E. is reckoned in Germany the greatest female artist of the present age. So full of ideal grace and beauty are the heads of her women and children, in particular, that it has been said that 'she seems to paint in the presence of angels;' her coloring, however, is gray, dull, and sombre, like that which prevails among the old masters of the German school. She died in June 1863.

ELLESMERE, first **EARL OF**, politician, patron of the arts, and author. Francis Egerton, second son of the first Duke of Sutherland, was born 1800; graduated at Christ Church, Oxford, where he was second-class in classics, 1820; entered the House of Commons, 1820, and represented successively Bletchingly, Sutherland county, and South Lancashire; filled the office of Chief-secretary for Ireland from January 1823 to July 1830, and Secretary at War from July to November 1830; in 1833 assumed the name of Lord Francis Egerton, in lieu of his patronymic Leveson-Gower. He achieved considerable literary distinction as a writer of graceful poems, translations from the German, &c. He also published a pamphlet on the defenceless state of the coasts and of the metropolis, which called forth some adverse criticism. He was a munificent patron of the arts, and made many valuable additions to the collection of pictures which he inherited with the large estates of the late Duke of Bridgewater. He also built a noble gallery for their reception, which he liberally threw open to the public. After faithfully voting with the Conservative party in parliament for a quarter of a century, he, on the retirement of the Peel administration in 1846, obtained a revival in his favor of the peerages of Ellesmere and Brackley. His last public appearance was in May 1856, when he moved, in the House of Lords, an address to the crown, approving of the treaty of peace after the war with Russia. He died in 1857 at his new mansion, Bridgewater House, London, and was succeeded in the earldom by his eldest son, Viscount Brackley.

ELLICOTT, CHARLES JOHN, Bishop of Gloucester and Bristol, was born 25th April 1819, near Stamford, of which parish his father was rector. He studied at Cambridge, where he graduated in 1841, and obtained many honors. He became professor of divinity at King's College, London, in 1848, and at Cambridge in 1859. He was named Dean of Exeter in 1861, and raised to the Episcopal bench in 1863. He is best known as a commentator on the Epistles of the New Testament, and is distinguished for thoroughness of grammatical criticism. He has published critical and grammatical commentaries on Galatians, Ephesians, Philipians, Colossians, Thessalonians, Philemon, and the Pastoral Epistles; works on the Sabbath, on Scripture and its Interpretation, and on Scepticism.

ELLESMERE, a town in the north-west of Shropshire, near a beautiful lake or mere, 19 miles north-north-west of Shrewsbury.

Pop. (1881) 1875. It has considerable malting establishments. On the present site of a bowling-green once stood an ancient castle, alternately held by the English and Welsh.

ELLIOT, EBENEZER, the **CORN-LAW RHYMER**, was born at Masborough, in Yorkshire, March 7, 1781. His father was a man of strong character and narrow opinions, and, as appears from Ebenezer's Autobiography (published in the *Athenæum* in 1850), exercised no little influence on his son's modes of thinking and sympathies. When a boy at school, E. was not a quick pupil; and even after his father had sent him to work in the iron-foundry where he himself held the situation of a clerk, the youth exhibited no fondness for reading. Before long, however, he entirely changed, and commenced to study Milton, Shakspeare, Ossian, Junius, and other authors. His first published poem was composed in his 17th year: it is entitled *The Vernal Walk*. This was succeeded by *Night, Wharfedale, &c.* In 1821, E. began business as an iron-founder on his own account at Sheffield. He was very successful; and in 1841 retired to an estate which he had purchased at Great Houghton, near Barnesley, where he died 1st December 1849. E.'s principal productions are *Love*, accompanied with a letter to Lord Byron, his famous *Corn-law Rhymes*, *The Ranter*, and *The Village Patriarch*, a work full of noble and earnest poetry, all of which appeared between 1823—1830. In 1834, he issued a collected edition of his works, in 3 vols.; and in 1840, an edition in one volume. E. followed Crabbe, but with more depth and fire of feeling, in depicting the condition of the poor as miserable and oppressed, tracing most of the evils he deplores to the social and political institutions of the country. The laws relating to the importation of corn were denounced by E. as specially oppressive, and he inveighed against them with a fervor of manner and a harshness of phraseology which ordinary minds feel as repulsive, even while acknowledged as flowing from the offended benevolence of the poet. But the glow of earnestness kindles his verse, and hides a multitude of faults. More enduring, however, than his rhyming philippics are his descriptions of English, and especially of Yorkshire scenery, and his delineations of humble virtue and affection. These are instinct with the purest spirit of poetry.

ELLIPSE is the name of a figure in Geometry, important from its being the approximate shape of the planetary orbits. It is a curve of the second order, and is a conic section, formed by cutting a right cone by a plane passing obliquely through its opposite sides. It may be defined as a curve, the sum of the distances of every point in which from two fixed points within the curve is always the same. These two fixed points are called the foci; and the diameter drawn through them is the major axis; the minor axis bisects the major at right angles. The distance of either focus from the middle of the major axis is the *eccentricity*. The less the eccentricity is compared with the axis, the nearer the figure approaches to a circle; and a circle may be considered as an ellipse whose foci coincide.

There are various contrivances for describing an ellipse, called *ellipsographs* or *elliptic compasses*. The simplest method of description is to fix on a plane the two ends of a thread with pins in the foci, and make a pencil move on the plane, keeping the thread constantly stretched. The end of the pencil will trace an ellipse, whose major axis is equal to the length of the thread.

The equation to an ellipse (see **CO-ORDINATES**), referred to its center as origin, and to its major and minor axes as rectangular

axes, is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where a and b are the semi-major and semi-

minor axes respectively. From this equation it may be shown, by the integral calculus, that the area of an ellipse is equal to πab ; or is got by multiplying the product of the semi-major and semi-minor axis by 3.1416. It may also be shown that the length of the circumference of an ellipse is got by multiplying the major axis by

the quantity $\pi \left(1 - \frac{d^2}{2} - \frac{3d^4}{64} - \frac{3^2 \cdot 5d^6}{2^2 \cdot 4^2 \cdot 5^2} - \&c. \right)$, where $d = \frac{1-4b^2}{4a^2}$.

ELLIPSI (Gr. omission), is a term used in Grammar and Rhetoric to signify the omission of a word necessary to complete the expression or sentence in its usual form. The object of ellipsis is shortness and impressiveness; accordingly, it prevails in proverbs. Ellipses are used in all languages, but the same forms of ellipses are not common to all. Thus, 'the house we saw,' instead of 'the house that we saw,' is a kind of ellipsis peculiar, so far as we know, to English.

ELLIPSOID is a surface of the second order, of which the Spheroid (q. v.), is a species, and the most interesting, from the fact of the form of the earth being spheroidal. The equation to an ellipsoid referred to its center and rectangular co-ordinates is

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1.$$

ELLIP'TIC CITY (of the Earth). See **EARTH**.

ELLIS, ALEXANDER JOHN, F.R.S., F.S.A., was born at Hoxton in 1814, and educated at Shrewsbury, Eton, and Trinity College, Cambridge, taking his B.A. degree in 1837. His name by birth was Sharpe, which was changed by royal license in 1825. He was elected a Fellow of the Royal Society in 1864, and of the Society of Antiquaries in 1870. He was president of the Philological Society during 1872–1874, and is a member of the Philosophical and Mathematical Societies of London. Among his numerous and valuable works may be noted: *Alphabet of Nature* (1845); *Essentials of Phonetics* (1848); *Universal Writing and Printing* (1856); *Early English Pronunciation* (1869–1871); *Practical Hints on the Quantitative Pronunciation of Latin* (1874); translation of Helmholtz's *Sensations of Tones as a Physiological Basis for the Theory of Music* (1875).

ELLIS, WILLIAM, an eminent English missionary, was born in the year 1795. In January 1816, he sailed with his wife for the South Sea Islands, as a missionary of the London Missionary Society, and labored there for nearly ten years. He set up in Tahiti the first printing-press in the South Sea Islands. In 1824, he returned to England, on account of the illness of his wife. He was for some years employed at home in the business of the London Missionary Society. In 1826, he published a *Narrative of a Tour through Owhyhee*; and in 1829, *Polynesian Researches*, 2 vols. In 1839, he published a *History of Madagascar*, 2 vols., compiled from government papers, and information received from missionaries.

In 1835, his wife died, and two years afterwards he married Miss Sarah Stickney, who for many years conducted a school for girls at Hoddesdon, in Hertfordshire, and who is well known as the authoress of many popular works, among which are *The Women of England* (1838), *The Daughters of England* (1842), *The Wives of England* (1843), *Hearts and Homes* (1848–1849), and *The Mothers of Great Men* (1859). Her works are all of an excellent moral and religious tendency, and have been very widely circulated both in Britain and America. She was educated among the Society of Friends, to which her parents belonged.—In 1853, Mr. E. was sent to Madagascar by the London Missionary Society, to inquire into the state of things in that island, and particularly into the condition and prospects of the Christians there. In 1859, he published an interesting and valuable work, entitled *Three Visits to Madagascar, during 1853–1856, with Notices of the People, Natural History, &c.*, a work to which we are largely indebted for our present information concerning that island. In his *Polynesian Researches*, as well as in this work, Mr. E. gives much information concerning the inhabitants, scenery, and productions of the countries which he visited, and few works of greater general interest or higher value have come from the pens of modern missionaries. In 1867, he published another work, the nature of which appears from its title, *Madagascar Revisited, describing the Events of a New Reign, and the Revolution which followed, setting forth also the Persecutions endured by the Christians, and their Heroic Sufferings, with Notices of the Present State and Prospects of the People*. He died in 1872.

ELLO'RA, a decayed town in the dominions of the Nizam, not far from the city of Dowlatabad, in lat. 20° 2' N., and long. 75° 13' E. It is celebrated for its wonderful rock-cut temples. Their number has not been precisely ascertained, but Erskine reckoned 19 large ones, partly of Hindu and partly of Buddhist origin. Some are cave-temples proper—i. e., chambers cut out in the interior of the rock—but others are vast buildings hewn out of the solid granite of the hills, having an exterior as well as an interior architecture, and being, in fact, magnificent monoliths. In executing the latter, the process was, first to sink a great quadrangular trench or pit, leaving the central mass standing; and then to hew and excavate this mass into a temple. The most beautiful of these objects is the Hindu temple, Kailasa. At its entrance, the traveler passes into an antechamber 133 feet wide by 88 deep, adorned by numerous rows of pillars. Then he proceeds along a colonnade over a bridge into a great rectangular court, which is 247 feet in length and 150 broad, in the center of which stands the temple itself, a vast mass of rock richly hewn and carved. It is supported by four rows of pilasters, with colossal elephants beneath, and seems suspended in the air. The interior is about 103 feet long, 56 broad, and 17 high, but the entire exterior forms a pyramid 100 feet high, and is overlaid with sculpture. In the great court are numerous ponds, obelisks, colonnades, sphinxes, and on the walls thousands of mythological figures of all kinds, from 10 to 12 feet in height. Of the other temples, those of Indra and Dumarheyana are little inferior to that of

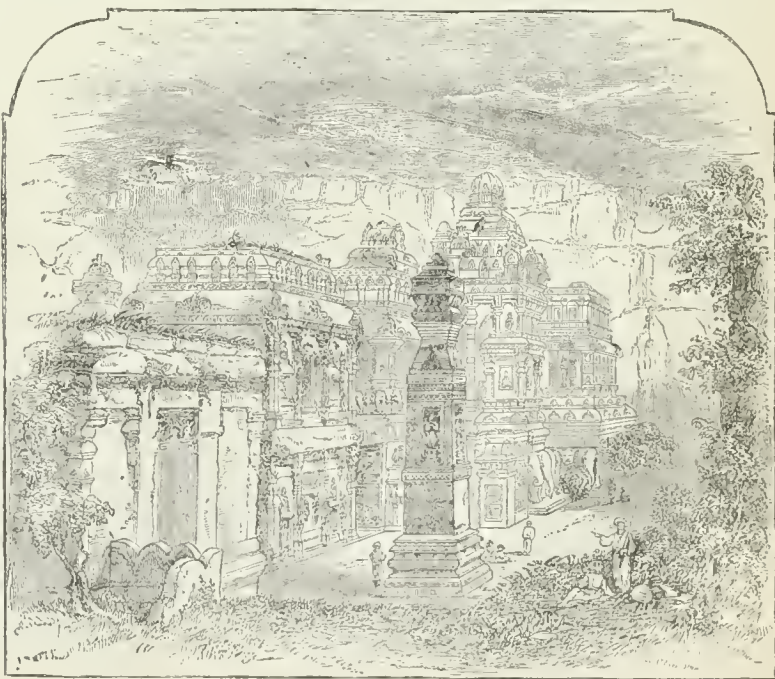
Kailasa. Regarding their antiquity and religious significance, authorities are not agreed; but at all events they must be subsequent to the epic poems *Ramayana* or *Mahabharata*, because they contain representations taken from these poems, and also to the cave-temples at Elephanta, because they exhibit a richer and more advanced style of architecture.

ELLO'RE, a town of the district of Godavari, in the province of Madras, stands in lat. 16° 42' N., and long. 81° 10' E. According to the census of 1871, the population of E. was 25,487. E. was formerly an important military station, and has at present carpet manufactures. The town occupies both banks of the Jummulair, a torrent of the Eastern Ghauts, which, instead of reaching the Bay of Bengal, loses itself three miles further down, in the landlocked Colair Lake. In fact, for about 50 miles to the westward of the sea, the neighboring country is depressed below the level of the maritime belt, the stagnant pool above mentioned not only having independent feeders of its own, but also receiving supplies, in the season of high-water, from the Kistnah or Krishna, and the Godavery. Under such circumstances, the climate of E. is at once unpleasant and unhealthy. During the south-west monsoon, bringing with it, of course, the accumulated heats of the whole breadth of the peninsula, the temperature is more particularly oppressive, having been known to rise, in the night, to 120° F.

ELLSWORTH, a small but flourishing town of North America, in the state of Maine, on both sides of the navigable river Union, 30 miles south-east of Bangor, and about 4 miles west of Frenchman's Bay. It exports 50,000,000 feet of timber annually, carries on cod and mackerel fisheries, and had in 1880, 5052 inhabitants.

ELM (*Ulmus*), a genus of trees of the natural order *Ulmaceæ*, natives of temperate climates, with serrated leaves unequal in their two sides, and small flowers growing in clusters appearing before the leaves, and containing 4–12 stamens and one germen. The fruit is a samara, or compressed one-seeded little nut, winged all around. One of the most important species is the COMMON SMALL-LEAVED or ENGLISH ELM (*U. campestris*), a tree of 60–80 feet in height, with ovato-elliptic, doubly serrated leaves, and flowers almost destitute of stalks. The wood is compact, and very durable in water. The tree is diffused all over Europe; is found also in the west of Asia and north of Africa, and is used for a great variety of purposes by wheel-wrights, machine-makers, ship and boat builders, &c.; it is also prized by joiners for its fine grain, and the mahogany color which it readily assumes on the application of an acid. It is reckoned superior to the wood of any other species of elm. The bark is used in dyeing and in sugar-refining, and, in times of scarcity, has been used in Norway for grinding into meal and mixing in bread, which has a less disagreeable taste than that made from meal mixed with fir-bark. The inner bark is used medicinally in cutaneous diseases; it is mucilaginous, and has a bitter astrigent taste.

The ELM BALSAM (*Beume d'orme*), which was formerly in great repute, is a brownish substance, which is found in dried



Temple called Kailasa, at Ellora.—From Fergusson's *Handbook of Architecture*.

galls of the leaves in the south of Europe, Persia, &c. From these galls, in an earlier stage, flows a clear, viscid, sweetish liquid, called Elm Water (*Eau d'orme*), which is used for washing wounds, contusions, and sore eyes.—The seeds of the elm are eagerly eaten by pigeons and common poultry. The elm is one of the principal timber trees of Britain, most extensively planted, and a chief ornament of English scenery.—The CORK-BARKED ELM (*U. suberosa*), by many regarded as a variety of *U. campestris*, is distinguished by the corky wings of the bark of the branches. It is a taller and more spreading tree, with much larger leaves. It is a European tree, common in plantations in Britain, but a doubtful native.—The DUTCH CORK-BARKED ELM (*U. major*) is also looked upon by many as a variety of *U. campestris*. It is still more corky in its bark, and has still larger leaves. It is of very quick growth, but the wood is very inferior.—The BROAD-LEAVED or WICH ELM (*U. montana*) is the only species that can with certainty be regarded as indigenous to Scotland. It has rough and broad leaves, a stem less upright than the English elm, and large, spreading branches. The wood is used for all the purposes of the English elm. The tree is of very quick growth. Protuberances of gnarled wood are not unfrequently produced, which are



Common English Elm (*Ulmus campestris*).

finely knotted and richly veined; they are much esteemed for veneering, and are sometimes very valuable. Varieties of this species are known as the GIANT ELM and CHICHESTER ELM.—The SMOOTH-LEAVED ELM (*U. glabra*) is by some regarded as a variety of *U. montana*, but is distinguished, besides other characters, by smooth leaves, which are much smaller. It is a native of England. A variety called the HUNTINGDON ELM is much esteemed.—The CORNISH ELM (*U. stricta*), found in the south-west of England, is remarkable for its rigid, erect, and compact branches.—Very different is the habit of *U. effusa*, a continental species with a large spreading head and smooth bark, distinguished also by the long stalks of its flowers and its ciliated fruit. The AMERICAN or WHITE ELM (*U. Americana*), which abounds in the basin of the Mississippi, and attains its loftiest stature between lat. 42° and lat. 46°, is a magnificent tree, sometimes 100 feet in height, the trunk reaching 60 or 70 feet before it separates into branches, and the widely diffused pendulous branches floating gracefully in the air; but the timber is not much esteemed.—The RED or SLIPPERY ELM (*U. fulva*) is also common in the basin of the Mississippi as far south as lat. 31°, and in the western parts of Canada. It attains a height of 50 or 60 feet.

The wood is more valuable than that of the last species, but much inferior to the English elm. The leaves and bark yield an abundant mucilage, which is bland and demulcent, and esteemed a valuable remedy in catarrh, dysentery, and other complaints.—The WAHOO or WINGED ELM (*U. alata*) is a small tree, found from lat. 37° to Florida, Louisiana, and Arkansas, remarkable for the branches being furnished on two opposite sides with wings of cork. The wood is fine-grained, compact and heavy.—*U. chinensis* is a Chinese species of elm, the leaves of which often bear galls used by the Chinese in tanning and dyeing.

The name SPANISH ELM is given in the West Indies to a tree also called BOIS DE CHYPRE. *Cordia Gerascanthus*, of the natural order *Cordiaceæ*, the timber of which is valuable; also to *Hamelia ventricosa*, of the natural order *Rubiaceæ*, the timber of which is known to cabinet-makers as Prince-wood.

ELMI'NA, a fortified town and seaport of West Africa, formerly capital of the Dutch settlements on the Gold Coast, is situated in an undulating and thickly wooded district, in lat. 5° 10' N., and long about 1° 40' W. It is a large irregularly built town, and seems to be destitute of any noteworthy architectural features. The inhabitants consist chiefly of traders, fishermen, and artisans. A few miles to the east is Cape Coast Castle. E. was established by the Portuguese in 1481, and was the first European settlement on the coast of Guinea. It was taken by the Dutch in 1637, and, four years after, was ceded to them by Portugal. It was ceded to the British in 1872, and destroyed by them in 1874, during the Ashantee war. Pop. 12,000 to 15,000.

ELMI'RA, a town of New York state, had, in 1880, 20,541 inhabitants, as compared with 15,863 in 1870. In point of situation it

possesses both natural and artificial advantages. It stands on the Chemung, a navigable feeder of the Susquehanna; it is connected by canals with Seneca Lake and the interior of Pennsylvania, and by the Erie and Northern Central Railways with New York, Philadelphia, &c. It possesses important iron and steel works, flour mills, breweries, tanneries, &c. E. is 273 miles distant from the capital of the state.

E'LMO'S FIRE, ST., is the popular name of an appearance sometimes seen, especially in southern climates during thunderstorms, of a brush or star of light at the tops of masts, spires, or other pointed objects. It is sometimes accompanied by a hissing noise, and is evidently of the same nature as the light caused by electricity streaming off from points connected with an electrical machine. See ELECTRICITY. The phenomenon, as seen at sea, was woven by the Greeks into the myth of Castor and Pollux; and even yet such lights at the mast-head are considered by sailors a sign that they have nothing to fear from the storm.

ELMSHORN, a town in the Prussian province of Schleswig-Holstein, 20 miles N.W. of Hamburg, is situated on both banks of the Krückau, a navigable stream and feeder of the Elbe. It is well built, has considerable manufactures and an active trade in grain; it has also a boat-building yard and some tanneries.

Vast numbers of boots and shoes are made at E., and are sold at all the fairs in the country round about. Many Jews reside here, as this was one of the few places in Schleswig or Holstein in which they were allowed to settle without having previously obtained permission. E. has an important annual cattle market. Pop. (1880) 7956.

EL OBEID. See IL OBEID, or EL OBEID.

ELOCUTION (Lat. for speaking out), the art of effective speaking, more especially of public speaking. It regards solely the utterance or delivery; while the wider art of oratory, of which elocution is a branch, takes account also of the matter spoken. The art of elocution held a prominent place in ancient education, but has been greatly neglected in modern times. See READING AND SPEAKING.

ÉLOGE. When a member of the French *Académie* dies, it is customary for his successor to deliver an oration, setting forth his merits and services. This is called an *éloge* (Lat. *elogium*, Gr. *eulogia*, praise), and a considerable branch of French literature goes by the name. Many of the French *éloges* are mere florid panegyrics; but others, particularly those written by Thomas, D'Alembert, Bailly, Condorcet, Cuvier, and other eminent savants, are interesting and valuable biographies. The proper epoch of the *éloge* began with Fontenelle (2 vols., Par. 1731), who was distinguished for clearness, ease, and elegance. His successors have tried to outshine him in pomp of language.

ELOHIM, Hebr., plural of *Eloah*, Arab. *Ilāh*, Chald. *Elāh*, Syr. *Alōh*, might, power; in plur., intensified, collective, highest power—great beings, kings, angels, gods, *Deity*. As a *pluralis excellentiæ* or *majestatis*, and joined to the singular verb, it denotes, with very rare exceptions, the One, true God. Joined to the plural verb, however, it usually means gods in general, whether including the One or not. It is mostly used (in the singular sense) for or together with Jehovah (the Everlasting One); but some portions of the Scriptures employ exclusively either the one term or the other. This circumstance has given rise to endless discussions, and has also suggested amongst others the notion of different authors of Genesis. On this, and on the relation of those two words to each other, see the article JEHOVAH. We shall only mention here the hitherto unnoticed opinion of the Talmudists, that Elohim denotes the Almighty under the aspect of a God of strict justice; Jehovah, of clemency and mercy. As important for the history of the word Elohim, we may add, in conclusion, that it was very probably Petrus Lombardus who first tried to prove the Trinity out of this plural form—an attempt which, although unanimously and scornfully rejected by all scholars, from Calvin, Mercerus, Calixtus, the younger Buxtorf, &c., to our times, has lately been revived by Rudolf Stier, who has gone so far as to invent a new grammatical term, '*Pluralis Trinitatis*,' for this purpose. See also the articles SHEMITIC PLURAL and PENTATEUCH.

ELONGATION, ANGLE OF, is the angle measuring the distance between two stars, as seen from the earth. Usually, it is employed only in speaking of the distance of planets from the sun; the word 'distance' being used instead of the word elongation, in regard to fixed stars and planets, as related to one another.

ELOPEMENT. See ADULTERY.

EL PA'SO DEL NORTE (in English, *the Pass of the North*) is a narrow valley of nine or ten miles in length, near the north-eastern extremity of the republic of Mexico. It is situated within the state of Chihuahua (q. v.), in lat. 31° 42' N., and long. 106° 40' W., being on the right bank of the Rio Grande, or Rio Bravo del Norte, about 1420 miles from its mouth. It is remarkably

fertile, yielding, in particular, considerable quantities of wine and brandy. It contains about 5000 inhabitants, nearly all of them of mixed blood. In fact, the people are little better than the aboriginal savages, being almost destitute of the most ordinary appliances of civilized life. The place is worthy of notice chiefly as the main thoroughfare between New Mexico and Mexico Proper.

ELPHIN, a bishop's see in Ireland, united to Kilmore in 1833.

ELPHINSTONE, WILLIAM, a celebrated Scottish prelate, and founder of King's College, Aberdeen, was born in the year 1430 or 1431. He was the son of William Elphinstone, Rector of Kirkmichael, and Archdeacon of Teviotdale, and, as the marriage of ecclesiastics was then prohibited, his birth was illegitimate. E. studied at the university of Glasgow, where he took his degree of M.A. at the age of twenty-four, at the same time that he took priest's orders. He seems to have acted as his father's curate at Kirkmichael for four years, but being strongly attached to the study of law (he had practised as an advocate in the church courts before this), he went to France in his twenty-ninth year, at the instigation of his uncle, Laurence Elphinstone, who supplied him with the means of studying at the most celebrated schools of the continent. E. so highly distinguished himself, that after three years he was appointed professor in the university of Paris, and afterwards at Orleans, which had then the highest reputation as a legal school. So greatly were his learning and talents appreciated, that the parliament of Paris used to ask his opinion on great questions. After a residence of nine years abroad, he returned to Scotland, and was made successively official-general of the diocese of Glasgow (1471—1472), rector of the university (1474), and official of Lothian in 1478, 'then probably,' says Mr. Cosmo Innes (*Sketches of Early Scottish History*, Edin. 1861), 'the second judicial office in the kingdom, which he filled for two years, sitting in parliament, and serving on the judicial committees, which formed the supreme civil jurisdiction in Scotland.' His dignity, learning, and prudence, now began to procure him universal respect. He was the principal member of a great embassy sent from Scotland to France, to settle certain disputes that had sprung up between the two countries, and threatened the stability of their ancient alliance. In this important affair, he was eminently successful. On his return, he was made Bishop of Ross in 1481.

In 1483, he was removed to the see of Aberdeen; and between this period and the death of James III. he was several times engaged in embassies to France, England, Burgundy, and Austria. For a few months before the death of that monarch, he held the office of chancellor of the kingdom. He lost this great office on the accession of James IV., but, says the authority already quoted, 'he was speedily restored to favor, and to the royal councils, and seems to have been keeper of the Privy Seal from 1500 till his death.' He did not suffer his office to withdraw him from the care of his diocese, where he applied himself to the faithful discharge of his episcopal functions, endeavoring to reform the clergy, the service, and the ritual of his church. He next concluded (while on a mission to the continent for another purpose) a treaty with Holland, which was beneficial to Scotland. E. seems to have had a genuine desire for the enlightenment and improvement of his countrymen. Whenever leisure permitted, we find him engaged in devising means to this end. It appears to have been chiefly through his influence that the first printing-press—that of Chepman and Millar—was established in Scotland. He superintended the preparation and printing of the *Breviary of Aberdeen*, and collected the materials for the lives of the Scottish saints contained in that work. He procured from the pope (Alexander VI.) a bull for erecting a university in Aberdeen. The bull was sent in 1494, but the college was not founded till 1500, when it was dedicated to St. Mary—a name afterwards changed to King's College. E. built also the great central tower and wooden spire of his cathedral church at Aberdeen, provided its great bells, covered the roofs of its nave, aisles, and transept with lead; and, at his own expense, built a stone bridge over the Dee for the benefit of his townsmen. The fatal battle of Flodden, 9th September 1513, broke the spirit of E., who was never seen to smile after. He died 25th October 1514, and was buried before the high altar of the chapel of the college which he founded. E. was a man of great vigor of mind and nobleness of nature—'one of those prelates,' says a writer in the *Quarterly Review* (No. clxix. p. 141), 'who in their munificent acts, and their laborious and saintly lives, showed to the Scottish church, in her corruption and decay, the glorious image of her youth.' 'We know him,' says Mr. Innes, 'in the history of the time as the zealous churchman, the learned lawyer, the wise statesman; one who never sacrificed his diocesan duties to mere secular cares, but knew how to make his political eminence serve the interests of his church; who, with manners and temperance in his own person, befitting the primitive ages of Christianity, threw around his cathedral and palace the taste and splendor that may adorn religion, who found time, amidst the cares of state, and the pressure of daily duties,

to preserve the Christian antiquities of his diocese, and collect the memories of those old servants of truth who had run a course similar to his own; to renovate his cathedral service, and to support and foster all good letters, while his economy of a slender revenue rendered it sufficient for the erection and support of sumptuous buildings and the endowment of a famous university.' Some volumes of notes made by E. when studying in the law schools, are preserved in the library of the University of Aberdeen. A transcript of Fordun's *Scotichronicon*, with some additions, in the Bodleian Library at Oxford, was long erroneously ascribed to him. His *Breviarium Aberdonense*, printed in 1509—1510, was reprinted in two volumes quarto at London in 1853.

EL ROSARIO, a small town of the Mexican Confederation in the state of Chimaloa, is situated 55 miles east-north-east of Mazatlan. It is important chiefly as being a commercial entrepôt between Mazatlan and the interior. Pop. 5000.

ELSINÖRE (Dan. *Helsingör*), a town and seaport of Denmark, on the island of Seeland, is situated on the western shore of the Sound, and at its narrowest part $3\frac{1}{2}$ m. W.S.W. of the town of Helsingborg in Sweden, and 24 m. north of Copenhagen. Lat. $56^{\circ} 2' N.$, long. $12^{\circ} 36' E.$ The town, which has been in recent times considerably improved, is spacious, and consists of one long principal street, with several lateral branches. The cathedral, containing some fine tombs, many of them very old, may be considered as one of the most interesting edifices. At a short distance to the east of E. are the castle and the fortress of Kronborg, the former a white stone building in the Gothic style, and the latter, a stronghold mounted with guns that command the Sound in all directions. To the north-west of E., and in its immediate vicinity, is the royal chateau of Marienlist, the pleasure-grounds of which, occupying the crest of a hill, are open to the public. From the grounds of Marienlist, magnificent views may be had of the Sound, of Helsingborg, and of the plains of Sweden. The harbor of E., formed by a wooden pier, is accessible to ships of light draught. E. has a brisk foreign trade, and has besides manufactures of straw-hats, arms, sugar, brandy, &c., also cotton-printing and fisheries. The Sound Dues (q. v.) were collected here. Pop. (1880) 8978.

Saxo Grammaticus, a famous writer of the 12th c., was born here. Here Shakspeare laid the scene of his *Hamlet*, a perversion of history on the part of the great dramatist, as Jutland, not Seeland, was Hamlet's country. The vaults under the castle of Kronborg were supposed to be the residence of Holger Danske, the mythic hero of Denmark, who never appeared above ground save when the country was in danger, and was then supposed to march at the head of the Danish armies. In severe winters the Sound is frozen over at E., so that one can walk over the ice from Denmark to Sweden.

ELSSLER, FANNY, a celebrated dancer, was born at Vienna in the year 1811, and educated at Naples for the ballet, along with her elder sister Theresa. The first triumph of the sisters took place at Berlin, where they appeared in 1830. The reputation acquired by Fanny in Berlin preceded her to France, America, England, and St. Petersburg, where her beauty, amiability, and mastery in her art, charmed all classes of society. In 1841, the two sisters went to America, where they excited unwonted enthusiasm. After Fanny had earned laurels in St. Petersburg, she returned, in 1851, to Vienna, to take a final leave of the stage. She then retired to Hamburg, where she remained, till in 1854 she settled finally in Vienna. Theresa was less graceful in her motions than her sister, but exhibited great strength, boldness, and agility. On the 25th April 1851, she became the wife of Prince Adalbert of Prussia (who died in 1873), and was ennobled by the king of Prussia.

ELSTER, the name of two rivers of Germany, the White and the Black Elster. The White E. rises at the foot of the Elster mountains, on the north-western boundary of Bohemia, flows in a northerly direction, and falls into the Saale three miles south of the town of Halle, in Prussia. Its chief affluent is the Pleisse from the right. Total length, 165 miles. The Black E. rises in the kingdom of Saxony, within two miles of Elstra, flows north-west, enters Prussia, and joins the Elbe eight miles south-east of Wittenberg. Length 130 miles.

ELSTRACKE, REGINALD or RENOLD, an English engraver, who flourished about 1620. He worked chiefly for the book-sellers, and his plates, which are executed with the graver, without etching, are almost entirely confined to portraits. Prints from his plates are much sought after, not only from their scarcity, and as illustrating English history, but as works of art, in which much character is expressed in a firm and forcible manner. When he did not sign his plates with his name, he marked them with his initials, R. E.

ELTON, a famous salt lake of Russia, is situated in the government of Saratov, 170 miles south-south-east from the town of that name, the lat. of its center being $48^{\circ} 56' N.$, and the long. $46^{\circ} 40' E.$ Its longest diameter is eleven miles, and its shortest about nine miles. It has a superficial extent of 45,500 English

acres, but at no place is it more than about 15 inches in depth. It is of an oval form, and can be easily reached from the south, but the northern banks rise so rapidly that access to it from that quarter is difficult. In the hottest season, so wonderful is the illusion produced by the crystallized salt, that the lake seems covered with snow and ice. E. yields about 100,000 tons of salt annually, in the collection of which about 10,000 persons are employed.

ELUTRIA'TION is the term applied to the process of separating, by means of water, the finer particles of earths and pigments from the heavier portions. The apparatus generally used is a large vat, in which grinding wheels revolve, and the substance to be reduced to powder being placed in the vat along with water, the wheels in revolving not only pulverize the material, but from their motion being communicated to the water, the latter is enabled to retain in mechanical suspension the finer particles of the clay, &c. By allowing a stream of water to flow in and out of the vat, the finer particles can be constantly floated away, and the liquid being run into settling vats, the fine powder settles to the bottom, when the water can be run off from the surface. This process is much employed in the manufacture of the materials used in pottery, and in the preparation of pigments.

ELVANS are veins of a granular crystalline mixture of felspar and quartz, probably proceeding from a granite mass, which are found in granite rocks and fossiliferous slates in Cornwall, Devon, and the south of Ireland.

ELVAS, an episcopal city and fortress of Portugal, stands in a very fruitful district on the eastern frontier of the province of Alemtejo, 10 miles west of Badajoz, and 40 miles north-east of Evora. It is the strongest fortress in Portugal, and one of the strongest in Europe. It is built upon a precipitous hill; is surrounded by walls, and by a glacis and covered-way. Besides these, E. has other defences in two formidable forts, Fort Sta. Lucia, and Fort Lippe, the former to the south, and the latter—almost entirely shell-proof—to the north of the city. E. is an old town; many of its houses are badly built. Its most striking architectural feature is an enormous aqueduct, which conveys water to it from a distance of three miles. This aqueduct consists of four tiers of arches built upon one another, and rising to the height of about 250 feet. The chief manufactures of E. are arms and jewelry. There are here extensive store-houses filled with British manufactures, and the inhabitants, by illegally selling these goods within the Spanish frontier, realize considerable wealth. Pop. 18,510.

E. has undergone many sieges, but has never been taken. The Spaniards besieged it in 1385, and again in 1659, when a famous battle took place called the Lines of Elvas, in which the Portuguese, though greatly inferior in numbers, drove the Spaniards from their lines in front of the town. E. was raised to the rank of a city by D. Manoel, king of Portugal, in 1513.

ELVES. See **FAIRIES**.

E'LY, so called from a Saxon word, *elig*, an cel, or *helig*, a willow, may be called a cathedral town rather than a city, and is situated on an eminence in that part of the fen-country of Cambridgeshire called the *Isle of Ely*. Pop. (1881) 8172. The Eastern Counties and the Great Northern Railways have each stations, the former outside, the latter in the town.

Ely Cathedral.—About the year 673, Etheldreda, daughter of the king of East Anglia, and wife of Oswy, king of Northumberland, founded a monastery here, and took on herself the government of it. Two hundred years afterwards (870), the Danes ravaged the Isle, and destroyed the monastery, which was rebuilt in 970 by St. Ethelwold, Bishop of Winchester; and this continued till 1081, when a new church was begun, which was converted into a cathedral, and the abbey erected into a see in 1109. The possessions of the abbey were divided between the bishop and the community. The cathedral contains some beautiful specimens of architecture, especially of Early Norman. Its exterior dimensions are 535 feet from west to east. The great cross or main transept is 190 feet. The turrets of the west tower are 215 feet high, and the lantern over the central tower 170 feet. The west front was built by Geoffrey Ridel, the third bishop, who died in 1189, and is of Norman work. About 200 years after his time, an addition of 64 feet was made to the tower, and over that a spire. This great superincumbent weight crushed the north-west transept, and the south-west one, which still remains, was considerably weakened. In front there is a west portico or galilee (q. v.), of Early Gothic, said to be the work of Bishop Eustachius. The nave is of Norman work, and was completed about 1174. The columns are alternately round and octagonal. The roof was, in 1861, beautifully painted.

The transepts, which are the most ancient parts of the church, were built in the reign of Henry I. They had originally a middle and two side aisles, but the latter are, in the south transept, walled up, and the space used as a vestry and library. Originally there

stood a square tower in the center of the building, opening into the nave and transepts; but this gave way in 1322, and fell eastwards, crushing three arches of the choir. The repair of this dilapidation was undertaken by the sacrist of that time, Alan de Walsingham. The design was original, an octagon tower with four longer and four shorter sides, surmounted by a lantern. The upper part of this, which is of timber, has recently been rebuilt.

The choir contains some rich varieties of decorated Gothic, and the fine shafts of Purbeck marble combine beautifully with the white stone work. The whole has lately been restored and beautified. Originally, it was much shorter eastwards, and protruded into the nave, but in 1235 the semicircular end of the old church was taken down, and six arches added by Hugh de Northwold. At the dedication and removal of the relics, Henry III. and his court were present. The east end is eminently beautiful: it consists of two tiers of high lancet-shaped windows. Perhaps the most interesting and yet beautiful part of the building is the Lady Chapel—an incomparable work, irreparably spoiled by the barbarism of Puritan times. It was begun in 1321, and finished in 1349, simultaneously with the rebuilding of the central tower and ruined choir, a circumstance highly illustrative of the taste and munificence of the times. It has a stone roof, like King's College Chapel in Cambridge, which it is supposed to have suggested, and the walls were once decorated from top to bottom with countless niches and images of saints and martyrs, not one of which remains undefaced. Its length is 100 feet; width, 46; height, 60. Bishop Alcock's Chapel, in which he lies buried, is at the east end of the north aisle—an overloaded specimen of the richest florid Gothic. Bishop West's Chapel, at the east end of the south aisle, is a more pleasing example of the same style.

Amongst the celebrated names connected with E. are Abbot Thurstan, who defended the Isle against William the Conqueror for seven years; Longchamp, chancellor and regent under Richard I.; Chancellor Molton, Simon Patrick, and Bishop Andrews. The bishops of E., like the bishops of Durham, formerly enjoyed a palatine jurisdiction, and appointed their own chief-justice, &c.; but this privilege was taken from them by the 6th and 7th Will. IV. The Bishop of E. is visitor to St. Peter's, St. John's, and Jesus Colleges, Cambridge, of which last he also appoints the master. There is a grammar-school attached to the Cathedral, founded by Henry VIII. There are some interesting remains of the old conventual buildings in the neighborhood of the Cathedral.

ELY, ISLE OF, the south part of the Bedford Level, or the part of Cambridgeshire north of the Ouse. It includes above a half of this county, is 24 miles long from north to south, with an average breadth of 14 miles, and contains four hundreds. It consists of a monotonous, marshy, or fenny plain, formerly covered with water, and abounding in aquatic birds and plants. It chiefly consists of black earth and turf, and, where well drained by innumerable artificial canals and ditches, it produces fine crops of hemp, flax, wheat, oats, and cole seed. Over it are interspersed small eminences, generally crowned with villages and towns, as Ely City, March, Thorney, Whittlesea, and Wisbeach. Pop. about 190,000.

E'LYMUS. See **LYME GRASS**.

ELY'SIUM (Gr. *elysion*), a place in the infernal regions of the ancient classical mythology, where the souls of the good dwell after death. In the *Odyssey*, Homer describes it as a place where the souls of the departed lived in ease and abundance among innocent pleasures, and enjoying a mild and wholesome air. In the *Iliad*, however, he gives a sombre view of the state of the departed souls. Achilles, though in Elysium, is made to envy the life of the meanest hind on earth. By succeeding poets, the bliss of Elysium is drawn in much more lively colors. Besides the amenity and various delights of the place, diverse employments are found for the inhabitants, according to the ruling passion of each while on earth. Elysium was supposed by some writers to be in mid-air, by others in the sun, by others in the center of the earth, next Tartarus, by others, in the Islands of the Blest.

ELZEVIE'R, or **ELZEVIR**, the name of a celebrated family of printers at Amsterdam, Leyden, and other places in Holland, whose beautiful editions were chiefly published between the years 1583 and 1680. Louis, the first of them, is said to have been born at Louvain about the year 1540. He was induced by religious disturbances to leave his native city, and in 1580, he settled as a book-binder and bookseller in Leyden, where he died about 1617. The first work edited by him bears the title *Drusii Ebraicorum Questionum ac Responsionum Libri Duo, videlicet Secundus ac Tertius, in Academia Lugdunensi MDLXXXIII. Venenit Lugduni Batavorum apud Elzevirium e Regione Scholæ Novæ*. The second, a Eutropius by P. Merula, bears the date 1592, and was long erroneously believed to be the first that issued from E.'s press. Five out of Louis's seven sons continued to carry on their father's business. Their names were Matthew, Louis, Aegidius, Jodocus (Joost), and Bonaventura. The last, in conjunction with his nephew Abraham E. (a son of Matthew), prepared the smaller editions of the classics,

In 12mo and 16mo, which are still valued for their beauty and correctness. It is mainly on these that their reputation is based. The house of E., in Amsterdam, was established by Louis, the son of Jodocus E., in 1638. Peter E., grandson of the last mentioned, carried on the bookselling business in Utrecht, and died in 1696. For more than a century, however, this family has ceased to have any connection with book-printing. It is believed that 1213 works in all proceeded from the E. presses. Amongst the most beautiful are the editions of Pliny, Virgil, Livy, Tacitus, and Caesar; and, though for Greek and Hebrew texts the house of E. was surpassed by that of Stephens (q. v.), their Latin classics are unrivalled both for beauty and correctness. It is said that the Elzeviers generally employed women to correct the press, under the conviction that they would be less likely than men, on their own responsibility, to introduce alterations into the text. Compare Adry, *Notice sur le Imprimeurs des la Famille des Elzeviers* (1806); Pieter, *Annales de l'Imprimerie Elzevirienne* (1852); Willems, *Les Elzevier* (Brussels, 1880).

EMACIATION (Lat. *maies*), leanness. See CONSUMPTION, TABES DORSALIS.

EMANA'TION means, in general, efflux or issue. In theology and philosophy, it indicates an ancient doctrine, which considered all things as emanating or flowing from a Supreme Principle. According to this doctrine, the origin of things is only an overflowing of the divine fulness—an outstreaming of the light from the necessity of its nature, and not any free action on the part of God. What is thus given off as a copy from original perfection, departs more and more from its source, and gradually degenerates, which was thought to account for the origin of evil. This doctrine came from the East, and pervades the Indian mythology, the system of Zoroaster, and the Neo-Platonic philosophy of Alexandria. In Christian theology, the idea of emanation has been applied to explain the relation among the persons of the Trinity.

EMANCHÉ. See MANCH.

EMANCIPATION. See SLAVERY.

EMANCIPATION, in the Roman law, was the act by which the *Patria Potestas* (q. v.), or paternal authority, was dissolved in the lifetime of the father. It took place in the form of a sale (*mancipatio*) by the father of the son to a third party, who manumitted him. The Twelve Tables required that this ceremony should be gone through three times, and it was only after the third sale that the son became *sui juris* under his own law. In general the son was at last resold to the father, who manumitted him, and thus acquired the rights of a Patron (q. v.), which would otherwise have belonged to the alien purchaser who finally manumitted him. In the case of daughters and grandchildren, one sale was sufficient. If the child died intestate, or if he required a tutor or curator, the father's right as patron came into play; but if the father died intestate, the son took nothing, because he was out of his family. But this rigor of the old law was modified by the prætor's edict, which placed all the children on the same footing. In the law of Scotland, emancipation is called *Forisfamiliatio* (q. v.). The only case in which the term is employed in England is with reference to poor-law settlements. See SETTLEMENT, POOR AND POOR-LAWS.

EMANCIPATION, CATHOLIC. See ROMAN CATHOLIC EMANCIPATION.

EMA'NÜEL I., king of Portugal, styled THE GREAT, and sometimes, likewise THE FORTUNATE, was born on the 3d May 1469, and succeeded John II. in 1495. Before his accession to the throne, he bore the title of Duke of Beja. On his accession, he prepared the code of laws which bears his name, and rendered himself remarkable by his zeal and exertions in the cause of education, by his active piety, and by his predilection for the society of artists and scholars. Through his exertions, Portugal became the first naval power of Europe, and the center of the commerce of the world. He despatched Vasco da Gama to sail round the Cape of Good Hope, and discover the passage to India. Cabral was commissioned by him to prosecute the discoveries of Vasco da Gama still further, and Corte Real to sail along the coasts of North America. The expeditions under Albuquerque put E. in possession of the south coast of Africa and the Indian Archipelago. Not satisfied with this, he opened a communication with Persia, Ethiopia, and, in 1517, with China. At his death, 13th December 1521, Portugal was in possession of a large fleet, strong fortresses, well-furnished arsenals, a war-like army, a flourishing trade and commerce, and extensive colonies. His reign has been termed the golden age of Portugal. E. was thrice married: first to Isabella, the daughter of Ferdinand; afterwards to Mary of Castile, her sister (by whom he had two children, John and Isabella, the former of whom succeeded him on the throne); and thirdly, to Eleanore of Austria, sister of Charles V.

EMA'RGINATE. See LEAVES.

EMBA. a river of Turkistan, in the Kirghiz territory, rises at the western base of the Muchajar or Mongojar Mountains, and flowing in a south-west direction, enters the Caspian Sea after a course of about 300 miles.

EMBA'LING, the art of preserving the body after death, invented by the Egyptians, whose prepared bodies are known by the name of mummies, and are called in the hieroglyphs *sahu*, and by St. Augustine *gabbroæ*. This art seems to have derived its origin from the idea, that the preservation of the body was necessary for the return of the soul to the human form after it had completed its cycle of existence of three or ten thousand years. Physical and sanitary reasons may also have induced the ancient Egyptians; and the legend of Osiris, whose body, destroyed by Typhon, was found by Isis, and embalmed by his son Anubis, gave a religious



Egyptian Mummy.

sanction to the rite, all deceased persons being supposed to be embalmed after the model of Osiris in the *abuton* of Philæ. The art appears as old as 4000 B.C. at least, the bodies of Cheops, Mycerinus, and others of the age of the 4th dynasty having been embalmed. One of the earliest recorded embalmments on record is that of the patriarch Jacob; and the body of Joseph was thus prepared, and transported out of Egypt. The process has been described by Herodotus and Diodorus; but their accounts can only refer to their own age, and are only partially confirmed by an examination of the mummies. The following seems to have been the usual rule observed after death. The relations of the deceased went through the city chanting a wail for the dead. The corpse of a male was at once committed into the charge of the undertakers; if a female, it was retained at home till decomposition had begun. The *paraschistes*, or flank-inciser of the district, a person of low class, whose establishment was situated in the cemeteries or suburbs, conveyed the corpse home. A scribe marked with a reed-pen a line on the left side beneath the ribs, down which line the paraschistes made a deep incision with a rude knife or Ethiopian stone, probably flint. He was then pelted by those around with stones, and pursued with curses. Another kind of embalmer, the *taricheutes*, or preparer, then proceeded to remove the entrails and lungs, with the exception of the heart and kidneys. The brain was extracted by another taricheutes, by a crooked instrument, through the nose. All this having been effected, the body was ready for the salts and spices necessary for its preservation, and the future operations depended upon the sum to be expended on the task.

When Herodotus visited Egypt, three methods prevailed: the first, accessible only to the wealthy, consisted in passing peculiar drugs through the nostrils into the cavities of the skull, rinsing the belly in palm wine, and filling it with resins, cassia, and other substances, and stitching up the incision in the left flank. The mummy was then steeped in natron for seventy days, and wrapped up in linen, cemented by gums, and set upright in a wooden coffin against the walls of the house or tomb. This process cost a silver talent, which, considering the relative value of ancient money at one-third of that at present, would amount to about £725. The second process consisted in removing the brain, as before, but only injecting the viscera with *kedrim*, or cedar oil, and soaking the corpse in a solution of natron for seventy days, which brought away or destroyed the viscera and soft portions, leaving only the skin and bones. The expense was a *mina*, relatively worth about £243. The third process, in use for the poorer classes, washed the corpse in myrrh, and salted it for seventy days. The expense was a trifle, not mentioned. When thus prepared, the bodies were ready for sepulture, but were often kept some time before being buried—often at home—and even produced at festive entertainments, to recall to the guests the transient lot of humanity. When buried, they were sent to the *cholechyta*, a higher class than the *taricheutes*, who had charge of the tombs, the mummies, and the masses for the dead. All classes were embalmed, even malefactors; and those who were drowned in the Nile or killed by crocodiles received an embalmment from the city nearest to which the accident occurred. As the art, however, existed for many centuries, it may be easily conceived that mummies were preserved by very different means, and quite distinct from those described by classical authors, some having been found merely dried in the sand; others salted by natron, or boiled in resins and bitumen, with or without the flank incision, having the brains removed through the eyes or base of the cranium, with the viscera returned into the body, placed upon it, or deposited in jars in shapes of the genii of the dead, the skin partially gilded, the flank incision covered with a tin plate, the fingers cased in silver, the eyes removed, and replaced. The mummies are generally wrapped in linen bandages, and placed in costly coffins.

See SARCOPHAGUS. The sacred animals were also mummied, but by simpler processes than men. Mummies, it may be observed in passing, were used in the 15th and 16th centuries of the Christian era for drugs and other medical purposes, and nostrums against diseases, and a peculiar brown color, used as the background of pictures, was obtained from the bitumen. The Ethiopians used similar means to preserve the dead, and the successful nature of embalming may be judged from the numerous mummies in the different museums of Europe. Other less successful means were used by nations of antiquity to embalm. The Persians employed wax; the Assyrians, honey; the Jews embalmed their monarchs with spices, with which the body of our Lord was also anointed; Alexander the Great was preserved in wax and honey, and some Roman bodies have been found thus embalmed.

The Guanches, or ancient inhabitants of the Canary Isles, used an elaborate process like the Egyptian; and desiccated bodies, preserved by atmospheric or other circumstances for centuries, have been found in France, Sicily, England, and America, especially in Central America and Peru. The art of embalming was probably never lost in Europe; and De Bils, Ruysch, Swammerdam, and Clauderus boast of great success in the art. There was a celebrated cabinet of M. De Rasiere in 1727, containing prepared bodies; and the mode of embalming princes and others, by prepared balms and other substances, is detailed by Penicher, consisting in the removal and separate embalming of the heart and viscera, and removing the brain, and introducing the preparations by incisions all over the body. Dr. Hunter injected essential oils through the principal arteries into the body. Boudet, during the French Empire, embalmed the bodies of the senators with camphor, balsam of Peru, Jews' pitch, tan and salt; but the discovery of Chaussier of the preservative power of corrosive sublimate, by which animal matter becomes rigid, hard, and grayish, introduced a new means of embalming by Beclard and Larrey; but owing to the desiccation, the features do not retain their shape. The discovery of the preservative power of a mixture of equal parts of acetate and chloride of alumina, or of sulphate of alumina, by Gannal in 1834, and of that of arsenic by Tranelini, and of pyroxilic spirits by Babington and Rees in 1839, and of the antiseptic nature of chloride of zinc, have led to the application of these salts to the embalming or preparation of bodies required to be preserved for a limited time; but there is no reason to believe that bodies so preserved will last as long as Egyptian mummies. See Pettigrew, *History of Mummies* (4to, Lond. 1834); Gannal, *Traité d'Embaumement* (8vo, Paris, 1838), translated by Harlan (8vo, Philadelph. 1840); Magnus, *Das Einbalsamiren der Leichen* (8vo, Braunsch. 1839).

EMBA'NKMENT, EA'RTHWORK. Embankments, in Engineering, are masses of earth, rock, or other materials artificially formed, and rising above the natural surface of the ground. They are chiefly formed either (1) to carry railways, common roads, canals, &c., over depressions of the country; or (2) for hydraulic purposes, such as the formation of reservoirs for storing water, or as defences against the overflowing of rivers, the encroachments of the sea, of lakes, &c.

In the formation of canals, railways, and other roads, embankment and excavation go hand in hand, and under the name of **EARTHWORK**, form—especially in modern times, and since the development of the railway system—a vast branch of industry, giving employment to many thousands of laborers, known in England as 'navvies.' The earthworks executed within the last quarter of a century in Great Britain alone have cost many millions of pounds.

In planning works of the kind alluded to, engineers follow, as much as possible, the principle of making the cuttings or excavations and the embankments balance, i. e., of making the earth, &c., taken from the cuttings be sufficient for the formation of the embankments. See **RAILWAYS (ENGINEERING)**. In proceeding to the actual construction of a railway embankment, e. g., a beginning is made at the points where the level of the formation meets the surface of the ground; and on each side of these points the cutting is taken out, and the embankment formed by men using pick, shovel, and barrow, so that a roadway is formed for a distance of from 50 to 100 yards. When the 'lead,' or the distance between the face of the cutting and the 'tip-head,' or end of the embankment, is greater than this, it is no longer economical to use the barrow. To continue the cutting and embankment, several methods may be employed; the most common are, dobbin carts; small wagons run upon light rails at a narrow gauge, and drawn by men or horses; ordinary earth-wagons drawn by horses, and occasionally by a locomotive; and lastly, ballast-wagons or trucks drawn by a locomotive. The cost of earthwork naturally varies greatly with the nature of the strata in which the cutting has to be made, the length of the 'lead,' and other circumstances. When rocks have to be cut through, Blasting (q. v.) is had recourse to. One of the points on which considerable doubt existed, was as to the inclination of the side-slopes of embankments; but

it has been found that nearly all kinds of earthwork will stand at an inclination of $1\frac{1}{2}$ horizontal to 1 vertical. When, however, it is necessary to use very wet substances, such as peat-moss or wet clays, or when the embankment is of great height, a flatter slope may be necessary. In many cases, it is advisable to substitute a Viaduct (q. v.) for an embankment. All embankments put in as above mentioned subside more or less, the subsidence being much more distinctly perceptible in clay than in gravel. When clay is thrown by the wagon over a considerable tip, the lower half of the embankment will be seen to consist of round bullets of clay of sufficient hardness to resist being squeezed into one mass by the weight of the embankment, until, in the course of time, from the effects of moisture, they become gradually disintegrated, and a settlement or sinking of the embankment takes place, sometimes to the extent of a twelfth, or even a tenth of the height. The greatest sinking usually occurs during the first wet weather after the formation of the embankment; but it sometimes goes on, though more and more slowly, for years. In the case of railway embankments, this subsidence is seldom of very material importance. If the permanent rails are laid, the labor and expense of restoring them to the level is not great, and the embankment should always be formed sufficiently wide at the top to allow of filling it up to its proper level without adding to the slopes. It is, however, practicable, though rather hazardous, to widen it at the top afterwards by cutting trenches in the slopes.

When the side-slope of the ground on which an embankment is to be formed is very steep, the whole work has a tendency to slip laterally, and to prevent this, trenches or steps are cut in the ground before putting in the embankment. When the material is very wet, it sometimes is impossible to prevent the slopes from bulging out, in which case it is generally sufficient to put in additional stuff until the work stands. Peat-moss is seldom used to form an embankment, but frequently an embankment has to be formed where the ground below is moss to a considerable extent. In this case, many plans have been adopted to form a substantial unyielding work, which, where the moss is deep, and contains much water, is often very troublesome and expensive. Among these, perhaps, in most cases, the best is to continue throwing in earth until no further subsidence takes place. In some cases, piling has been adopted, and in others, a layer of tree-tops and brushwood has been placed on the moss under the embankment. When this is done, it frequently happens that the ground on each side of the embankment opens in great rents, rises to a considerable height, and moves laterally from the embankment. A good example of this may be seen on the Scottish Central Railway, a short distance to the south of the Bridge of Allan station.

Embankments, when finished, have their side-slopes usually covered with soil and sown with grass-seed; this not only improves their appearance, but adds considerably to their stability, preventing rain and wind from doing the damage that might otherwise take place.

In regard to embankments to restrain or prevent the encroachment of water, it is necessary, in addition to forming them of sufficient height and strength, to cover the surface of the slopes in such a way that the action of the water will not affect it. Of course the method adopted must depend entirely on the nature of the case; where, for example, the water only occasionally touches the embankment, as in the case of river-floods, and does not run with great violence along it, good turf pinned to the slopes has been found effectual. Where, however, the slopes are subject to the action of waves or rapid water, more effectual and expensive measures must be adopted, such as stone-pitching, piling, &c. Embankments of this nature are used on a great scale in Holland. See **DYKE**.

Embankments for damming up water so as to form ponds or reservoirs, require, in addition to the other conditions, to be perfectly water-tight; and for this purpose a 'puddle-wall' of clay is carried from top to bottom in the heart of the structure. The great difficulty lies in preventing the water from finding its way between the bottom of the puddle-wall and the foundation on which it rests, or even through the substances of which that foundation consists; and the wall must often be carried to a great depth below the surface of the ground until an impermeable stratum be found. A knowledge of the geology of the place is here essential to the engineer.

EMBA'RG (from the Spanish *embargar*, to in-bar, to arrest), is a temporary order from the Admiralty to prevent the arrival or departure of ships. It may apply to vessels and goods, or to specified goods only; it may be general or special; it may apply to the entering only, to the departure only, or to both entering and departure of ships from particular ports; and lastly, although issued by the Admiralty in this country, it would be equally an embargo if issued by any other competent authority. Such embargoes are generally connected in some way or other with a state of war between two countries.

EMBASSY. In a popular sense, all diplomatic missions are spoken of as embassies; but such is not the technical meaning of

the term. In its more limited acceptance, embassy is a mission presided over by an ambassador, as distinguished from a mission or legation intrusted to an envoy, or other inferior diplomatic minister. In this stricter sense, Great Britain has now only four embassies—those at Paris, Vienna, St. Petersburg, and Constantinople. The only difference between the powers and privileges of the ambassador and the envoy is, that the former represents the person of his sovereign, and in this capacity he can demand a private audience of the sovereign to whom he is accredited; whilst the latter must address himself to the minister for foreign affairs. A residence is provided for the ambassador, and an allowance for house-rent is made to inferior ministers, in addition to their salaries. See AMBASSADOR, ENVOY, CONSUL.

EMBATERION, a war-song of the Spartans, accompanied by flutes, which they sung marching in time, and rushing on the enemy. The origin of the embaterion is lost in antiquity.



EMBATTLED, or IMBATTLED, called also *Crenellé*, one of the partition lines in heraldry, traced in the form of the battlements of a castle or tower. A bordure embattled is often given as a difference to any member of a family who is, or has been, a soldier.

EMBATTLEMENT. See BATTLEMENT.

EMBER or EMBERING DAYS. According to the *Book of Common Prayer* of the Church of England, three days are appointed four times in the year to be observed as days of fasting and abstinence; these days are the Wednesday, Friday, and Saturday after the first Sunday in Lent, after the feast of Pentecost, after the 14th September, and after the 13th December. The term 'embering' has been variously derived from the Greek and from the embers or ashes which in the earliest times were strewed over the head at times of fasting, in token of humility and self-condemnation. But the more correct derivation would appear to be from the Saxon *Ymbrine dagas*, from the Saxon *ymb*, about, and *ryne*, a course or running, the term applied to these fasts because they came round at certain set seasons in the year.—Somner, *Dictionarium Saxonie*. This phrase is used in the laws of Alfred the Great, and also of Canute, and corresponds with the term used by the canonists, *jejunia quatuor temporum*, the fasts of the four seasons.

Mr. Somner says that the embering days were 'times of old chosen and set apart for fasting and prayer for obteining the fruits of the earth, and to give thanks for the same, whereas at those times they are either sown, sprung up, coming in their ripeness, or gathered into the barn, as also to obtaine the grace of the Holy Ghost, when holy orders are given and ministers made.' It is to this latter purpose that the Church of England in the present day particularly devotes the 'ember days, and a special prayer is appointed for use at those seasons.

EMBER'ZA and EMBERIZIDÆ. See BUNTING.

EMBEZZLEMENT, the felonious appropriation by clerks, servants, or others in a position of trust, of goods, money, or other chattels intrusted to their care, or received in the course of their duty, on account of their employers. It is essential to the crime of embezzlement that the article taken should not have been in the actual or constructive possession of the employer; for if it were, the offence would amount to Larceny (q. v.). Embezzlement is not an offence at common law; hence, persons guilty of this crime were formerly suffered to escape punishment. In consequence of a flagrant instance of this immunity (Bazeley's Case, ii. Leach, 835), the Act 39 Geo. III. c. 85, was passed, whereby embezzlement was made a felony. This act has been repealed, but the law has since been fixed by subsequent enactments, and is now included in the act 24 and 25 Vict. c. 96.

Embezzlement by clerks or servants is punishable by penal servitude or imprisonment. See PUNISHMENT. If the offender be a male under 16, he may also be ordered to be privately whipped, at the discretion of the judge. Questions of much nicety often arose as to whether the facts proved constituted the crime of embezzlement or that of larceny; but this distinction has ceased to be of any importance under the recent acts—the Criminal Justice Act (14 and 15 Vict. c. 100), and the 24 and 25 Vict. c. 96, s. 72—whereby it is made competent, on an indictment for embezzlement, to convict a man of larceny, and *vice versa*. And hence, whichever of the two offences is charged against the servant, if the evidence shows he committed the other offence, then he may be found guilty of that other offence, and punished accordingly.

Embezzlement by bankers, brokers, factors, and other agents, is regulated by the above statute, sect. 3, formerly the Fraudulent Trustees Act (20 and 21 Vict. c. 54). These most important statutes have rendered almost every conceivable species of fraudulent misappropriation by bankers and others a punishable offence. In particular, by the latter statute, embezzlement by a Bailee (see BAILMENT) is now indictable. Under this provision, a shop-

keeper appropriating goods intrusted for repair, may be tried and convicted.

Embezzlement by bankrupts, or rather the pawning or disposing within four months before the bankruptcy of goods or any kind of property obtained on credit, is punishable by two years imprisonment. See BANKRUPT.

Embezzlement of letters and newspapers by servants of the Post-office, is also made highly penal by 7 Will. IV. and 1 Vict. c. 26. The embezzlement of newspapers is punishable by fine or imprisonment; but to embezzle a letter, subjects the offender in all cases to penal servitude for seven years; and if the letter contain money or valuables, to penal servitude for life.

Embezzlement of the Queen's stores is punishable by penal servitude for fourteen years. In regard to this species of embezzlement, summary authority was given to comptrollers and other officers named, on proof of embezzlement of government stores below the value of twenty shillings, to fine the offenders to the amount of double the value of the article taken.

In Scotland, the crime of embezzlement, or breach of trust, is punishable at common law. The distinction between this crime and that of theft is substantially the same as between embezzlement and larceny in England. In both countries, the criterion relied upon to distinguish these crimes is the question of possession by the owner; but in Scotland the tendency of the decisions of late years has been to regard the appropriation of articles intrusted for a temporary purpose as amounting to theft. In this respect, the law of Scotland agrees with that of England in regard to embezzlement by a bailee. In Scotland, the appropriation of things found without an owner would appear, according to Mr. Hume, not to be an indictable offence. Such a case would sometimes be treated in England as Larceny (q. v.).

EMBLEM, a representation of an object intended to signify or indicate to the understanding something else than that which it directly represents to the eye. The meaning of the emblem rests upon its secondary, not its primary signification. Emblem is often used in a sense synonymous with Symbol, under which, as the wider word, it will be more convenient to treat it.

EMBLEMATA (Gr.), the works of art with which gold and silver vessels were decorated by the ancients. These sculptured figures were generally executed either in the precious metals or in amber. They were called *crustæ* by the Romans, though the Greek word was also used.

EMBLEMENTS (Fr. *emblaver*, to sow with blé or wheat) growing crops of cereal and vegetable productions raised by the labor of the cultivator. Fruits of trees growing on the land, and grass, are not emblements. The law has ever been mindful of the interests of the tenant who has expended his toil and capital in tilling the ground. By the feudal law when a tenant for life died between March and August, his heirs were entitled to the profits for the whole year. By the existing law of England, a tenant for life, or other tenant, whose term may be suddenly and unexpectedly brought to a close, is entitled to reap the crop which he has sown, and to enter the lands after expiry of the term to remove the emblements.

By 14 and 15 Vict. c. 25, a tenant at Rack-rent (q. v.) under tenant for life is entitled, where the tenancy determines by death of tenant for life, to hold the land till the expiry of the current year. But if a term be brought to an end by the act of the tenant, he is not entitled to emblements. Thus, a tenant for life who commits forfeiture, or a widow entitled to dower—who, as regards dower-lands, is considered tenant for life—marrying again, are not entitled to emblements. On the death of a tenant, the executor, and not the heir, is entitled to the emblements. By 11 Geo. II. c. 19, emblements may be distrained for rent, and by common law they may be taken in execution. The right of life-renters in Scotland to reap the growing crop is somewhat similar to the English right to emblements. See LIFE-RENT.

EMBLICA, a genus of plants of the natural order *Euphorbiaceæ*, having a fleshy fruit. *E. officinalis* is a tree found in most parts of India, with a crooked stem, thinly scattered spreading branches, long narrow leaves, minute greenish flowers, and a globular fruit about the size of a gall-nut. The fruit is very acid, and somewhat astringent, which qualities it retains when dry and shrivelled. It is used in India as a deobstruent and febrifuge, also for tanning leather, and making ink, and is generally called *Embic Myrobalans*.

EMBOLISM (derived from the Greek word *embolon*, a plug) is the term employed by recent pathologists to designate the plugging-up of a vessel by a clot of coagulated blood-fibrin, by a detached shred of a morbid growth from a diseased cardiac valve, &c. It is in cases of ill-nourished, broken-down constitutions, or after a protracted or a debilitating illness, that the morbid tendency of the fibrin to coagulate spontaneously within the veins chiefly exists, and in such cases very trivial circumstances may call it forth, especially if they lead to any pressure on the vessel.

Clots, or portions of a clot may be transported by the blood-current from the venous system to the right side of the heart, and block up the pulmonary artery either entirely or in part: if the occlusion is entire, sudden death is produced; while, if it is only partial, gangrene, or inflammation of a part of the lung, commonly ensues. Many of the sudden deaths of women in child-bed (till recently quite inexplicable) are due to this cause, the plug being formed in the inflamed uterine veins, or possibly in some cases, in the right side of the heart, and passing from thence to the spot where its arrest proves suddenly fatal. Several cases of this kind are reported in Simpson's *Obstetric Memoirs*. Similar accidents may happen in the arterial system. A detached fragment of a diseased tricuspid or aortic valve of the heart, or a separated fragment of coagulated fibrin, may be driven onwards in the blood-current, and enter and occlude some of the cerebral arteries, causing softness of the brain, by cutting off the due supply of nourishment. For further details, the reader is referred to an exhaustive treatise on this subject published a few years ago by Cohn, entitled *Ueber embolischen Krankheiten*.

EMBOSSING, the art of producing raised figures upon various substances, such as paper, leather, wood, metals, &c. This is usually effected by pressing the substance into a die, the kind of die and mode of applying the pressure being modified according to the nature of the design and the properties of the substance to be embossed. Sheet-metal is embossed by stamping it between a pair of steel dies, one in relief, the other in intaglio. See **DIE-SINKING**. When the pattern is a deep one, several pair of dies are used, and several blows given with each, the metal being occasionally annealed. The first stamping produces a crude resemblance to the final design, of moderate depth; successive stampings bringing up more of the details, and giving increased depth. The upper die is usually raised by a rope attached over a pulley to a stirrup, in which the workman places his foot; he draws his foot down to raise the heavy die to the required height, and then suddenly releases the pressure of his foot from the stirrup, when the die descends by its own weight. While thus raising the die with his foot, he adjusts the work in its place with his hands. Smaller work is embossed with a screw-press, the lever of which is turned with one hand, while the work is placed under the dies and removed by the other. Paper and card are embossed in a similar manner, but the dies are frequently of brass, sometimes of copper electro-deposits, suitably backed. The counter-die is commonly made of soft metal, card or mill board, pressed into the metal intaglio die until a sharp impression is produced. The paper or card is well damped, and a fly-press is generally used. The leather or cloth for book-binding is embossed in this manner, the counter-die being usually made by gluing several pieces of millboard together, and gluing them to the upper bed of the press, then stamping these into the lower die until a perfect impression is obtained. The embossing press designed and constructed by Mr. Edwin Hill, for impressing the medallion upon postage envelopes, is a very elaborate and beautiful machine, whichinks the die itself, and with the aid of two boys, to place and remove the envelopes, embosses sixty envelopes in a minute. When large surfaces of textile fabrics, such as table-covers, &c., have to be embossed, the fabric is compressed between rollers, one being of metal, upon which the device is sunk like a die; the counter-roller or bed-cylinder is of paper covered with felt; this yields sufficiently to allow the fabric to be pressed into the die-cylinder. A third smooth metal roller is commonly used to press out again the impression made upon the bed-cylinder; this acts upon the bed-cylinder on the side from which the fabric emerges. Paper is sometimes embossed in this manner; and the flattening roller may be dispensed with if the cylinders are sufficiently accurate in their diameters for the pattern always to fall on the same place at each successive revolution. Leather embossed in high relief has been used for ornamental purposes in place of wood-carving on picture-frames, cabinet-work, &c.

The dies are of type-metal or electro-deposits, and the leather is softened or felled, i. e., worked with water till it contracts and chickens, then it is pressed into the dies by suitable round pointed tools, like modelling tools, made of wood, bone, or copper. When dry, the leather is removed from the moulds, and by its elasticity and shrinking it will relieve from very deep and undercut designs.—Mr. Straker's mode of embossing wood differs from all the above, and is very curious and ingenious. When wood is pressed and rubbed with a blunt instrument, the surface yields, and a depression of some depth may be made in it; if the wood be now soaked in water, the depressed portion will rise again to its original level. Mr. Straker takes advantage of this property thus. He rubs down the surface in those parts that are to be finally in relief, he then planes or shaves away the uncompressed portions until the bottom of the depressions are reached and made level with the new surface; the wood is then soaked; the compressed parts rise to their original level, and, of course, in doing so, rise above the portions that have been planed away, and present the required device in relief.

EMBOUCHURE (Fr.), that part of a wind instrument to which the lips are applied to produce the sound.—The term **EMBOUCHURE** is also applied to the mouth of a river.

EMBOW'ED, the heraldic term for anything which is bent like a bow. The illustration represents a sinister arm couped at the



Counter-embowed.



Embowed.

shoulder, embowed. When the arm is turned the reverse way, it is said to be counter-embowed.

EMBRA'CERY, in the law of England, the offence of influencing jurors by corrupt means to deliver a partial verdict. This offence is a species of Maintenance (q. v.). The giving of money to be distributed amongst jurors is embracery, though the money be not actually distributed. Not only persons attempting to influence the jury, but jurors themselves attempting unduly to bias the minds of their fellows, are guilty of embracery. The using indirect means in order to be sworn on a jury, is also embracery. This offence is punishable by various old statutes. At present, the crime is punishable by 6 Geo. IV. c. 50, which enacts, that every person guilty of embracery, and the jury consenting thereto, shall be punished by fine and imprisonment.

EMBRA'SURES, in Fortification, are openings in the parapets, flanks of bastions, and other parts of the defence-works, through which cannon are pointed. The siege-batteries of the enemy have also embrasures. Their use is, to shield as much as possible the guns, gun-carriages, gunners, and interior of the place, and yet leave spaces for the free firing of the guns. Each opening slopes outwards, so as to give a greater sweep to the gun's action.

EMBROCA'TION (Gr. *em*, into, and *breecho*, I wet), the same as Liniment (q. v.).

EMBROID'ERY, the art of producing ornamental needlework-patterns upon fabrics of any kind. This art is coeval with the earliest and rudest manufacture of hair and woollen fabrics. It was one of the most important of the early arts in Oriental countries, where it is still practised with great skill and diligence. It is common among most savage tribes that wear any kind of clothing. The blanket-wrapper of the Red Indian is commonly ornamented with embroidery; the Laplander embroiders upon the reindeer skin that forms his clothes patterns worked with needles of reindeer bone, and thread of reindeer sinews and strips of hide. It is practised as a domestic art in our own country by all classes, from the princess down to the pauper school-girl, and is carried on in large manufactories by very elaborate machinery.

The Chinese are perhaps the most laborious and elaborate hand-embroiderers of modern times; their best work is upon silk. The figures are either in colored silk alone, or in silk combined with gold and silver thread; the figures of men, horses, dragons, &c., being outlined with gold cord, and filled up colored and shaded with silk. The Persians, Turks, and Hindus also still excel in embroidery; they use, besides silk and gold and silver thread, beads, spangles, pearls, and precious stones. The dress-slippers of Turkish women of all ranks are elaborately embroidered, usually with a precious stone or a glass bead in the middle of the toe-part of the slipper, and a radiating pattern in gold, silver, or brass wire and silk surrounding it. The Turkey carpet is a sort of embroidered fabric. See **CARPETS**.

Some of the Oriental and Indian embroiderers include in their work a great variety of materials besides those above mentioned; feathers are largely and very tastefully used; the skins of insects; the nails, claws, and teeth of various animals; nuts, pieces of fir, skins of serpents, &c., are among these. Coins, which are so commonly used as ornaments for the hair of unmarried women in the East, are sometimes worked into their dresses with the embroidery. This is specially the case with the Turks and Georgians. The Indian women embroider with their own hair and that of animals.

Tapestry is a kind of embroidery, formerly done with the needle, but now chiefly with the shuttle. This kind of work is, in fact, intermediate between embroidery and weaving, and it is somewhat difficult to determine under which it should be classed, but in accordance with the definition given above, we shall only include needlework under embroidery, and tapestry will be separately treated.

For hand-embroidery, the fabric is usually stretched upon a frame, and the design to be worked is drawn upon it, or some other contrivance is used to guide the worker. If the fabric is sufficiently thin and open, a colored drawing or engraving may be

placed behind the work, and followed with the needle. A sheet of thin transparent paper, with lines upon it corresponding to the threads of the canvas to be worked upon, is sometimes used; this is secured by gum or wax to the drawing; and the design is copied by observing the number of small squares occupied by each color, and filling in the corresponding meshes of the canvas.

Berlin-work, which is a kind of embroidery, is done in a similar manner, the pattern being an engraving on which the lines corresponding to the thread are printed, and the meshes filled up with the required colors, painted in by hand by women and children, who copy it from the original design of the artist. The name has been given from the fact, that the best patterns have, since 1810, been published by Wittich, a printseller of Berlin.

In France, pricked patterns are sometimes used, one for each color, and colored powders are dusted through the holes upon the fabric to be worked.

All these devices render the art of embroidery a mere mechanical operation, requiring no further artistic skill or taste than is exercised in knitting stockings; but when the embroidress draws the design in outline upon the fabric, and works in the colors with her needle under the guidance of her own taste, embroidery becomes an art that might rank with water-color drawing or oil-painting; and it is to be regretted that so much time should be devoted by ladies to the mechanical, and so little effort made in the direction of truly artistic embroidery.

Muslin-embroidery has been very fashionable of late. This is purely mechanical work. The muslin is printed with a pattern made up of holes of different dimensions; these are cut or punched out, and their edges sewn with a 'button-hole stitch.' This kind of work is much used as trimming for ladies' clothing, for collars, and children's clothes.

Machine-embroidery has been practised with considerable success during the last quarter century. A machine was exhibited in the French Industrial Exhibition of 1854, by M. Heilmann of Mulhausen, by which one person could guide from 80 to 140 needles, all working at the same time, and producing so many repetitions of the same design. Although the details of the construction of this machine are rather complex, the principle of its action may be easily understood. The needles have their eyes in the middle, and are pointed at each end, so that they may pass through from one side of the work to the other without being turned. Each needle is worked by two pair of artificial fingers or pincers, one on each side of the work; they grasp and push the needle through from one side to the other. A carriage or frame connected with each series of fingers does the work of the arm, by carrying the fingers to a distance corresponding to the whole length of the thread, as soon as the needle has passed completely through the work. The frame then returns to exactly its original place, and the needles are again passed through to the opposite set of fingers, which act in like manner. If the work were to remain stationary, the needles would thus pass merely backwards and forwards through the same hole, and make no stitch; but by moving the work as this action proceeds, stitches will be made, their length and direction varying with the velocity and the direction in which the work moves. If 140 needles were working, and the fabric were moved in a straight line, 140 rows of stitching would be made; if the work made a circular movement, 140 circles would be embroidered; and so on. In order, then, to produce repetitions of any given design, it is only necessary to move the fabric in directions corresponding to the lines of the design. This is done by connecting the frame on which the work is fixed to an apparatus similar to a common pantagraph, or instrument so constructed that one end repeats on a smaller scale exactly the movements which are given to the other. See PANTAGRAPH.

The free end of this is moved over an enlarged copy of the design, the movement being a succession of steps, made after each set of needles has passed through, and thus the work is moved into the position required to receive the next stitch of the pattern.

This machine was subsequently patented in England, and many improvements have been made upon its details, but the principle of its construction remains the same.

Although it is possible to embroider any design with such machines, there are only certain designs that can be worked economically; for to do this, the patterns must be so designed as to consume each needleful of silk without waste. The length of silk required for each color can be calculated with extreme accuracy, and the designer is usually limited by this requirement. A greater range is, however, obtainable by dyeing the same thread of silk in different colors, the length of each color corresponding to what is required for producing the pattern; but a large demand for each pattern is required to render this profitable.

EMBRUN, a town of France, in the department of Hautes Alpes, is situated on a platform of rock in the midst of a plain, on the right bank of the Durance, 20 miles east of Gap. Seen from

a distance, the town has an imposing appearance. The streets of E. are narrow, dirty, and irregular. It is surrounded by loop-holed ramparts and ditches, and strengthened by bastions. The principal buildings are the cathedral, a Gothic edifice surmounted, by a lofty Romanesque tower, and the barrack, formerly the archbishop's palace. E. manufactures broadcloth, counterpanes, hats, cotton-yarn, and leather. Pop. (1876) 3287.

E. occupies the site of the ancient Ebrodunum, capital of the Caturiges, and an important Roman station. The line of its archbishops can, it is said, be traced to the time of Constantine. In modern times E. has been thrice destroyed by fire; by the Moors in 966, during the religious wars in 1573, and by the Duke of Savoy in 1692.

EMBRYO (Gr.), an organized being in a rudimentary condition, or the rudiment from which, under favorable circumstances, an organized body is to be developed. In botany, the term embryo is applied to the germ formed within the ovule on fertilization, and which increases to become the principal part of the seed. The albumen or perisperm of the seed, being regarded as a mere store of nourishment for the embryo, is not accounted part of the embryo; the cotyledons, however—although a large store of nourishment is often laid up in them—are considered as essentially belonging to it, along with the *plumule*, the *radicle*, and the connecting parts. As to animals, the term embryo is used as equivalent with *fetus*, and as designating the rudimentary animal from the moment of impregnation until the egg is hatched; but although this takes place at very different stages of development in different kinds of animals, and consequent metamorphoses are undergone by some before they reach their perfect state, the term embryo is not applied to the *larvæ* and *pupæ* of insects, or to the analogous states of other classes of animals. Eggs contain, along with the embryo, a store of nourishment for it in the early stages of its development. See REPRODUCTION, DEVELOPMENT OF THE EMBRYO, EGG, FÆTUS, OVULE, SEED, and SPORE.

EMBRYOLOGY. See DEVELOPMENT OF THE EMBRYO.

EMBRYOTOMY, a division of the fetus into fragments, to extract it by piecemeal, when the narrowness of the pelvis or other faulty conformation opposes delivery.

EMDEN, a town in the province of Hanover, once in the principality of East Friesland, is situated a little below the embouchure, of the Ems into Dollart Bay, in lat. 53° 22' N., long. 7° 13' E. It lies low, but is protected by strong dykes from any inroad of the waters of the bay. Nevertheless, occasional inundations take place; as in 1826, when the water stood up to the first floor of the houses for three months. E., which is the chief commercial town of Hanover, is surrounded by walls and towers, is well built, has spacious and well paved streets, and houses remarkable for their appearance of comfort, and for their extreme cleanliness. It is intersected by numerous canals, which are crossed by about thirty bridges. The Delf Canal runs south from the town to Dollart Bay, a distance of about two miles, but it can be entered at high water only, and even then is not navigable for vessels of more than 13 or 14 feet draught; all vessels of greater draught being obliged to unload in the roadstead of Delf, at the mouth of the canal. The principal building, and one of the finest public edifices in the whole region, is the town-hall, containing a library and a curious collection of ancient arms and armor. E. stands in a district of great fertility. It has a good deal of ship-building, besides various other manufactures. From this town, from 50 to 60 vessels are sent out to the herring-fishing off Scotland. E. was made a free port in 1751, came into the possession of Holland in 1808, and with the whole of East Friesland, was incorporated with the kingdom of Hanover in 1815. Pop. (1880) 13,667.

EMERALD (Sp. *esmeralda*, Fr. *émeraude*, Ger. *smaragd*, Gr. *smaragdōs*; the name is originally Semitic, or at least eastern, but the signification unknown), a mineral generally regarded by mineralogists as merely another variety of the same species with the Beryl (q. v.), with which it essentially agrees in composition, crystallization, &c., differing in almost nothing but color. The E., which, as a gem, is very highly valued, owes its value chiefly to its extremely beautiful velvety green color. It is composed of about 67—68 per cent. of silica, 15—18 of alumina, 12—14 of glucina, and a very little peroxide of iron, lime, and oxide of chromium. Its color is ascribed chiefly to the oxide of chromium which it contains. Its specific gravity is 2.577—2.725. In hardness it is rather inferior to topaz. The localities in which E. is found are very few. The finest have long been brought from South America, where they are obtained from veins traversing clay-slate, hornblende slate, and granite, in a valley not far from Santa Fé de Bogota. Emeralds of inferior quality are found in Europe, imbedded in mica-slate in the Henbach Valley in Salzburg. They are also found in the Ural; and some old mines in Upper Egypt have also been discovered to yield them, from which, probably, the ancients obtained them. This gem, known from very early

times, was highly prized by the ancients. Pliny states that when Lucullus landed at Alexandria, Ptolemy offered him an E. set in gold, with his portrait engraven on it.

Many wrought emeralds have been found in the ruins of Thebes. Nero, who was near-sighted, looked at the combats of gladiators through an eye-glass of E., and concave eye glasses of E. seem to have been particularly esteemed among the ancients. As a precious stone, the E. is rarely without flaw. Its value also depends much on its color. A very perfect E. of six carats has been sold for £1000.

It appears not improbable that emeralds have been found in the East, in localities not at present known, but the name E. or ORIENTAL E. is often given to a very rare, beautiful, and precious green variety of SAPPHIRE (q. v.).

E. COPPER is a beautiful and very rare E. green crystallized mineral, also called DIOPHASE, found only in the Kirghis Steppe, and composed of about 39 parts silica, 50 protoxide of copper, and 11 water.

EMERSON, the reappearance of one heavenly body from behind another, after an eclipse or occultation. The immersions and emersions of Jupiter's first satellite are particularly useful for finding the longitude of places. Minutes or scruples of emersion are the arc of the moon's orbit passed over by her center, from the time she begins to emerge from the earth's shadow to the end of the eclipse.

EMERSON, RALPH WALDO, the most celebrated of American philosophers, was born at Boston, United States, May 25, 1803, entered Harvard University in 1817, graduated in 1821, and became pastor of a Unitarian congregation in Boston in 1829. This office, however, he resigned in 1832. The next year he spent in England, and made the acquaintance of Carlyle, whose *Sartor Resartus* he helped to introduce to the American public in 1836. He afterwards led a retired, meditative life, chiefly at Concord. He delivered an oration entitled *Nature and Man Thinking*, before the Phi Beta Kappa Society at Cambridge, U.S., in 1837. In the following year appeared his *Literary Ethics, an Oration*; and in 1841, *The Method of Nature, Man the Reformer*, the first series of his *Essays*, and several lectures, &c. Three years later, he issued a second series of *Essays*. In 1846, he published a volume of poems. In 1847-8, he revisited England, to deliver a series of lectures on *Representative Men*. When published, they were generally reckoned the most vigorous and intelligible of all the author had then written. In 1852, he assisted in the publication of the *Memoirs of Margaret Fuller* (q. v.), with whom he had been associated in the issue of a magazine, the *Dial* (1840-4). *English Traits* appeared in 1856, and the *Conduct of Life* in 1860. In 1865, E. published an *Oration on the Death of President Lincoln*; a second volume of poems in 1868; *Society and Solitude*, a third volume of essays in 1870; in 1871, an introduction to Goodwin's translation of Plutarch's *Morals*; *Parnassus; Selected Poems*; a fourth volume of essays; *Letters and Social Aims* (1875); and *The Fortunes of the Republic* (1878). He received the degree of LL.D. from Harvard, in 1866. He died April 27, 1882.

There is perhaps no recent writer of note regarding whom opinions are so divided as Emerson. Some critics have placed him amongst the profoundest thinkers; others have pronounced him a sciolist and charlatan. No man who is himself sincere will doubt the sincerity of the American philosopher. It is true, however, that the subtlety of his intellect often deceives him by the facility with which it discovers divine meanings in nature and the human soul. E. never pauses to harmonize his thoughts and convictions. He knows that an idea is more forcible and attractive, and can be clothed in more brilliant and picturesque phraseology when it is not qualified, and, as it were, dragged down from its elevation by the influence of other ideas. He loves to watch the play of thought, and to dream and muse about it, borne up on the wing of a pure and delicate imagination, rather than to weigh its significance, or to build it up into an 'intellectual system' or a creed. E. thus belongs to the class of minds which are intuitional rather than reflective, and subtle rather than sagacious. His thinking charms, animates, and vividly excites the mental faculty of his reader, but it does not satisfy or settle any question conclusively. Hence his speculations on religion, philosophy, literature, and life, though stimulating to the young, are coldly regarded by men of mature and sage understanding. E. has nowhere formally defined the fundamental basis of his speculation. He appears to be what is called a Pantheist, at least he rejects entirely that kind of Theism which separates God from nature, and which looks upon him as simply a living Spiritual Personality. He will not recognize a God who is not 'one with the blowing clover and the falling rain.' In regard to man and his destinies, he entertains exalted hopes; but religion is not in his eyes a divinely revealed (in the ordinary sense) or infallible thing; all creeds are merely 'the necessary and structural action of the human mind' in the course of its historical progress. Man made them all (Christianity included), and he believes, that from the inexhaustible depths of

our nature there will come forth in due time new and higher faiths, which will supersede those that have gone before. E. is often said to have derived a good deal of his thinking from Thomas Carlyle. This is true, but not in any sense that can justify the vulgar criticism which makes him out to be a 'Yankee pocket-edition of Carlyle.' He is essentially an original and independent genius. Some of his writings have been translated into French. See *Lives and Reminiscences* by Willis, Cooke, and Ireland (1882); also, introductory essay, by Morley, to the English 6 volume edition of E.'s works (1882).

EMERY (Fr. *éméril*, Gr. *schmergel*, Gr. *smiris*; allied to *smear*), a variety of Corundum (q. v.), or of the same mineral species of which corundum and sapphire (with oriental ruby, &c.) are also varieties. It agrees with them very perfectly in composition, hardness, and specific gravity; but is dull, opaque, and not crystallized, sometimes of a grayish black, and sometimes of a blue color. It occurs both massive and disseminated. Its masses, although very compact, have a somewhat granular structure. It is found in several parts of Europe, in Asia Minor, Greenland, &c., generally in masses scattered through aqueous deposits, but in one locality in Saxony in beds of steatite in a schistose rock. The E. of commerce is chiefly obtained from the island of Naxos. Being very hard, it is much used for grinding glass and polishing metals and other hard substances. It is found in lumps, having a granular structure. It is composed of alumina, oxide of iron, and silica, with a little lime, in proportions varying considerably with different specimens. The following may be taken as an average: alumina, 82; oxide of iron, 10; silica, 6; lime, 1½.

It is prepared for use by first breaking it into lumps about the size of a hen's egg, then crushing these to powder by stampers. It is then sifted to various degrees of fineness, which are numbered according to the meshes of the sieve. Plate-glass manufacturers and others separate E. powder into different degrees of fineness by the method of *elutriation* (q. v.). A number of copper cylinders of graduated capacities are placed in a row, and filled with water; the E., churned up with an abundance of water, is admitted by a pipe into the smallest, it then passes to the next in size, and finally flows from the largest; and thus, as a given quantity of water with E. suspended in it, passes in equal times through vessels of varying capacities, the amount of agitation will obviously be greatest in the smallest vessel, least in the largest, and in like proportion with the intermediate; the largest particles, therefore, sink in the smaller vessel, and so on till only the very finest will reach the largest vessel. In this manner, any number of gradations of fineness may be obtained, according to the number and sizes of the vessels. Elutriation in oil or gum-water is sometimes used on a smaller scale, the E. being stirred up in the liquid, and portions poured off at different intervals of time, the finest being, of course, the last to settle. The use of the oil or gum is to make the subsidence take place more slowly.

E. thus prepared is used for a great many important purposes in the arts. Being next in hardness to diamond-dust and crystalline corundum, the lapidary uses it for cutting and polishing many kinds of stone. Glass-stoppers of all kinds are ground into their fittings with it. Plate glass is ground flat by its means; it is also used in glass-cutting, and in grinding some kinds of metallic fittings. When employed for the polishing of metals, it has to be spread on some kind of surface to form a sort of fine file. *E. paper*, *E. cloth*, *E. sticks*, *E. cake*, and *E. stone*, are various contrivances for such purposes.

E. paper is made by sifting E. over paper which has been covered with a coating of glue. It is used either by wrapping it round a fine file, or a stick, or in the hand, according to the form of the work. See POLISHING OF METALS.

E. cloth is made like E. paper, with coarse calico substituted for the paper. The E. does not adhere so well as to paper, and it is therefore not used by metal-workers, who work E. paper till smooth with wear, but is chiefly used for purposes where the hand alone is used, and paper would tear.

E. sticks are used for the same purposes as E. paper wrapped round files; they are made of deal sticks shaped like files, then glued over, and dipped once or twice in a heap of emery.

E. cake is a compound of bees-wax, suet, and E. melted and well worked together. It is applied to buffing wheels, &c.

E. stone is a kind of earthen-ware mixed with E., formed by pressing a mixture of clay and E. into suitable moulds, and then firing, like common earthen-ware. It is moulded into wheels, laps, &c. Its hardness and cutting power are very considerable.

EMESA. See HEMS, or HOMS.

EMETICS, medicines given for the purpose of producing Vomiting (q. v.). They are given when it is desirable to relieve the stomach of some noxious or indigestible substance, as a narcotic poison, or excess of food, or some special article of diet which has disagreed. Emetics are also administered in cases of fever, where the copious secretion they produce from the glands of the stomach and intestines is supposed to have a directly cura-

tive effect, aided perhaps, by the sedative action of emetics upon the circulation and nervous system. There is a considerable amount of evidence to show, that emetics have the power of cutting short typhus and other fevers in the earliest stage, and afterwards of making the attack of the disease less severe. In diseases of the respiratory organs, emetics are given as the quickest and safest method of removing accumulated mucus from the air-passages; and in Croup (q. v.), their action is especially favorable, being often followed by expectoration and a rapid improvement in the suffocative symptoms. Emetics are to be given with great caution, however, in all very depressed states of the system, as their primary action is to produce Nausea (q. v.), which is attended always with more or less diminution of the vital power, and often with great depression of the heart's action, amounting to syncope or fainting. The principal emetics are the preparations of antimony, zinc, and copper; ipecacuanha in powder or in wine; squill, lobelia, and, generally speaking, the whole class of expectorants and irritants; the latter of which, however, with the exception of sulphate of zinc, and perhaps mustard and water, form a dangerous kind of emetics, which should never be administered when the milder kinds can be procured.

EMETINE is the alkaloid which forms the active principle of ipecacuanha root. It is a yellowish-white powder, which is slightly soluble in cold water, but dissolves readily in alcohol. When taken internally, it exhibits violent emetic properties, $\frac{1}{16}$ th of a grain being sufficient to cause vomiting.

EMIGRATION is the passing from one part of the world to another for the purpose of permanently settling in it. People going thus from one district of the same state to another—especially if it be a distant part, with different habits and physical peculiarities—are sometimes said to emigrate, and in this way the term has often been applied to the English and Scotch settlers in Ireland. In its established signification, however, the word now refers to those who leave the state or dominions in which they have heretofore lived, and in this sense the term applies to those going to the colonies, though these are like the United Kingdom, under the authority of the British crown. In the country which people leave, they are called emigrants or wanderers out—in that in which they settle, they are usually called immigrants. Jacob and his family were immigrants to Egypt, and their descendants became emigrants from that country when they went to inherit the promised land.

The Greeks were addicted to emigration, owing, it has been said, to the many political contests which drove the weaker party from home. Greek emigrants planted colonies on the borders of the Mediterranean and the Black Sea, carrying them as far northward as France, where they established the city of Marseille. The Romans were great colonizers, but by conquest rather than emigration. They disliked leaving Italy; and the military and civil officers necessary to rule a colony were generally the only Romans who abode in it. These even did not, in general, settle in the colonies with their families, but were recalled after a certain period of service, the whole arrangement much resembling that for the government of British India.

The migrations of the northern tribes who overran the Roman empire, are well known in history; their wanderings may be said, indeed, to have continued down to the 13th century. Those who wandered from the north into France, where they acquired great territories, became known as Normans, and were remarkable for entirely throwing off the language and manners, and even all the traditions of their original homes, and becoming the most civilized and courtly portion of the French people. But though thus changed, they still continued to wander, spreading over Britain, Sicily, and the intervening portions of Europe.

The discovery of America opened a vast new field for emigration, which was taken immediate advantage of by the Spanish and Portuguese, and later, by the British, the French, the Germans, and the Dutch. In the 17th c., many of the English Puritans, persecuted in, or discontented with, their own country, found it more congenial to their tastes to live together in a new country, where they would be free from the presence of those who did not sympathize with them, and they thus founded the New England colonies. It is singular that, in the 19th c., an attempt should be made to revive the plan of emigrating for the purpose of maintaining an exclusive church, as, for instance, in the English High Church colony of Canterbury, and the Scotch Free Church colony of Otago.

The emigration fields at the present day are the territory still called the United States of America, the British colonies in America, and the colonies in South Africa, Australia, and New Zealand. There is a great distinction to be taken between colonies fit for emigration and those dependencies of the British crown held for other purposes. India, for instance, the greatest dependency of the crown, is totally unsuited for emigration. The British people who go there, with the exception of a few merchants, go to

form the civil and military staff which rules the country. They stay there no longer than they can help, and instead of living on from generation to generation, send home their children in early youth, families of a British origin having a tendency to degenerate, both physically and mentally, by long residence there. It is useless for working-people to go there, as every kind of work is done in some way or other by the natives much cheaper than it could be by Europeans, and the same may be said of every colony in the hot latitudes.

As a question in political economy, opinions about emigration have oscillated violently. At one time it has been prohibited, at another encouraged by all kinds of tempting offers held out to emigrants, while teachers of political economy have proclaimed that there can never be too much emigration. The conclusion to which we are coming in this, as in so many other questions in political economy is, that what is good for the individual members of a community is good for the community collectively—if people can improve their condition by emigrating, it is as well that they should emigrate; but if otherwise, they had better stay at home.

It might seem unnecessary to promulgate a doctrine which every man's self-interest should teach him, but unfortunately emigration is one of the matters on which the populace have been liable to delusions which have produced great mischief. Sometimes poor workmen have crowded in where labor was superabundant and capital deficient; at others, men have taken their capital to districts where there was no employment for it, and the unnaturally high price of the necessities of life has immediately absorbed it all. Young gentlemen, with nothing but showy accomplishments, have gone to the backwoods of America, where they could only prosper by ceaseless toil in felling and clearing.

Ambitious, discontented artisans have wandered to the wide pastures of Australia, where they could only get a scanty subsistence as hut-keepers or assistant shepherds, not having skill enough to be intrusted with the charge of stock. Such mistakes have originated from people's ignorance of the fate of those who have gone before, it being generally taken for granted that the emigrant has gone away for his benefit, whereas it has often been for his ruin, and to meet an untimely death.

The standard difficulty is the want of adjustment of capital to labor. This is enhanced by the circumstance, that those who wish to emigrate are generally persons feeling the pressure of poverty at home. The man, however, who goes to a place where there is no capital to employ him with—either his own or some other person's—is just in the position of a shipwrecked mariner cast on the shore.

Government interference has been found necessary for the protection of emigrants. Before he leaves his own country, the intending emigrant, through means of agents, can not only be shipped for a distant port, but can contract for his removal inland to his final place of settlement, and can even contract for the purchase of a plot of ground, or for the sale of his labor. The temptations and the opportunities for impositions in contracts to be fulfilled so far away from the place where they are undertaken, are obvious, and the instances of cruelty and rapacity exhibited in the emigration trade are among the most atrocious that have ever disgraced human nature. These led to the appointment of a department of government called the Emigration Commission, and to the passing of the Passengers' Act of 1849, which regulates the build and character of the vessels which may carry emigrants to certain points, limits the number that may be conveyed, requires the sufficiency of the provisions and other stores to be certified, and provides for proper medical attendance. The British government cannot, of course, enforce obedience to their regulations in vessels belonging to citizens of the United States, after these have gone to sea; but before allowing such vessels to receive emigrants, the owners must find security in this country for the performance of their undertakings, and to a considerable extent the American government has co-operated with ours for the protection of emigrants.

The greatest amount of emigration from any one country is from the United Kingdom. There is also a continual stream of emigration from Germany, which has formed several separate German communities in the States of America, and also in the British colonies there, and in Australia. A new kind of emigration, which has come under the charge of the British authorities, is that of hill coolies from India, and of Chinese, both for the purpose of supplying free labor in the sugar-growing and other tropical colonies where Europeans cannot work with safety. A difficulty which more or less attends all kinds of emigration is peculiarly felt in this kind—that of keeping the two sexes nearly equal.

The 'Thirty-fourth Report of the Emigration Commissioners' is for the year 1872. The Commissioners state that, as the administration of the Passenger Act has been transferred to the Board of Trade, it is the last report which they shall have to make on emigration from this country. The following table shows the

number and nationality of emigrants from the United Kingdom in 1870, 1871, and 1872 :

	English.	Scotch.	Irish.	Foreign.	Not Dis-tinguished.	Total.
1870.....	105,293	22,935	74,283	48,396	6,033	256,940
1871.....	102,452	19,232	71,067	53,246	6,438	252,435
1872.....	118,190	19,541	72,763	79,023	5,696	295,213

The emigration of 1872 was the largest since 1854, and exceeded the average emigration of the previous 17 years by 109,971. But it included a large proportion of foreigners who emigrated through this country—the number of whom was inconsiderable before 1864—and the real excess of the British emigration of 1872 over the average of the preceding 17 years was only 53,521. Of the emigrants from our own population in 1872, the English were 56·15 per cent.; the Scotch, 9·28 per cent.; and the Irish, 34·57 per cent. The proportion of English to Irish emigrants in 1872 was 61·59 to 38·41. The distribution of emigrants in 1872 was as under :

	English.	Scotch.	Irish.
United States, North America.....	82,339	12,691	66,752
British North American Colonies.....	16,691	4,254	3,437
British Australian Colonies.....	11,611	1,571	2,066
All other Places.....	7,549	1,025	508

Totals.....118,190 19,541 72,763

	Foreign.	Not Dis-tinguished.	Total.
United States, North America.....	68,137	3,828	233,747
British North American Colonies.....	7,805	18	32,205
British Australian Colonies.....	610	18	15,876
All other Places.....	2,471	1,832	13,385

Totals.....79,023 5,696 295,213

In the 66 years, from 1815 to 1889 inclusive, there left the United Kingdom 9,242,033 emigrants; of whom 6,004,523 went to the United States of America; 2,925,513 to British colonies; and 311,997 to other places. The average annual emigration was 164,085 for the eight years, 1853–60; 157,183 for the ten years, 1861–70; and 167,892 for the ten years, 1871–80. In the year 1879, there were 217,163 emigrants from the United Kingdom; in 1880, there were 332,294; of the latter, 166,570 went to the United States.

The country most affected by emigration from Europe is, of course the United States. The total immigration into the republic from 1820 to 1880 was 10,138,758, over 3,000,000 being from Ireland, about 3,000,000 from Germany, about 1,600,000 from England, Scotland, and Wales. Sweden and Norway sent during that period 306,000; France, 313,009; Austro-Hungary, 65,000; and British America, 568,000. The immigrants were 457,257 in 1880; and 668,000 in 1881.

EMIGRATION OF PAUPERS. The manifest advantages derivable both to themselves and the community which supports them from the emigration of paupers, and more particularly of pauper children to the colonies, have led to several legislative provisions on the subject. Parishes in England and Wales are empowered to raise funds by a yearly rate for defraying the expenses of poor persons willing to emigrate. 11 and 12 Vict. c. 110, empowers the guardians of a parish to promote the voluntary emigration of the poor, and to charge the expenses upon the ordinary funds for relief of the poor.

By 12 and 13 Vict. c. 103, s. 20, guardians are empowered to expend a sum not exceeding £10 for each person, on the emigration of paupers having settlements in their union or parish, without a previous vestry meeting. 13 and 14 Vict. c. 101, s. 4, enacts that it shall be lawful for the guardians of any parish or union to expend money in the emigration of any poor orphan or deserted child under the age of 16 years, having no settlement, or the place of whose settlement is unknown, and to charge the expense so incurred to the same parish to which such orphan or deserted child was chargeable at the time of the emigration. The section concludes with the provision, that no emigration of any such orphan or deserted child, under any of the above-mentioned powers, shall take place until such orphan or deserted child shall have consented thereto before the justices assembled in petty sessions, and a certificate of such consent, under the hands of two of the justices present thereat, shall have been transmitted to the Local Government Board.

These statutory provisions do not apply to Scotland, and there are no corresponding clauses in the Scottish acts, except in the Drainage and Improvement Acts of Scotland, 14 and 15 Vict. c. 91, and 19 and 20 Vict. c. 9, which enabled owners of lands in the Highlands and Islands of Scotland to ask grants of money to assist emigration of the poor population. This was allowed on inquiry, and with consent of the Board of Supervision, the owner paying part of the expense. But parishes generally have no similar powers. Directors of ragged schools are prevented from trying the experiment of sending the children to the colonies, by

want of funds, as well as by want of arrangements for their reception on arrival.

ÉMIGRÉS, the name given more especially to those persons who quitted France during the Revolution. After the insurrection at Paris, and the taking of the Bastille, 14th July, 1789, the princes of the royal family departed from France. They were followed, after the adoption of the constitution of 1791, by all who considered themselves aggrieved by the destruction of their privileges, or who were exposed to persecution. Nobles quitted their châteaux; officers, with whole companies, passed the frontiers. Crowds of priests and monks fled to escape the oath of allegiance to the constitution. Belgium, Piedmont, Holland, Switzerland, and, above all, Germany, were overrun with fugitives of every age. Only a few had been able to save their property; the greater portion were in a state of destitution, and sank into utter demoralization. A court had formed itself round the princes at Coblenz; a government, with ministers and a court of justice, had been established, and communication was kept up with all the foreign courts unfavorable to the Revolution. This conduct embittered France, aggravated the position of the king, and drove the revolutionary party forward in their sanguinary career. Under the command of the Prince of Condé, a body of émigrés was formed, which followed the Prussian army into Champagne. The result was that the severest laws were now put in force against the émigrés. Their lands were confiscated. The penalty of death was proclaimed against any one who should support or enter into communication with them.

Thirty thousand persons were placed upon the list of émigrés, and exiled for ever from the soil of France, although many of them had refused to bear arms against their country. Not until after the failure of their attempt to land at Quiberon in 1795, did the émigrés abandon all thoughts of penetrating into France by force of arms. Condé's corps, after the peace of Luneville, was obliged formally to dissolve, and sought an asylum in Russia. Even under the Directory, however, many had endeavored to obtain permission to return to France. The general amnesty proclaimed by the First Consul was therefore joyfully hailed by the greater portion of the émigrés. Many, however, did not return home till after the downfall of Napoleon. Dignities, pensions, and offices were now showered upon these faithful adherents; but, according to the charter of 1814, they were unable to recover either their estates or their privileges. Finally, on motion of the minister Villèle, the émigrés who had lost their landed estates, by the law of the 27th April 1825, received a compensation of 30 million francs yearly on the capital of 1000 million francs. After the July revolution, however, the grant was withdrawn. Compare Antoine de Saint-Gervais, *Histoire des Emigrés Français* (3 vols., Paris, 1823), and Montrol, *Histoire de l'Émigration* (2d edit., Paris 1825).

EMILIAN (or **EMILIAN**) **PROVINCES**, a name now employed to designate a portion of the recently formed kingdom of Italy, comprising the northern part of the States of the Church (the Romagna), and the duchies of Parma and Modena. The name is derived from the ancient *Via Emilia* (a continuation of the *Via Flaminia*, or great northern road), which passed through these territories. The E. P. were formally annexed to Sardinia in April 1860. See **ITALY**.

ÉMINENCE, a title given to cardinals by Urban VIII. Up to the period of his pontificate, they had been called Most Illustrious and Most Reverend. The assumption by the Roman Catholic clergy of this and other ecclesiastical titles, not having reference to any 'pretended province, or to any pretended see or diocese,' are not struck at by the Act 14 and 15 Vict. c. 49, to prevent the assumption of certain ecclesiastical titles in respect of places in the United Kingdom. See **ECCLESIASTICAL TITLES ASSUMPTION ACT**.

ÉMIR, an Arabic word, equivalent to 'ruler,' is a title given in the East, and in the North of Africa, to all independent chieftains, and also to all the actual or supposed descendants of Mohammed through his daughter Fatima. The latter are very numerous throughout the Turkish dominions, but although entitled by birth to be classed among the first four orders of society, they enjoy no particular privileges or consideration; on the contrary, they are found engaged in all sorts of occupations, and are to be met with among beggars, and the lowest of the populace, as frequently as among the mollahs.

Their privileges are confined to a few unimportant matters, chiefly to the exclusive right to wear turbans of a green color, that having been the favorite color of the Prophet. They are placed under the supervision of the Emir-Beshir. In former times, the title of Emir was born by the leaders in the religious wars of the Mohammedans, as well as by several ruling families, such as the Thaherides, and Samanides in Persia, the Tulunides in Egypt, the first seven Ommayades in Spain. The title Emir, in connection with other words, likewise designates different offices. *Emir-al-Mumenin*, 'Prince of the Faithful,' is the title assumed by

the califs themselves; *Emir-al-Muslemin*, signifying the same thing, was the title of the Almoravides. *Emir-al-Omrah*, 'Prince of Princes,' was the title of the first minister, under the califs and the East Indian Moguls, who united in his own person the highest civil and military dignities. It is now the title of the governors of different provinces. The Turkish master of the horse is styled *Emir-Achor*; the standard-bearer, *Emir-Alem*; and the leader of the caravans of pilgrims to Mecca, *Emir-Hadji*. *Ameer* or *Amere* is another spelling of the same word.

E'MILY, an Irish see, united to Cashel in 1568.

EMMANUEL COLLEGE, CAMBRIDGE, was founded in 1584 by Sir Walter Mildmay, Chancellor of the Exchequer and privy-counsellor in the reign of Queen Elizabeth. The foundation fellowships are thirteen in number. These fellowships are open to all her Majesty's subjects, and a candidate becomes eligible to them on proceeding to the degree of B.A. or any equivalent degree. All the foundation fellows are obliged to proceed regularly to the further degree in Arts, Law, Medicine, or any other faculty they have selected. There must be four of them always in priest's orders; and any who are not tutors or bursars in the college, are bound to be in orders at the end of the seventh year of their fellowship, at the risk of forfeiting it three years afterwards. The college also possesses two fellowships and four scholarships on Sir Wolstan Dixie's foundation (but the Dixie fellows have no voice in college affairs, nor any claim to the offices or dividends of the college); 21 scholarships (13 of £70 a year, 5 of £30, and 3 minors of £70), paid from the general revenues of the college; five of £30 a year, founded by Dr. Thorpe; and other seven (4 of £35, 2 of £50, and 1 of £16), for which candidates from certain schools have a preferable claim. The patronage of the college consists of 24 benefices, situated in the eastern and south-western counties of England; and of two schools, one in Norfolk, and the other in Suffolk. This college had in 1881 369 members of senate, 81 undergraduates, and 484 members on the boards.

EMME'NAGOGUES, medicines intended to restore, or to bring on for the first time, the menstrual excretion in women. The emmenagogues chiefly in use are the preparations of aloes, iron, myrrh, and other stimulants in connection with purgatives; and also the local use of the warm baths, leeches, fomentation, &c. Some recommend still more powerful and direct applications to the uterine mucous membrane; as galvanic pessaries, lunar caustic, scarifications, &c.; but these are not in general use. See MENSTRUATION.

E'MMERICH, a town of Rhenish Prussia, is situated on the right bank of the Rhine, on the borders of Holland. It is a very old town, and has a Dutch character of cleanliness. It has a custom-house, an orphan-house, a gymnasium, and several churches. E. has manufactures of tobacco, chocolate, leather, and liqueurs. Pop. (1880) 8900.

E'MMET. See ANT.

EMO'LLIENTS (from Lat. *mollis*, soft), substances used to soften the textures to which they are applied, as poultices, fomentations, &c., externally, and Demulcents (q. v.) internally.

EMO'TION. This is the name for one of the comprehensive departments of the human mind. It is now usual to make a threefold division of the mind—Emotion, or Feeling; Volition, or Action prompted by Feelings; and Intellect, or Thought. It is not meant that these can be manifested in absolute separation; or that we can be at one time all emotion, another time all volition, and again all thought, without either of the other two. But although our living mind is usually a concurrence, in greater or less degree, of all of them, still they can be distinguished as presenting very different appearances, according as one or other predominates. Wonder, Anger, Fear, Affection, are emotions; the Acts that we perform to procure pleasurable feelings, and avoid painful, are volitions, or exercises of Will; Memory and Reasoning are processes of Thought, or Intellect.

Emotion is essentially a condition of the waking, conscious mind. When asleep, or in a faint, or in any of those states called 'being unconscious,' we have no emotion; to say that we have would be a contradiction, which shows that 'emotion' is a very wide and comprehensive word. In fact, whenever we are mentally excited 'anyhow,' we may be said to be under emotion. Our active movements and intellectual processes can sometimes go on with very little consciousness; we may walk and scarcely be aware of it; trains of thought may be proved to have passed through the mind while we are unconscious of them. Now, it is these unconscious modes of Volition and Intellect that present the greatest contrast to emotion; showing how nearly co-extensive this word is with mental wakefulness, or consciousness, in its widest signification.

Emotion, then, is of the very essence of mind, although not expressing the whole of mind. There are three distinct kinds or divisions of it: Pleasures, Pains, and Excitement that is neither pleasurable nor painful.

Every kind of Pleasure is included under emotion in its widest acceptance. The pleasures of the Senses are as much of an emotional character as those pleasures that are not of the senses—as, for example, those of Power, Pride, Affection, Malevolence, Knowledge, Fine Art, &c. Every one of our senses may be made to yield pleasurable emotion; and all those other susceptibilities, sometimes called the special emotions, of which a classification is given below, are connected with our pleasures or our pains. What pleasure is in its inmost nature, each one must find from his own experience; it is an ultimate fact of the human consciousness which cannot be resolved into anything more fundamental, although, as will be seen, we can lay down the laws that connect it with the other manifestations of mind—namely, action and thought, and with the facts of our corporeal life.

In the next place, Pain is a species of emotion. We know this condition as being the opposite of Pleasure, as the source of activity directed to its removal or abatement, and as the cause of a peculiar outward appearance, known as the Expression or Physiognomy of Pain. All the inlets of pleasure are also inlets of pain. The various sensibilities of the mind, whether the outward senses, or the more inward emotions, give rise at one time to pleasure, at other times to pain, the conditions of each being generally well understood by us; we can define the agencies that cause pleasure or suffering through the skin, the ear, or the eye.

But it is requisite, further, to recognize certain modes of Neutral Excitement, in order to exhaust the compass of emotion. We are very often roused, shocked, excited, or made mentally alive, when we can hardly say that we are either pleased or put to pain. The mind is awakened and engrossed with some one thing, other things are excluded; and the particular cause or the excitement is impressed upon us so as to be afterwards remembered, while all the time we are removed alike from enjoyment and from suffering. This is a kind of emotion that has its principal value in the sphere of intellect. The emotion of Wonder or Astonishment is not seldom of this nature; for although we sometimes derive pleasure, and sometimes the opposite, from a shock of surprise, we are very frequently affected in neither way, being simply *impressed*. The strange appearance of a comet gives far more of this neutral effect than of the others. It is a thing that possesses our mind at the time, and is afterwards vividly remembered by us, and these are the chief consequences of its having roused our wonder.

The Physical Accompaniments of emotion are a part of its nature. It has been remarked in all ages, that every strong passion has a certain outward expression or embodiment, which is the token of its presence to the beholder. The child soon learns to interpret the signs of feeling. Joy, Grief, Affection, Fear, Rage, Wonder, have each a characteristic expression; and painters, sculptors, and poets, have adopted the demeanor of passion as a subject for their art. There must be some deep connection in the human frame between the inward states of consciousness and the physical or corporeal activities, to produce results so uniform throughout the human race. When we study the facts closely, we obtain decisive proof of the concurrence of the following members and organs in the manifestation of feeling.

In the first place, the *muscles* or *moving organs* are affected. Under strong excitement, the whole body is animated to gesticulation; in less powerful feelings, the expression confines itself more to the *features* or the movements of the face. These last have been analyzed by Sir Charles Bell. The face has three centers of movement—the Mouth, Eyes, and Nose; the mouth being most susceptible, and therefore the most expressive feature. In the Eyes, expression is constituted by the two opposite movements of the eyebrows; the one raising and arching them (prompted by a muscle of the scalp, *occipitofrontalis*), the other corrugating and wrinkling them. The one movement is associated with pleasing states, the other with painful. The Nose is acted on by several muscles, the most considerable of which is one that raises the wing together with the upper lip, and is brought into play under the disgust of a bad smell and in expressing dislike generally.

The Mouth is principally made up of one ring-like muscle (*orbicularis*), from which nine pairs radiate to the cheeks and face. In pleasing emotions, the mouth is drawn out by the action of two pairs of muscles, named the buccinator and zygomatic, situated in the cheek. The expression of pain is determined by the contraction of the aperture of the mouth, through the relaxation of those muscles, and the contraction of the ring-like muscle that constitutes the flesh of the lips; and by two muscles in the chin, one depressing the angle of the mouth, and the other raising the middle of the lower lip, as in pouting. Besides the features, the Voice is instinctively affected under strong feelings; the shouts of hilarious excitement, the cry of sharp pain, and the moan of protracted agony, are universally known. Another important muscle of expression is the Diaphragm, or midriff, a large muscle dividing the chest from the abdomen, and regularly operating in expiration. In laughter, this muscle is affected to convulsion.

In the second place, the *organic functions* of the system are

decidedly influenced for good or evil under emotion. The glandular and other organs acted on in this way comprehend the most important viscera of the body. The Lachrymal Secretion is specifically affected under passion; the flow of tears being accelerated to a rush, instead of pursuing the tranquil course of keeping the eyeball moist and clean. The states of the Sexual Organs are connected with the strongest feelings of the mind, being both the cause and the effect of mental excitement. The Digestion is greatly subject to the feelings, being promoted by joy and hilarity, not in too great excess, and arrested and disturbed under pain, grief, terror, anger, and intense bodily or mental occupation. The Skin is known to respond to the condition of the mind; the cold sweat in fear is a derangement of its healthy functions. The Respiration may be quickened or depressed according to the feelings. The action of the Heart and the Circulation of the Blood are subject to the same causes. The nature of this influence was explained under BLUSHING. Lastly, in women, the Lacteal Secretion participates in the states of emotion, being abundant, healthy, and a source of pleasure in a tranquil condition of mind, while grief and strong passions change it to a deleterious quality.

The connection between mental emotion and bodily states being thus a fact confirmed by the universal experience of mankind, can we explain this connection upon any general law or principle of the human constitution? Have we any clue to the mysterious selection of some actions as expressing pleasure, and others as expressing pain? The reply is, that there is one principle or clue that unravels much of the complexity of this subject—namely, that *states of pleasure are usually accompanied with an increase in some or all of the vital functions, and states of pain with a depression or weakening of vital functions.* This position may be maintained on a very wide induction of facts, many of them very generally recognized, and others open to any careful observer; there being, however, some appearances of an opposite kind, which have to be satisfactorily accounted for, before we can consider it as fully established.

If we consider first the respective *agents* or causes of pleasure and pain, we must acknowledge that they are very generally of a nature to accord with the view now stated. How many of the sources of pleasure are obviously sources of increased energy of some vital organs. The case of Food is too obvious to need any comment. Warmth within limits both confers pleasure and stimulates the skin, the digestion, and other functions. Fresh air exhilarates the mind, while quickening the respiratory function. Light is believed to stimulate the vital actions no less than the mental tone. And if there be some pleasures of sense, such as mere sweetness of taste, fragrant odors, music, &c., that do not obviously involve greater energy of vital function, they might be seen to do so, if we knew more than we do respecting the operation of the various organs, and we are certain that they do not have the opposite effect. Medical authorities are so much impressed with the general tendency of pleasures, that they include them in the list of *stimulants* in cases of low vitality. If we pass from the senses to the special emotions, such as Wonder, Power, Tender Affection, Taste, we find that when those are pleasing, they also increase the animal forces at some point or other. A stroke of victory sends a thrill through the whole system; and if the pulse were examined at that moment, we should find that it beats stronger. The illustration for Pains is exactly parallel, but still more striking. It is notorious that hurts, wounds, fatigue, ill-health, hunger, chilliness, nauseous tastes and odors, the silence of a prison, the gloom of utter darkness, failure, humiliation, contumely, deprivation of one's usual comforts and pleasures—while causing pain, cause in a corresponding degree a depression of the powers of the system. There are some apparent exceptions, as in the stimulus of the whip, the bracing agency of cold, and the effect of misery generally in rousing men from lethargy to action, but these could all be shown to be quite compatible with the main principle.

If we turn from the agents to the *expression*, or modes of manifestation, of the opposing mental conditions, we shall find that the facts are of the same general tenor, although with some seeming exceptions. Joy makes a man spontaneously active, erect, animated, and energetic. It is as if a flush of power were diffused through his members; and the efforts he is then prompted to, lead to no painful exhaustion. The opening up of the features, by the elevation of the eyebrows and the retraction of the mouth, indicates that the stream of energy has coursed over the face. In a still greater shock, the convulsiveness of laughter, by which respiration is quickened, attests the superabundance of the animal spirits. The body stands more erect, and every act done is done with more emphasis. Grief and depression are the opposite in every particular. The frame is languid and stooping, the features lifeless, the voice is a feeble wail; and although there is a species of convulsion attending on this condition of mind, it is a marked contrast to the other. The sob is caused by the *partial paralysis* of the diaphragm, which necessitates great voluntary efforts in order that breathing may proceed. The choking sensation at the

throat is also a species of paralysis from loss of vital power. The convulsions arising under such circumstances are productive of an exhausting reaction, which is the case with all the energetic movements stimulated by extreme pain.

Such is undoubtedly the general fact. But why should pain stimulate, or give strength to *some special* muscles, such as the corrugator of the eyebrow, and the depressor of the angle of the mouth? This has appeared a great difficulty to the ablest physiologists. It would look as if pleasure coincided with an energetic wave sent to some muscles, and pain with an energetic wave sent to others; so that the opposite conditions of mind are equally accompanied by an accession of power to some bodily member. But if we examine the matter more narrowly, it will probably turn out that the muscles that seem to be stimulated under pain, are not so in reality, but obtain the upper hand through the general relaxation of the system. Thus, take the mouth. We know the state of the mouth in languor, inaction, and sleep. We know that when we are roused in any way, the muscles of the face operate and draw the mouth asunder in a variety of forms. Pleasure corresponds with our energetic moods, pain causes a collapse towards the sleepy and exhausted condition which represents a state of departed energy. So the collapse of the body might seem an exertion of the *flexor* muscles, or those that bend the frame forward; but we are well aware that such collapse takes place when the system is totally lifeless. A renewed energy, as a matter of course, makes us stand erect.

This is a part of the case in reply to the objections arising from a specific expression of pain, but not the whole; and the answer to the difficulties still remaining is furnished by a fact that, if well authenticated, will probably dispose of nearly all the exceptions to the general principle now contended for. It is the organic functions, *more than the muscular system*, whose increased vitality coincides with pleasurable feeling, and their diminished action with pain. Muscular exercise is often highly agreeable, but the pleasure of *resting* after exercise is still more so. Now, there can be little doubt that what happens in the state of healthy repose is this: the amount of vital force stimulated by exercise—the increased energy derived from plying the lungs and heart—is now allowed to leave the active members, and to pass to the other organs—the digestion, skin, and various secreting glands—and it is their aggrandizement that is associated with the comfortable sensations of repose and sinking into sleep. Thus, the abating of muscular energy may be a cause of pleasure, provided the organic functions are raised in consequence; but it may be maintained as a highly probable supposition, that a certain health and energy of some or all of these functions (it is difficult to draw a specific line) is essential to pleasurable feeling. We may doubt whether even mental causes can materially raise the tone of enjoyment, if they do not also raise the activity of some of these organs.

Not only may a person be very happy and comfortable in the prostration of the muscular energy, even in a sick-bed, but one way of procuring comfort is to induce a total inaction of the moving members, to allow all the available nervous power to pass to the viscera and secretions. Hence a *forced relaxation* of the muscles *generally*, by the employment of *some* of them, is a means of soothing the mind under pain. Thus, the active intervention of certain small muscles—such as the corrugator of the eyebrows, the orbicular muscle of the mouth, and the depressor of the angle of the mouth—by relaxing a much greater body of muscle, is the means of setting free vital energy for behoof of the other parts of the system. This would explain the mental relief furnished by an assumed sadness of feature, and a voluntary collapse of the body generally.

It would appear, then, that the stimulus of muscle is not necessarily or immediately a cause of pleasure; while the stimulus of the organic functions is so. Thus, a bracing cold quickens the activities, but is apt to cause a shock of pain, by temporarily checking the action of the skin; when the reaction arrives, this check is converted into stimulation, and the mental state is altered in like manner. A bitter tonic must be supposed to act on the same principle.

The emotions of the human mind may be classified under two heads:

First—The pleasures, and pains, and modes of excitement growing out of the exercise of the Senses, the Movements, and the Appetites. See SENSES. The five senses, commonly recognized, are partly sources of pleasure and pain, in which case they yield Emotion, and partly sources of Knowledge, by which they are related to the Intellect. There are other sensibilities not included in the five senses, but ranking with them in those particulars—as the feelings of Muscular Exercise and Repose, and the sensations of Digestion, Respiration, &c.

The second head comprises the Special Emotions not arising immediately out of Sensation, although connected therewith. These have been variously classified. The following is one mode of laying them out: 1. Feelings of Liberty and Restraint;

2. Wonder; 3. Terror; 4. Tender Affections; 5. Emotions of Self-complacency, Love of Approbation, &c.; 6. Sentiment of Power; 7. Irascibility; 8. Emotions of Action, including the interest of Pursuit or Plot; 9. Emotions of Intellect, Love of Knowledge, Consistency, and Inconsistency; 10. Fine Art Emotions, or Taste; 11. The Moral Sense.

On this subject, see Müller's *Physiology, Movements due to the Passions of the Mind*; Bell's *Anatomy of Expression*; Stewart on the *Active Powers*; Bain on the *Emotions and the Will*, &c.

EMPANNEL—*Empannare vel ponere in assisis et juratis*—to write in a schedule or roll the names of such jurors as the sheriff returns to pass upon any trial. The judges of assize in England, before commencing their circuits, issue precepts to the sheriffs of the several counties, calling upon them to summon a sufficient number of jurors to serve upon the grand and petty juries. In compliance with this order, the sheriff prepares lists, called the Panels (q. v.) of the jury, and the persons named in the lists are thereupon summoned to attend at the assizes.

EMPECINA'DO, DON JUAN MARTIN DIAZ, EL, one of the leaders of the Spanish revolution of 1820, was born in 1775. He was the son of poor parents, and entered the Spanish army in 1792. At the head of 5000 or 6000 men, he carried on a guerilla warfare against the French during the Peninsular struggle, and acquired great distinction. In 1814, he was appointed colonel in the regular army, and the king himself created him field-marshal; but in consequence of petitioning Ferdinand, in 1815, to reinstitute the Cortes, he was imprisoned, and afterwards banished to Valladolid. On the outbreak of the insurrection in 1820, he took a prominent part on the side of the constitutionalists, and on several occasions exhibited great courage, daring, and circumspection. After the triumph of the absolutists in 1825, he was arrested, exposed in an iron cage to the contumely of the passers-by, and finally executed on a common gibbet, amidst the ferocious yellings of a debased and liberty-hating populace.

EMPE'DOCLES, a Greek philosopher of Agrigentum, in Sicily, lived about 450 B.C. So great was the estimation in which he was held by his fellow-citizens as a physician, a friend of the gods, a predictor of futurity, and a sorerer, or conjuror of nature, that they are said to have offered him the sovereignty. But being an enemy of tyranny, he declined it, and was the means of delivering the community from the dominion of the aristocracy, and bringing in a democracy. There was a tradition that he threw himself into the crater of Etna, in order that his sudden disappearance might beget a belief in his divine origin; this, however, can only be regarded as a mere fable, like the story told by Lucian, that Etna threw out the sandals of the vain philosopher, and thus destroyed the popular belief in his divinity. The statement of Aristotle is, that he died at the age of 60; later writers extend the period of his life considerably further, but their testimony is not equal in weight to that of Aristotle.

In E., philosophic thought is bound up with poetry and myth even in a higher degree than in Parmenides (q. v.). His general point of view is determined by the influence of the Elatic school upon the physical theories of the Ionic philosophers. He assumed four primitive independent substances—air, water, fire, and earth, which he designates often by the mythical name Zeus, Here, &c. These four elements, as they were called, kept their place till modern chemistry dislodged them. Along with material elements, he affirmed the existence of two moving and operating powers, love and hate, or friendship and strife, the first as the uniting principle, the second as the separating. The contrast between matter and power, or force, is thus brought out more strongly by E. than by previous philosophers.

The origin of the world, or cosmos, he conceived in this way: In the beginning, the elements were held in a sort of blended unity, or *sphere*, by the attractive force of love; when hate, previously exterior, penetrated as a repelling and separating principle. In this process of separation, which gives rise to the individual objects of nature, he seems to have assumed a series of stages, a gradual development of the perfect out of the imperfect, and a periodical return of things to the elemental state, in order to be again separated, and a new world of phenomena formed. From the fragments that we possess of his didactic poem, it is not quite clear in how far he considered fire as the substratum of strife, and water as the substratum of love, and ascribed various creations to the predominance of one or the other of these principles. Of his opinions on special phenomena, may be mentioned his doctrine of emanations, which proceeding from one thing enter into corresponding openings in other things. By this assumption in connection with the maxim, that like is known only by like, he thought to explain the nature of perception by the senses. He attempted to give a moral application to the old doctrine of the transmigration of souls, his views of which resembled those of Pythagoras. The fragments of E. have been edited by Sturz (2 vols., Leip. 1805), Karsten (Amst. 1828), and Stein (Bonn, 1852).

EMPEROR (Lat. *imperator*). The original signification of this, which in the modern world has become the highest title of sovereignty, can be understood only when it is taken in conjunction with *imperium*, which in the Roman political system had a peculiar and somewhat technical meaning. The *imperium* of a magistrate, be he king or consul, was the power which he possessed of bringing physical force in operation for the fulfilment of his behests. This power was conferred by a *lex curiata*, and it required this authorization to entitle a consul to act as the commander of an army. In the case of the kings also, the *imperium* was not implied in their election, but was conferred separately, by a separate act of the national will. 'On the death of King Pompilius,' says Cicero, 'the *populus* in the *comitia curiata* elected Tullus Hostilius king, upon the rogation of an *interrex*; and the king, following the example of Pompilius, took the votes of the *populus*, according to their *curiæ*, on the question of his *imperium*.'—*Republic*, ii. 17. Now, it was in virtue of this *imperium* that the title *imperator* was given to its possessor. Far from being an emperor in the modern sense, he might be a consul or a pro-consul; and there were, in fact, many *imperatores*, even after the title had been assumed as a prenominal by Julius Cæsar. It was this assumption which gradually gave to the title its modern signification. In republican times, it had followed the name, and indicated simply that its possessor was an *imperator*, or one possessed of the *imperium*; now it preceded it, and signified that he who arrogated it to himself was the emperor. In this form, it appears on the coins of the successors of Julius.

After the times of the Antonines, the title grew into use as expressing the possessor of the sovereignty of the Roman world, in which sense *Princeps* also was frequently employed. In the Introduction to the *Institutes*, Justinian uses both, in speaking of himself, in the same paragraph. From the emperors of the West, the title passed to Charlemagne, the founder of the German empire. When the Carolingian family expired in the German branch, the imperial crown became elective, and continued to be so till it ceased—Francis II., who in 1804 had declared himself hereditary Emperor of Austria, having laid it down in 1806. In addition to the Emperor of Austria, there are now in Europe the Emperor of Russia and Emperor of Germany, the latter of whom, was, on Jan. 18, 1871, proclaimed under this title within the Hall of Mirrors, in the palace of the French kings at Versailles, in the presence of the German princes, and the standards of the German army which was beleaguering Paris. In 1876 the Queen of England assumed the title of Empress of India, in addition to those which she bore previously.

EMPEROR MOTH (*Saturnia pavonia minor*), a moth of the same family (*Bombycidae*) with the silkworm moth. The E. M. is the largest British lepidopterous insect. Its expanse of wings is about three and a half inches. Each wing is ornamented with a large eye-like glassy and transparent spot. The Peacock Moth (*S. pavonia major*) is the largest European species, and attains an expanse of 5 inches across the wings. The cocoons of E. M. are remarkable for being formed internally of stiff convergent elastic threads, which readily permit the escape of the insect, but prevent the entrance of intruders. The cocoons of this genus of moths are invested with silk, which in China and India is collected for use. See SILK AND SILKWORM.



Emperor Moth, with Caterpillar, Pupa, and Cocoon.

EMPETRA'CEÆ. See CROWBERRY.

EMPHASIS. See ACCENT.

EMPHYSE'MA, an unnatural distension of a part with air. Emphysema of the cellular texture often takes place in the neighborhood of wounds of the air-passages in the lung, and is the consequence of an escape of air from these parts. Emphysema of the lungs is the consequence either of distension or of rupture of the air-vesicles, especially on the surface. It is rarely that emphysema is produced otherwise than mechanically; but collections of fluid in a state of decomposition sometimes give out gases, which penetrate and distend the textures with which they are in contact.

EMPHYTEU'SIS (Gr., an implanting), in the Roman law, a perpetual right in a piece of land, for which a yearly sum was

paid to the superior or original proprietor. The emphyteusis much resembled our feudal holdings, so much so, indeed, that Craig and other Scotch writers apply the term to them. The sum paid to the superior was called the *canon emphyteuticus*. The tenant handed down the right to his heirs, and was entitled to sell, but only on condition of giving the first offer to the dominus. The consent of the lord, however, was not necessary to entitle him to impignorate the emphyteuta for his debt. Justinian put the emphyteusis and the *ager vectigalis* on the same footing. The latter is the term applied to lands leased by the Roman state, by towns, ecclesiastical corporations, and by the vestal virgins. There were several ways in which the right of emphyteusis might cease. If the tenant died without heirs, it reverted to the dominus. He might also lose his right by injuring the property, by non-payment of his rent or public burdens, or by alienation without notice to the dominus. It was, of course, also in his power to renounce it.

EMPIRIC (Gr. *empeirikos*, an experimentalist or searcher after facts in nature, from *peirao*, I try). It is difficult to say at what period, or in what manner, this word began to degenerate from its original meaning. Probably the idea was, that empiricism, or experimental science, excluded, because it did not require, the reasoning faculties for its cultivation; and, therefore, the profession of empiricism came to be synonymous with vulgar ignorance. The empirics were a regular sect of ancient physicians in the time of Celsus and Galen, who gives us some insight into their modes of thought and practice. They laid great stress on the unprejudiced observation of nature; and thought that, by a careful collection of observed facts forming a history, the coincidence of many observations would lead to unalterable prescriptions for certain cases. The later adherents of the school excluded all theoretical study, even that of anatomy, and were guided solely by tradition and their individual experience. By an empiric in medicine is now understood a man who, from want of theoretic knowledge, prescribes remedies by guess according to the name of the disease or to the individual symptoms, without thinking of the constitution of patient or other modifying circumstances. What are called *specifics* are administered on this principle, or want of principle.

EMPIRICAL FORMULA, in Chemistry, is the mode of expressing the constituents of a compound in symbols, where the total quantity of each element is written down without reference to any particular order or state of combination. Thus alcohol consists of 4 equivalents of carbon, 6 of hydrogen, and 2 of oxygen; and its empirical formula is $C_4H_6O_2$. When regarded, however, as a member of a family group, the constituents are arranged in a more systematic manner, as in $C_2H_5O.HO$, representing the theoretical constitution of alcohol, which, strictly speaking, is the hydrated oxide of ethyl. Again the rational formula of Epsom salts, which is $MgOSO_4 + 7HO$, represents it theoretically as a hydrated sulphate of magnesia; while the empirical formula MgH_2SO_4 merely tells us that it consists of 1 equivalent of magnesium (Mg), 1 of sulphur (S), 7 equivalents of hydrogen, and 11 of oxygen. (Old notation.)

EMPIRICAL LAWS are such as express relationships, which may be merely accidental, observed to subsist among phenomena but which do not suggest or imply the explanation or cause of the production of the phenomena. They are usually tentative, and form stages in the progress of discovery of causal laws. Bode's law of the distances of the planets from the sun may be accepted as an example of an empirical law.

EM'POLI, a town of Italy, is situated in the province of Florence, in a remarkably beautiful and fertile district on the left bank of the Arno, 16 miles west-south-west of Florence. It is a thriving town, is surrounded by walls flanked with towers, and although its streets are narrow, it is on the whole well built, and has some good squares. The most interesting building is the Collegiate Church, built in 1093, the fine original façade of which has suffered but little from modern improvements, although the other portions of the building were considerably altered in 1738. This church contains several good paintings, and has also some excellent specimens of sculpture, among which is one by Donatello. E. has several manufactories of cotton, leather, straw-hats, and glass, a considerable trade in agricultural produce, and a weekly market of some importance. Pop. 6500

EMPO'RUM (Gr. *emporion*, trading-place). The word is derived from *emporos*, which signified in Homer's time a person who sailed in a ship belonging to another, but latterly meant a wholesale merchant, as opposed to a retailer, who was called *kapelos*. An emporium thus came to be applied to the receptacles in which wholesale merchants stowed their goods in seaports and elsewhere, and thus corresponded to our warehouse, as opposed to a shop.

E'MPTION. See SALE OF GOODS.

EMPYE'MA (Gr.), an internal suppuration, a word now applied

exclusively to a collection of pus in the pleura, causing pressure of the lung, and often attended by hectic fever. See PLEURISY.

EMPYREU'MA (Gr. *empyreuo*, I kindle), the burned smell and acid taste which result when vegetable or animal substances are decomposed by a strong heat. The cause of the smell and taste resides in an oil called *empyreumatic*, which does not exist naturally in the substance, but is formed by its decomposition.

EMS, usually called the *Baths of Ems*, to distinguish it from other places of the same name, a bathing-place known to the Romans, and celebrated in Germany as early as the 14th century. It is situated about four miles from Coblenz, near the most picturesque parts of the Rhine, in a beautiful valley in the province of Hesse-Nassau, traversed by the navigable river Lahn, and surrounded by wooded hills. Pop. (1880) 6943. Its warm mineral springs belong to the class containing soda; the only essential difference between the numerous springs is in the temperature varying from 24° to 46° Reaumur, and in the greater or lesser amount of carbonic acid gas contained in them. The bathing establishments are comfortably and luxuriously fitted up, as are also the hotels and private lodging-houses.

EMS, a river in the north-west of Germany, rises in Westphalia, at the southern base of the Teutoburger Wald, and flowing first in a north-western, and then through the Hanoverian territories in a northern direction, empties itself into Dollart Bay, an estuary of the German Ocean, after a course of 250 miles. Its chief affluents are the Aa, the Haase, and the Leda. It is navigable for vessels of 100 tons as high as Pappenburg, which is 25 miles up the river from Dollart Bay. The E. drains a basin of about 5000 square miles in extent. In 1818, it was connected by a canal with the Lippe, and thus with the Rhine, which greatly increased its importance with respect to commerce and navigation.

E'MU (*Dromaius*—or *Dromecius*—*Novæ Hollandiæ*), a very large bird, one of the *Struthionidæ* or *Brevipennes*, a native of Australia, and widely diffused over the southern parts of that continent and the adjacent islands. It is by some ornithologists referred to the same genus with the cassowary, but the differences are very considerable; the bill being horizontally depressed, whilst that of the cassowary is laterally compressed, the head feathered, and



Emu, and Young.

destitute of bony crest; the throat is nearly naked, and has no pendant wattles; the feet are three-toed as in the cassowary, but the claws are nearly of equal length. The name emu or emen was given by the older voyagers and naturalists to the cassowary, but is now the invariable designation of the Australian bird. The emu is even taller than the cassowary, which it resembles in the general character of its plumage. Its wings are mere rudiments hidden beneath the feathers of the body. Its color is a dull brown, mottled with dingy gray; the young are striped with black. When assailed, it strikes backwards and obliquely with its feet, like the cassowary, and it is so powerful that a stroke of its foot is said to be sufficient to break a man's leg. Dogs employed in hunting it are often injured by its kicks, but well-trained dogs run in before it, and spring at its neck. It cannot fly, but runs very fleetly. It is timid and peaceful, and trusts altogether to its speed for safety, unless hard pressed. In a wild state it sometimes occurs in small flocks; but it has now become rare in and around all the settled parts of Australia. The extinction of the species may, however, perhaps be prevented by its being preserved in a state of domestication; as its flesh is excellent, and it is very easily domesticated, and breeds readily in that state. It has frequently been bred in Britain. The eggs are six or seven in number, dark green; the male performs the principal part of the incubation. The eggs are highly esteemed as food. The skin of the emu contains much oil—six or seven quarts are ob-

tained from a single bird, and on this account it has been much hunted in Australia. The food of the emu consists chiefly of roots, fruits, and herbage. Its only note is a drumming sound, which it frequently emits.

EMULSIN, or SYNAPTASE, is a peculiar ferment present in the bitter and sweet almond, and which forms a constituent of all almond emulsions. When bitter almonds are bruised, and water added, the emulsin acts as a ferment on the amygdalin, and decomposes the latter into volatile oil of bitter almonds, prussic acid, grape-sugar, formic acid, and water (see ALMONDS, VOLATILE OIL, or ESSENTIAL OIL OF). The vegetable albumen of almonds is almost entirely composed of emulsin; which, when separated, is a white substance, soluble in water, and is distinguished by its remarkable power of causing the fermentation of amygdalin. It consists of carbon, hydrogen, nitrogen, and oxygen.

EMULSION is the term applied to those preparations in pharmacy obtained by triturating certain substances with water, and where the product is a milky white opaque mixture of a gummy consistence, and composed more or less of oily particles floating in mechanical suspension in the mucilaginous liquid. The *true* and *oily* emulsions are those containing true oil, as the emulsion of bitter almonds, obtained by bruising the latter in a mortar with water; and the *false*, or *not oily*, where no true oil is suspended, as where camphor, balsams, or resins are rubbed up with yolk of egg, mucilage, or dilute spirit of wine.

EMYSA, a genus of Marsh Tortoises, from which the whole family of Marsh Tortoises is sometimes called *Emys*. The chelonians of this family are numerous, and widely diffused throughout the warmer parts of the world. They differ more in their habits than in their appearance and structural characters from Land Tortoises. Their carapace, however, is more flattened, and their feet are more expanded and webbed, so that they swim with great facility. They feed chiefly on animal food, as insects and



Alligator Tortoise, in the act of seizing a Water Spaniel.

molluscs, aquatic reptiles, and fishes, some of them even preying upon birds and mammalia, which come within their reach. Two or three species of *Emys* are natives of the south of Europe; but two species are particularly abundant in North America, the Painted Tortoise (*Emys picta*), and the Alligator Tortoise (*Emysauria serpentina*). The flesh of some, as *Cistudo Europæa*, is esteemed for food. This small species, about ten inches long, an inhabitant of lakes, marshes, and muddy places in the south and east of Europe, is sometimes kept in ponds, and fattened for the table on lettuce-leaves, bread, &c.

ENAMEL (Fr. *émail*, originally *esmail*, from the same root as *smelt*), the name given to vitrified substances of various composition applied to the surface of metals. Enameling is practised (1) for purposes of utility, as in making the dial-plates of watches and clocks, coating the insides of culinary vessels, &c., when it may be considered as belonging to the useful arts; and also (2) for producing objects of ornament and beauty—artistic designs, figures, portraits, &c., when it belongs to the fine arts. Both the composition of enamels and the processes of applying them are intricate subjects, besides being in many cases kept secret by the inventors; and we can only afford space for the most general indications of their nature. The basis of all enamels is an easily fusible colorless silicate or glass, to which the desired color and the desired degree of opaqueness are imparted by mixtures of metallic oxides. The molten mass, after cooling, is reduced to a fine powder, and washed, and the moist paste is then usually spread with a spatula upon the surface of the metal; the whole is then exposed in a furnace (*fired*, as it is called), till the enamel is melted, when it adheres firmly to the metal. The metal most commonly used as a ground for enamel is copper; but for the finest kinds of enamel-work gold and silver are also used.

Artistic or Ornamental Enamelling.—This art is of great antiquity: it is proved by the remains found in Egypt to have been

practised there; from the Egyptians it passed to the Greeks, and it was extensively employed in decoration by the Romans; in the reign of Augustus, the Roman architects began to make use of colored glass in their mosaic decoration; various Roman antiquities, ornamented with enamel, have been dug up in Britain, and it was adopted there by the Saxons and Normans. A jewel found at Athelney, in Somersetshire, and now preserved in the Ashmolean Museum at Oxford, is proved by the inscription on it to have been made by order of Alfred; and there are various figures with draperies partly composed of colored enamel on the sides of the gold cup given by King John to the corporation of Lynn, in Norfolk.

Enamelling has been practised from a remote period in the East, Persia, India, and China, under a separate and distinct development; but there is nothing from which it can be inferred that the various methods were in use earlier than in Europe. As a decoration, enamelling was more popular, and attained to greater perfection in the middle ages, than in classic times. It was extensively practised at Byzantium from the 4th until the 11th c., and afterwards in Italy in the Rhenish provinces, and at Limoges in the south of France, where it was successfully followed out till a comparatively late period, in several different styles. The Byzantine and other early styles of enamel-work down to the 17th c. were generally employed in ornamenting objects connected with the service of the church, such as reliquaries, pyxes, church-candlesticks, crosiers, portable altars, the frontals of altars, &c.; the art was also greatly used in ornamenting jewelry, and vessels made for use or display in the mansions of the rich, such as salt-cellars, coffers, ewers, plateaux, candlesticks, &c. After this period, the art declined, until a new phase of it was invented in France, in which enamel is used as a ground, and the figures are painted with vitrified colors on the surface of it. This is enamel-painting properly so called, the earlier styles being more of the nature of mosaics.

Distinguished with reference to the manner of execution, enamel-work may be divided into four kinds: 1. *Oloisonée*, or enclosed, the method of the Byzantine school, in which the design is formed in a kind of metal case, generally gold or copper, and the several colors are separated by very delicate filigree gold bands, to prevent them running into each other. 2. *Champ Lévé*, practised by the early Limoges school. In this process, the ornamental design, or the figures that were to be filled in with color, were cut in the metal (generally copper) to some depth; and wherever two colors met, a thin partition of the metal was left, to prevent the colors running into each other by fusion when fired. 3. Translucent enamel, which had its origin, and was brought to great perfection in Italy, was composed of transparent enamel of every variety of color, laid in thin coatings over the design, which was incised on the metal, generally silver, the figure or figures being slightly raised in low relief, and marked with the graver, so as to allow the drawing of the contours to be seen through the ground, instead of being formed by the coarse lines of the copper, as in the early Limoges enamels. 4. Surface-painted enamels, which may be divided into two stages. The first stage, which is known as the *late Limoge* style, sprang up under Francis I. of France (1515—1547). In this the practice was to cover the metal plate with a coating of dark enamel for shadows, and to paint on this with white, sometimes set off with gold hatchings, sometimes having the hands and other parts of the figures completely colored. The designs were generally taken from well-known paintings or engravings of the period; and the style of the designs was strongly influenced by that of the Italian artists employed by Francis I. This style soon degenerated, and gave place to the latest or *miniature* style, which was invented before the middle of the 16th c. by Jean Toutin, a goldsmith at Chateaudun, and carried to the highest perfection by Jean Petitot, a miniature-painter, who was born at Geneva, 1607, and afterwards resided long in England, and then in Paris. In this the plate is covered with a white opaque enamel, and the colors are laid on this with a hair-pencil, and fixed by firing. The paints are prepared by grinding up colored enamels with some kind of liquid, and when fused by the heat they become incorporated with the enamel of the ground. The earlier enamellers of this school occupied themselves with miniatures, snuff-boxes, and other trinkets, till the period of the French Revolution, when the art fell into disuse. It was, however, revived in England early in this century; and copies of portraits and pictures on a much larger scale than the French miniatures were executed with much success by the late H. Bone, R.A., and the late Charles Muss. Works of this description possess the obvious advantage of durability; but those various qualities of texture, and the delicacy of color for which good works in oil or water color are prized, cannot be attained in enamel copies; and it is to be regretted that greater efforts are not made to turn enamelling to account in the way of ornamentation, for which it is so admirably fitted, rather than in attempts at imitating works classed strictly as within the bounds of fine art, and to put in practice the older styles of enamelling, particularly those denominated *champ levé* and transparent enamelling.

Enamelled-ware.—The liability of iron to oxidation by heat or moisture, and to corrosion even by the weakest acids, has led to many attempts to coat it with a protecting surface. Ordinary tin plate is the oldest and most familiar example of a partially successful method. Since the beginning of the present century, many attempts have been made to cover iron with a vitreous surface, and several patents have been taken for such methods of enamelling. The chief difficulty in applying enamels to iron arises from the tendency of the metal to oxidize before it reaches the temperature at which the enamel fuses, and to become brittle from the oxide combining with the silica of the enamel. This action being superficial, the mischief is the greater in proportion to the thinness of the iron. Therefore it is much easier to enamel thick cast-iron vessels than thin vessels made of sheet-iron. A glass may be made by combining either silicic acid or boracic acid with a base; the latter fuses at a lower temperature than the former, but the glass is much dearer and not so durable as the silica glass. The enamels used for coating iron consist of a mixture of silica and borax, with various basic substances, such as soda, oxide of tin, alumina, oxide of lead, &c.

The best enamel for such purposes with which we are acquainted, is that patented by C. H. Paris, and applied by Messrs. Griffiths and Browett of Birmingham. It consists of 130 parts of flint-glass powdered, 20½ parts of carbonate of soda, 12 of boracic acid. These are fused together to form a glass, then reduced to a very fine powder; the article to which they are to be applied is carefully cleaned with acid, then brushed over with gum water, and the powder dusted upon it. The gum water is merely to cause adhesion. This coating is then carefully dried, and heated just to the point at which the powdered glass will fuse, and by running together, coat the surface. The enamel is generally put on in two separate layers or coatings, the first being dull gray, and the second or outer one of some brighter color. For sheet-iron hollow-ware, the latter is usually white, upon which a pattern is often printed with transfer paper by the process in use for earthenware (see POTTERY). These light enamelled iron vessels, from their being practically indestructible (except when used for cooking), are made in large numbers for use on board ships, and for colonial markets. A great variety of articles, many of them beautifully decorated in colors, such as grate-fronts, clock-dials, panels of different kinds, tablets, and name-plates, are now executed in enamelled iron at a comparatively moderate cost. It is also applied to corrugated roofing. Clarke's and other patent enamels have been successfully applied to saucepans, small cisterns, pipes, and other articles of *cast iron*. See HOLLOW-WARE.

The action of sudden heat is to expand the metal more than the enamel, and cause the latter to peel off. Acids find their way through minute invisible pores, which exist in the best enamel; and when once they reach the iron, they rapidly spread between it and the enamel, and undermine and strip it off. This kind of action is curiously shown by filling an enamelled vessel with a solution of sulphate of copper. The acid attacks the iron wherever pores exist, and little beads of metallic copper are deposited at all such spots; these beads go on growing until they are large enough to be very plainly seen. This is the severest test for trying the continuity of enamelled surfaces, to which they can be subjected, as sulphate of copper will penetrate the glaze and body of ordinary earthen-ware.

ENAMEL OF TEETH. See TEETH.

ENARA, or ENARÉ, a lake of Russia, in the extreme north of Finland, is situated in lat. 65° 30'—69° 10' N., and long. 27° 30'—28° 45' E. It has an area of 1200 square miles, and has numerous islands. Its superfluous waters are discharged into the Arctic Ocean.

ENARÉA, a country of Africa south of Abyssinia, is situated within lat. 7°—9° N., and long. 36°—38° E., but its limits have not yet been definitely ascertained. It is inhabited by a portion of the Gallas tribes, who, owing to the continued communication which they keep up with Abyssinia, and also to the residence of many Mohammedan merchants among them, are much more civilized than the Gallas usually are. Their government is a hereditary and absolute monarchy. The principal rivers of E. are the Gibbe and the Dodesa. Its coffee-plantations are so extensive as to deserve the name of woods; they occur chiefly along the banks of the Gibbe. E. is remarkable for its manufactures of ornamented arms, and of cloths with embroidered borders. Besides these, it exports slaves, gold, ivory, civet, and skins, into Abyssinia. The king and a small portion of the population are Mohammedans, and it is said that native Christians have been found here. The capital is Saka, a place of considerable importance, near the river Gibbe.

ENARTHRO'SIS is the term used by anatomical writers to express the kind of Joint (q. v.) which admits of the most extensive range of motion. From the mode of connection and the form of the bones in this articulation, it is commonly called the ball-and-socket joint. It occurs in the hip and shoulder joints.

ENCA'MPMENT (Lat. *campus*, a plain) is a lodgment or home for soldiers in the field. There are *intrenched* camps, where an army is intended to be kept some time, protected against the enemy; *flying* camps, for brief occupation; camps of *position*, bearing relation to the strategy of the commander; and camps of *instruction*, to habituate the troops to the duties and fatigues of war.

Under CAMP has been given an account of the manner in which Roman camps were constructed. It is probable that the same general plan was adhered to until the invention of gunpowder. When cannon came to be used, however, a new arrangement of camp became necessary to shield the army from long-range projectiles. Everything, indeed, relating to attack and defence, especially to the latter, is taken into account in choosing the locality of a camp. A healthy site, good water, security from floods and plenty of fuel and forage, are the chief requisites in a good encampment.

The British army, when in the field, usually encamps by brigades or divisions, roads and paths being arranged before the troops arrive. The infantry, cavalry, and artillery are so placed as to defend each other in the event of a sudden attack. There is a chain of guards all round the spot; and the park of artillery is placed behind the troops. The sutlers and servants are in the rear of the camp, but not beyond the limits of the rear-guard. The tents of the infantry are ranged in rows perpendicular to the front, each row containing the tents (q. v.) for one company.

The circular tents, now much used, accommodate fifteen men each. The cavalry are in like manner encamped in rows; but each circular tent accommodates only twelve men. There are streets or roads between the rows of tents, of regulated width; and the officers' tents are at a given distance behind those of the men: the subalterns' tents being nearest to those of the companies to which they respectively belong. As a general rule, the line of the whole encampment is made to correspond as nearly as practicable with that in which the troops are intended to engage the enemy when fighting is renewed; to which end the tents of each battalion are not allowed to occupy a greater space in front than the battalion itself would cover when in order of battle.

Under most circumstances, in modern warfare, an encampment is not defended by artificial constructions; the commander seeks security for his troops in streams, marshes, difficult surface of country, and numerous advanced posts. Sometimes, however, more extensive defence-works are necessary; and then we have an example of an *intrenched* camp, which becomes a fortified enclosure. The chief uses of such a camp are—to secure an army while covering a siege, or in winter-quarters, to accommodate a corps of observation while the active army is engaged elsewhere; or to defend a position near a fortified place. Care is taken that the site is not commanded by neighboring hills. All villages are occupied, and all obstacles removed, within a distance of half a mile or a mile. The area of ground selected is large enough to contain the necessary store of arms, ammunition, food, fuel, forage, and water, and to enable the troops to manœuvre. The junction of two rivers is often selected as a favorable spot. Various defence-works are constructed around or near the spot, such as continuous earth-works, redoubts, *flèches*, &c. The position held by the allies outside Sebastopol, during the long intervals when the cannonading was suspended, had many of the characteristics of an entrenched camp.

Camps of *instruction* may be either temporary or permanent. Of the former kind was the camp formed at Chobham in Surrey in 1853, merely for the summer months, to exercise certain regiments in evolutions. Another was formed at Shorncliffe in Kent in 1855, at first to receive troops of the Foreign Legion; but it has since been improved to the condition of a permanent camp. The great establishment at Aldershot is described under ALDERSHOT CAMP. Since that article was originally written, this remarkably popular camp has been, by an ungrudging outlay of public funds, improved in all particulars, and the small agricultural village of Aldershot has grown into an important commercial town, with railway stations, hotels, market-house, handsome shops, &c. A large permanent camp has also been established in Ireland, on a plain called the Curragh of Kildare, and there is a smaller one at Colchester.

ENCAUSTIC PAINTING (Gr. *encaustike*, infired, or fixed by fire), a manner of painting practised by the ancients. As the name implied that fire was used in the execution, some have been led to suppose that encaustic painting was the same as enamel painting; but notices by Pliny and other writers show clearly that it was a species of painting in which the chief ingredient used for mixing and fixing the colors was wax dissolved by heat. Various attempts have been made in modern times to revive it. About the middle of last century, Count Caylus and M. Bachelier, and in 1792, Miss Greenland, made various experiments with this view. The count laid the result of his experiments before the Academies of Painting and of Sciences in Paris; and the ingenious lady was

rewarded with a gold pallet by the Society for the Encouragement of Arts in London; but the success of these efforts seems to have been but temporary. Encaustic painting was, however, some years ago again taken up in Germany under the patronage of the late king of Bavaria, who had a number of important works executed in this way. The colors are ground, and laid on with a vehicle composed principally of wax. Miss Greenland dissolved gum-arabic in water, afterwards adding gum-mastic, which was dissolved by stirring and boiling, and when the mixture had reached the boiling point, she put in the wax. After painting the picture, she passed a thin coating of melted wax over it with a hard brush, and then drew over the surface an iron—for ironing linen—moderately heated. After the picture cooled, it was rubbed with a fine linen cloth. The German method is somewhat similar, but some other ingredients are used; among these, potash with the wax; and in place of an iron being passed over the surface, the wax is brought to the surface by a vessel containing fire being held at a little distance from the picture. Encaustic painting is not likely to come into general use, for neither in imparting brilliancy to the colors, facility for execution, nor durability, is it to be compared with oil-painting.

ENCAUSTIC TILES, ornamental tiles made of earthenware, and now extensively used for paving churches, halls, conservatories, &c. Strictly speaking, the name applies only to tiles with a pattern produced by layers of different-colored clays; but we may also include those made of a single color where two or more kinds go to form a pattern. Of course a mosaic can thus be formed with tiles of various forms as well as colors. Tiles of one color are made of dried slip—that is, the powder of carefully mixed and prepared clay. These 'dry tiles' are made by placing the colored clay powder in strong steel moulds, and subjecting it to a pressure of several hundred tons, by means of a plunger fitting accurately into the mould. A depth of three inches of powder is compressed into a tile of one inch in thickness. It is then removed, heated in a hot chamber, fired, and glazed if required.

The figured tiles are made in a different manner. The clay is worked in a moist state, but very stiff, first into square blocks. These are cut into square slices or slabs by passing a wire through them; upon this is put a facing of fine clay of the color of the ground of the pattern—another layer, of a different quality of clay is sometimes added to the bottom, to prevent warping. It is then placed in a mould, with a plaster-of-Paris slab forming the top, on the under surface of which is the pattern in relief. This slab is pressed down, and thus forms a deep impression of the pattern which is to be produced in another color.

The clay of the requisite color to form the pattern is now poured, in a semi-fluid state, into this depression, and allowed to flow over the whole face of the tile; then it is set aside until dry enough to have its surface scraped and smoothed on a whirling table. By this means the superfluous clay is removed, and the pattern is brought out clear and well defined, the two colors of clay forming one smooth flat surface. The tile is then dried and fired.

By Malkin's patent process, inlaid as well as plain tiles are now wholly made of dried slip. The pattern is produced by the use of brass plates one-eighth of an inch thick, a separate one being used for each color. Thus, if it consist of an ornament in red and white on a blue ground, one plate is perforated so as to enable the red portion of the clay powder to be filled in, another is cut for the white portion, and a third for the blue ground. When all are filled up, the tile is pressed in a screw-press and fired.

Tiles of this kind were used for paving churches in England and on the continent from the 12th to the 15th century, after which they fell into disuse. The modern manufacture is therefore nothing more than a revival, with some improvements, of an ancient art.

ENCEINTE (Fr.), in Fortification, denotes generally the whole area of a fortified place. Properly, however, it means a cincture or girdle, and in this sense the *enceinte* signifies the principal wall or rampart encircling the place, comprising the curtain and bastions, and having the main ditch immediately outside it.

ENCEPHALOCE'LE (derived from the Greek *encephalon*, the brain, and *kele*, a tumor) is the term applied to a tumor projecting through the skull, in one of the parts where the bones are incomplete in infancy, and consisting of a protrusion of the membranes of the brain, containing a portion of brain itself. The most common situation of such tumors is in the middle line and at the back of the head. Surgical interference is scarcely ever justifiable, and all that can usually be done is to give uniform support to the tumor, and to defend it from injury.

ENCHONDRO'MA is the term employed in Pathological Anatomy to signify an abnormal cartilaginous growth. These growths most commonly occur in connection with the bones, and they are not unfrequent in some of the glandular structures. See **TUMORS**.

ENCHO'RIAL CHARACTERS. See **HIEROGLYPHICS**.

ENCKÉ, JOH. FRANZ, the well-known astronomer, was born September 23, 1791, at Hamburg, where his father was a clergyman. After studying at Göttingen, he served, during the campaign of 1813—1814, in the artillery of the Hanseatic legion, and in 1815, in the Prussian army, as lieutenant of artillery. On the establishment of peace, he left the service, and became assistant, and afterwards principal astronomer in the observatory of Seeberg, near Gotha. In 1825, chiefly at the instigation of Bessel, he was called to Berlin as successor to Tralles, in the secretaryship of the Academy of Sciences, and as director of the observatory.

While at Gotha, the astronomical prize offered by Cotta was awarded to E. by the judges Gauss and Olbers, for his determination of the orbit of the comet of 1850. This led him to solve another problem, which had been proposed along with the other—viz., the distance of the sun. The solution, by means of the two transits of Venus in 1761 and 1769, is published in two separate tracts (*Die Entfernung der Sonne*, Gotha, 1822—1824). In 1819, he proved that the comet discovered by Pons, November 26, 1818, revolved in the hitherto incredibly short period of about 1200 days, and had been already observed in 1786, 1795, and 1805. It has since gone by the name of E.'s comet, and has appeared regularly. The period of its recurrence being 3.29 years, or about $3\frac{9}{10}$ years. See **COMETS**. E.'s researches on this subject are contained in the *Transactions of the Berlin Academy*. In 1830, he undertook to edit the *Berlin Astronomical Almanac*, in which he published a number of astronomical treatises. Three volumes have appeared of *Astronomical Observations at the Berlin Observatory*, begun in 1855. He died 2d Sept. 1865.

ENCORE ('Again'), a French expression, generally used in England by the audience of a theater or concert-room when requesting the repetition of the performance of a piece of music. It is not used by the French themselves, who, in similar circumstances, exclaims *bis* (twice).

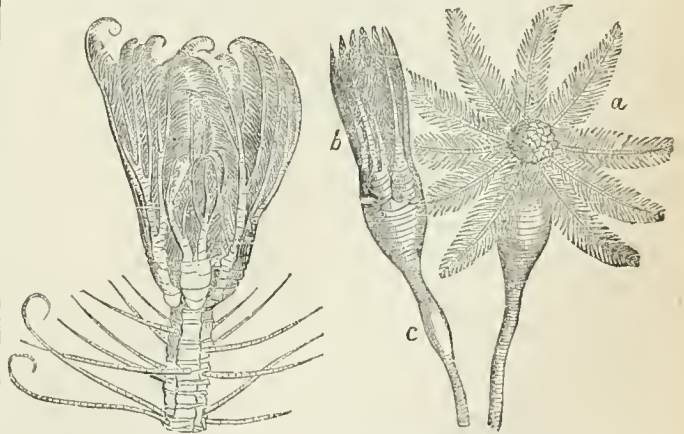
ENCRI'NAL or **ENCRINI TAL LIMESTONE**, a name given to some carboniferous limestones, from the great abundance in them of the calcareous skeletons of Encrinurites (q. v.), whole masses of the rock being almost entirely composed of them.

ENCRINURITES, a name applied generally to the fossil Crinoidæ, a family of Echinodermata (q. v.). The popular name *Stone Lilies*, is given to the numerous fossil species, from the resem-



Encrinurite Stems (Mountain Limestone).

blance which many of them present when the rays are closed to the lily. Hence also the name Crinoidæ. Crinoids are characterized by having their bodies supported during the whole or part of their existence, on a longer or shorter jointed calcareous stem. The



Pentacrinus Caput Medusæ.

Aplo Crinites Rotundus (from Buckland's *Bridgewater Treatise*).

a, expanded; b, closed; c, showing where the stem has been injured, and repaired by calcareous secretion.

stem is attached either by the expanded base, or by jointed processes, to the rocky bed of the sea, or perhaps, in some cases, to floating bodies, like barnacles. Occasionally, numerous root-like side-arms are sent out from the base of the stem to strengthen and support it; and in some species, as in the recent *Pentacrinus*, the column throughout its length is furnished with auxiliary side-

arms. The stem is round or five-sided; in one genus only is it elliptical. It is composed of a number of joints, perforated in the center, for the passage of a soft portion of the animal, and beautifully sculptured on the articulating surfaces. The body is cup-shaped, and composed of many-sided plates on the under surface, to the center of which the stalk is attached, while the upper surface is covered with a coriaceous skin, protected by many small plates. On this was situated the mouth, which was frequently proboscoidiform, and near it was the anal orifice—the alimentary canal being turned upon itself, as in the Bryozoa. The arms spring from the edges of the cup. They are five in number at their origin, but, with few exceptions, speedily divide and subdivide dichotomously. The arms are composed of articulated calcareous joints, similar to those of the stems. Each joint is furnished with two slender-jointed appendages or cirri, of use to the animal in capturing its prey, which consisted of mollusca and other small animals. The number of joints in some species is truly amazing.

Dr. Buckland calculated that *Pentacrinus Briareus* consists of at least 150,000; and 'as each joint,' according to Carpenter, 'was furnished with at least two bundles of muscular fibre—one for its extension, the other for its contraction—we have 300,000 such in the body of a single *Pentacrinus*, an amount of muscular apparatus far exceeding anything that has elsewhere been observed in the animal kingdom.'

E. are represented in the British seas by one species, *Comatula rosacea*, which in its perfect state is free, and moves about in the same manner as other star fishes, but is in its structure a true crinoid, and, in fact, when young, has the flexible stalk characteristic of the order. It is doubtful whether more than one species (*Pentacrinus Caput Medusæ*) of permanently stalked E. lives in modern seas. It is a native of the West Indian seas.

The family commenced its existence with the earliest sedimentary deposits. Seventy-three genera have been described, containing upwards of 300 species, two-thirds of which are found only in Paleozoic rocks. The most ancient E. have nearly all round stems, the few that are five-sided having the articulated surface of the joints simply radiated, and not complexly sculptured as in *Pentacrinus*, the type of a division of the order which appears first in the Lias. The earlier seas literally swarmed with these animals. 'We may judge,' says Dr. Buckland, 'of the degree to which the individual crinoids multiplied among the first inhabitants of the sea, from the countless myriads of their petrified remains which fill so many limestone beds of the older formations, and compose vast strata of entrochal marble, extending over large tracts of country in Northern Europe and North America. The substance of this marble is often almost as entirely made up of the petrified bones of Encrinurites, as a corn-rick is composed of straws.' See CRINOIDEÆ and PENTACRINUS.

ENCUMBERED ESTATES COURTS. See INCUMBERED ESTATES COURTS.

ENCYCLOPÆDIA means properly a book or work professing to give information, more or less full, on the whole circle of human knowledge. The name is compounded of two Greek words, *enkuklios*, circular or general; and *paideia*, discipline or instruction. These words were used by the Greeks and Romans to signify the circle of instruction through which every free-born youth had to pass before entering on public life. That circle embraced more particularly grammar, music, geometry, astronomy, and gymnastics, and afterwards became the 'seven liberal arts' of the middle ages. The compound name Encyclopædia appears to have been unknown to the Greeks, and also to the Latin writers of the classic period; and there is no evidence that either Greeks or Romans ever applied the words, single or compounded, to designate a book. The short form *Cyclopædia* has still less classical authority than Encyclopædia.

Encyclopædias, in the modern sense of the word, are most commonly Alphabetical; but sometimes the arrangement is 'rational,' i. e., according to the natural relations of the subjects. An alphabetical Encyclopædia is a Dictionary of Universal Knowledge. Besides this, its proper meaning, of a repository of universal knowledge, the name Encyclopædia is often applied—less properly perhaps—to alphabetical works whose scope is limited to a particular branch—works differing in no respect from others which are styled Dictionaries, Gazetteers, &c. See DICTIONARY. As all works of this kind, which now form a large and increasing section of literature in every language, have in so far a common character with Encyclopædias proper, we may give some account of the whole class under the present head.

For the sake of convenience, they may be arranged in three divisions: 1. The earlier works of this kind, having, for the most part, merely an encyclopædic character, i. e., embracing a large range of subjects, without distinctly aiming at universality; 2. Encyclopædias proper, which treat of the whole circle of human knowledge; 3. Books professedly confined to a definite department of knowledge, whether under the name of encyclopædia, dictionary, gazetteer, or other title. As books of this class profess

to touch on every important point that comes within their scope, they may be considered as encyclopædic in a limited sense. In the following sketch, the distinction between the first and second of those classes, which is of a somewhat indeterminate kind, is not strictly adhered to when it would interfere with the chronological sequence.

1. The earliest work of an encyclopædic character is generally ascribed to Speusippus, a disciple of Plato. The great collections of Varro (*Rerum Humanarum et Divinarum Antiquitates et Disciplinarum libri ix.*), of the elder Pliny (*Historia Naturalis*), of Stobæus, of Suidas, of Isidorus (the *Origines*), and of Capella, belong to the same class, but they exhibit no plan, and are only confused accumulations of the then known arts and sciences. Vincent of Beauvais (1264) surpassed them all. He gathered together with wonderful diligence the entire knowledge of the middle ages in three comprehensive works, *Speculum Historiale*, *Speculum Naturale*, and *Speculum Doctrinale*, to which soon after an unknown hand added a *Speculum Morale*.

But these, as well as the other similar compilations which appeared in the later mediæval period under the title of *Summa* or *Speculum* (Mirror), are marked throughout by a lack of philosophic spirit. Perhaps the nearest approach to the modern encyclopædia by an ancient writer, dates two centuries earlier than the time of Beauvais. In the tenth century, flourished Alfarabius, the ornament of the school of Bagdad, who wrote an encyclopædic collection of knowledge, remarkable for its grasp and completeness, and which still lies in MS. in the Escorial of Spain. Among the earliest and most noted of the modern encyclopædias was that of Johann Heinrich Alsted, or Alstedius, which appeared in Germany in two volumes in 1630. It consisted of 35 books in all, of which the first four contained an explanation of the nature of the rest. Then followed six on philology, ten on speculative, and four on practical philosophy; three on theology, jurisprudence, and medicine; three on the mechanical arts; and five on history, chronology, and miscellaneous topics. Two important French works belong to this century—the one is Louis Moreri's *Grand Dictionnaire Historique et Critique*, of which the first edition appeared at Paris in 1673, and the last in 1759; the other, Peter Bayle's famous *Dictionnaire Historique et Critique*, published at Rotterdam, in 4 vols., 1697. The first encyclopædic dictionary, so far as known, appeared in Germany as the *Lexicon Universale* of Hoffmann (2 vols., Basel) in 1677. Some time after there appeared in France Thomas Corneille's *Dictionnaire des Arts et des Sciences*, 2 vols. (Paris, 1694). Dictionaries limited to the explanation of technical terms had long been common throughout Europe; but previous to Hoffmann's work, no attempt had been made to bring the whole body of science and art under the lexicographic form. A highly successful attempt identical in kind, and attributable in idea, it may be, to the German work just alluded to, was the *Lexicon Technicum* of Dr. Harris, 2 vols. folio (London, 1710), which may fairly be regarded as the parent of all the dictionaries of arts and sciences that have since appeared in England. The *Cyclopædia* of Ephraim Chambers, published in 1728, in two very large folio volumes, presents the next marked advance in the construction of encyclopædic dictionaries. This one was brought out with considerable claims to originality of arrangement. The author endeavored to communicate to his alphabetical materials something of the interest of a 'continuous discourse,' by an elaborate system of cross references. Another peculiarity of this cyclopædia was, that its author, in the details of mathematical and physical science, gave only conclusions and not processes of demonstration. It was long a very popular work. The largest and most comprehensive of the successors to Hoffmann's book in Germany, was Zedler's *Universal Lexicon*, 64 vols. (Leip. 1732–1750). In point of comprehensiveness, this work should be classed with the encyclopædias proper, there being almost nothing then known that may not be found in it. Perhaps the strongest impulse, if not in all respects the best, communicated by this successful attempt of Ephraim Chambers, was given to the French mind through D'Alembert and Diderot. Their *Encyclopédie* was really, though not professedly, founded upon E. Chambers's book, which an Englishman named Mills had translated between 1743 and 1745, though the French version of it never was published.

The great French *Encyclopédie* was written by various authors of high literary and philosophical attainments, but of whom nearly all were tainted too much with the most impracticable revolutionary ideas, besides holding for the most part extremely skeptical opinions. The *Encyclopédistes* excluded both biography and history from its scope, yet infused into it more originality, depth, and ability than ever had appeared before within the boards of an encyclopædic dictionary. It appeared at Paris in 28 vols. between the years 1751–1772, and was followed by a Supplement in five vols. (Amst. 1776–1777), and an analytical index in two vols. (Paris, 1780). The work was everywhere received with the greatest enthusiasm, and it secured a place in the literary history of the nation for the editors and principal writers, who are ordinarily known as the *Encyclopédistes* of France. They

were D'Alembert and Diderot the editors, Rousseau, Grimm, Dumas, Voltaire, Baron d'Holbach, and Jaucourt. [See La Porte's *Esprit de l'Encyclopédie* (Paris, 1768); and Voltaire's *Questions sur l'Encyclopédie* (Paris, 1770).] D'Alembert's celebrated preliminary discourse was garbled in various pretensions works of this class published for the most part in England; such were Barrow's *New and Universal Dictionary of Arts and Sciences*, 1 vol. folio, 1751; and the *Complete Dictionary of Arts and Sciences*, by Croker, Williams, and Clerk, 3 vols. folio, 1766. A somewhat better, though rather illogical performance was published by a 'Society of Gentlemen' in 1754 in four 8vo volumes, generally known as *Owen's Dictionary*, from the name of the publisher of it. The first rude outline of the ponderous and solid *Encyclopædia Britannica* was laid down in the year 1771, in three volumes, but it was nothing more than a dictionary of arts and sciences; it had not yet attained to its subsequent universality. Such is a brief outline of the earlier kind of encyclopædias.

2. The first encyclopædia proper that demands our attention is the *Encyclopædia Britannica*, of which the 2d comparatively complete edition, containing biographical and historical articles, appeared in 10 vols. between 1776 and 1783; the 3d edition was completed in 18 vols. in 1797; the 4th edition, in 20 vols., in 1810; the 5th and 6th editions, and supplements in 6 vols., appeared between 1815—1824; the 7th edition in 21 vols., in 1830—1842; the 8th edition, in 21 vols., 1852—1860; and a ninth edition is now in progress. The method pursued by this work, while thoroughly alphabetical, consists in a combination of the systematic and the particular. In few instances is any science broken up into fractional parts; nearly all the sciences are given in treatises as they severally occur in the order of the alphabet. In some cases, however, where obscurity might result from such a plan, the other method is adopted. A marked feature of this work, is the number of complete treatises and dissertations which it contains by men of European name. From first to last, this *Encyclopædia* has been executed and published in Edinburgh, the literary reputation of which it has helped in no small degree to increase. The next encyclopædia that we must notice is the *Encyclopédie Méthodique par Ordres des Matières*, which was begun in 1782, and was not finished till 1832. It extends to 166½ vols. of text, with 51 'parties,' containing 6439 plates.

Each subject is treated in a separate volume or series of volumes, so that the work is a collection of separate dictionaries, more extensive than any encyclopædic work that has yet appeared. A work of higher scientific value, however, and even of a more varied nature, has been in progress for nearly half a century in Germany, undertaken originally by Professors Ersch and Gruber in 1818, and which has since continued to appear, in three several sections of the alphabet, up to the present time. There have already appeared of this great *Allgemeine Encyclopädie der Wissenschaften und Künste* some 150 volumes. In 1802, Dr. Abraham Rees projected an extended and improved edition of Ephraim Chambers's *Cyclopædia*, which was completed in 45 volumes in 1819. The system of cross references peculiar to E. Chambers is very effectually carried out in this book; but besides including a great accession of historical and biographical detail, it contained a large number of papers, prepared by competent writers, on subjects with which their life had rendered them familiar. Another work of considerable merit, which began to appear in 1810, was Brewster's *Edinburgh Encyclopædia* edited by the late Sir David Brewster, and completed in 18 volumes in 1830. In 1812, a great impetus was given to encyclopædic publications by the appearance of the *Conversations-Lexicon* of F. A. Brockhaus of Leipsic. The twelfth ed. (15 vols.) appeared in 1875—1879; the thirteenth, an illustrated ed., began to appear in 1882. (Meyer's and Pierer's *Conversations-Lexika* are also standard German works.) Brockhaus's has been translated into nearly all the civilized languages of Europe, no fewer than four English works of the kind being professedly founded on it: the *Encyclopædia Americana*, in 14 vols. (1829—1846); the *New American Cyclopædia*, 16 vols. (New York, 1858—1863), of which a new ed. under the title *American Cyclopædia* appeared between 1873 and 1876; the *Popular Encyclopædia*, 7 vols. (Glas., new ed. 1883); and Chambers's *Encyclopædia*, 10 vols. (Edin. 1860—1868; revised ed. 1874—1884). The last-named is a substantially new work, following in its construction the admirable plan of the *Conversations-Lexicon*, but making use of its valuable matter only so far as it is found suitable.

The next encyclopædic work which appeared after the *Conversations-Lexicon*, was one projected according to an original philosophic plan by Samuel Taylor Coleridge, in 1818, and finished in 1845, in 30 volumes. This *Encyclopædia Metropolitana* was arranged in four divisions: 1st, the pure sciences; 2d, the mixed and applied sciences; 3d, biography and history; and 4th, miscellaneous and lexico-graphic articles. The contributions to the first two divisions were written by persons of recognized ability, and they have nearly all been published separately in 8vo volumes since the *Metropolitana* appeared. If the book had any fault, it was that the plan of it was too rigidly philosophical, and therefore not

adapted to be consulted dictionary fashion; for although in one sense the alphabetic arrangement, by its jumble of subjects, is most heterogeneous and irrational, it recommends itself to popular acceptance by its extreme simplicity; and in point of fact, no encyclopædia has ever been thoroughly popular that has not been executed on the plan of a single alphabet, in which all subjects, however various, are included.

Next appeared the *Penny Cyclopædia* of the Society for the Diffusion of Useful Knowledge, which was begun in 1823, and completed in 1843, in 28 volumes. This work was perhaps at the time it appeared, the most useful and convenient, for the purposes of general consultation, of any encyclopædic treatise that had ever been issued. The *English Cyclopædia* is founded on the copyright of the *Penny Cyclopædia*, but is rearranged into four great divisions, which are each given in the order of the alphabet, viz., geography, natural history, biography, and arts and sciences. This publication was begun in 1853, and was completed in 1861 in 22 volumes; a synoptical index appeared in 1862, and a supplementary volume for each division has since (1869—1873) been issued. Among other publications of this character which have appeared in the course of the present century, may be mentioned Wilkes's *Encyclopædia Londonensis*, in 24 vols. 4to (Lond. 1810—1829); the *Encyclopædia Perthensis*, in 23 vols. (Edinburgh 1816); and the *London Encyclopædia* 22 vols. (Lond. 1829). The French have likewise published an *Encyclopédie des Gens du Monde*, in 22 vols. 8vo (Par. 1833—1844); and *Encyclopédie Moderne*, which, with its Supplement, occupies 42 vols. 8vo (Par. 1846—1862); and a *Dictionnaire de la Conversation et de la Lecture*, 2d ed. in 16 vols. (Par. 1854—1857), to which a Supplement was afterwards added. The last of these is to a large extent based on the *Conversations-Lexicon* of Brockhaus. The most notable of the other German encyclopædias are Meyer's *Neues Conversations-Lexicon*, in 15 vols. (1857; 3d ed. 1874); and Pierer's *Universal Lexicon*, in 34 vols. (Altenburg, 1840—1846), a sixth edition of which began to appear in 1875. In addition to these, there are several other continental encyclopædias, which are based upon the *Conversations-Lexicon*—such as the *Enciclopedia Española* (Madrid); the *Nuova Enciclopedia Popolare Italiana* (Turin); the *Nordisk Conversations-Lexicon*, 5 vols. (Copenhagen, 1858—1863); and the *Svenskt Konversations-Lexicon*, 4 vols. (Stockholm, 1845—1851); besides others in Russia, Hungary, the Netherlands, &c.

3. We have now to direct attention briefly to those books that are dictionaries or encyclopædias for one branch of knowledge. These works have been always very numerous, both in this country and on the continent. Such are the *Biographie Universelle* (commenced in 1811; new edition, 1842—1863); Chalmers's *Biographical Dictionary*, in 32 vols. (1812—1817); the *Dictionnaire des Sciences Médicales*, 60 vols. (Par. 1812—1822); *Nouveau Dictionnaire d'Histoire Naturelle*, 36 vols. (Par. 1816—1819); F. Cuvier's *Dictionnaire des Sciences Naturelles*, 60 vols. text, 10 vols. plates (1816—1847); *Dictionnaire de l'Industrie*, &c., 10 vols. (Par. 1834—1841); McCulloch's *Commercial Dictionary* (1832; last edition, 1882); McCulloch's *Geographical Dictionary* (1st edition, 1841; new edition, 1866); the *Dictionary of Practical Medicine* (Lond. 1866); Chambers's *Cyclopædia of English Literature* (1843; third edition, 1876); Spon's *Dictionary of Engineering* (1869—1874); Johnston's *Gazetteer* (1850; new edition, 1877); Morton's *Cyclopædia of Agriculture*, 2 vols. (1853); the *Nouvelle Biographie Générale* (1855—1866); Lippincott's *Gazetteer of the United States* (Philadelphia, last ed. (1882); Allibone's *Dictionary of British and American Authors* (Philadelphia, 1859—1871); Ure's *Dictionary of Arts, Manufactures, and Mines* (1839; 7th ed., supp. vol. 1877); Schmidt's *Encyclopædia des Erziehungs und Unterrichts Wesen* (1859—1875). Nor must we overlook the dictionaries of Dr. William Smith, viz., the *Dictionary of Greek and Roman Biography and Mythology*, 3 vols. (1843—1848; new ed. 1849—1851); the *Dictionary of Greek and Roman Antiquities*, 2d ed. (1849); the *Dictionary of Greek and Roman Geography*, 2 vols. (1854—1857); the *Dictionary of the Bible*, 3 vols. (1860—1863); and the *Dictionary of Christian Antiquities* (1875—1880), *Dictionary of Christian Biography* (4 vols.). These dictionaries are the product of the ripest scholarship in Britain, and are splendid specimens of encyclopædias devoted to special branches of knowledge. See DICTIONARY.

ENCYCLOPEDISTS. See ENCYCLOPÆDIA.

END. This familiar word is concerned in some important discussions, and especially in Ethics. It is in the sense of 'the thing aimed at,' the object, purpose, or goal of human action, that we have here to consider it. There is a fundamental contrast between Science and Art, Knowledge and Practice. Science, or Knowledge, embraces the general order of the universe, and states that order in the form by which we can take in as much as possible in one view; it is the fullest intellectual comprehension of the phenomena of nature that the mind can attain to. Art, or Practice, on the other hand, selects and appropriates certain items of knowledge, so as to subserve some useful purpose, some exigency of human life. Thus, Agriculture, Naviga-

tion, Law, Politics, Education are all branches of Practice; they involve knowledge, but in strict subordination to their several purposes. The navigator studies Astronomy, not with a view to enlighten his understanding as to the mysteries of the solar system and the starry sphere, but with a view to the guidance of his course in the sea. In short, to an Art (the word is not here used in the narrow sense of a Fine Art), or a department of Practice, belongs in the first place the consideration of the *end*. Every Art has its end, which is its distinction from every other. In most of the arts, the end is clear and unmistakable: we all know what is expected of a builder, a soldier, or a judge; the only question is how to obtain the knowledge requisite for adequately performing each separate function. But there are some departments where the end itself is not agreed upon, which casts a peculiar difficulty on the practice. Thus, it was remarked under CIVILIZATION, that the end of the whole mechanism, of Human Society, including Politics, &c., is differently viewed by different minds. But it is in the one special Department of Morality that the consideration of the end is of most vital consequence. This feature of the ethical problem has been very little adverted to in modern discussions, while the ancient philosophers kept it more prominently before them. Aristotle begins his *Ethics* by remarking that every art aims at some good; most arts, as medicine, ship-building, generalship, having limited or partial ends; while some comprehend much wider ends than others. The largest end of all is the good of mankind collectively. Hence he goes on to inquire what is the highest good of man, and finds that happiness is neither Pleasure, nor Honor, nor Virtue (by itself), nor Wealth, but that it is 'an energy of the soul according to virtue'; activity, in opposition to Oriental notions of luxurious repose, being an essential in his eyes. He has next, therefore, to inquire what 'virtue' is, according to which a man must employ his activity—a question of no easy solution. Still the discussion brings out the one fact, that Morality is a branch of Practice, but unlike most arts in this, that the end is peculiarly difficult to determine precisely. Accordingly, it is necessary to have in connection with it a set of discussions, called by Mr. J. S. Mill (*Logic*, concluding chapter) Teleology, or the Doctrine of Ends, corresponding to what the German metaphysicians have termed the Principles of Practical Reason.

The various theories of Moral Obligation differ in their statement of the end of Morality: according to one, it is the self-interest of the individual; according to another, the interest of mankind on the whole. The most prevalent theory is the harmonizing with a certain inward sentiment called the Moral Sense. See ETHICS.

ENDEMIC (from *en*, among, and *demos*, the people), a term applied to diseases which affect numbers of persons simultaneously, but so as to show a connection with localities as well as with their inhabitants. Endemic diseases are usually spoken of as contrasted with Epidemic (q. v.) and Sporadic (q. v.); the first term indicating that a disease infests habitually the population within certain geographical limits, and also that it is incapable of being transferred or communicated beyond those limits; while, on the other hand, a disease is termed epidemic if it is transmitted without reference to locality; and sporadic if it occurs in isolated instances only. The theory, accordingly, of endemic diseases is, that they are in some way or other connected with the soil—the result of terrestrial influences, or *miasms*—of poisons generated within the earth, or near its surface, and diffused through the air, so as to be weakened in proportion to the distance from the source of the poison. Such poisons are always observed to be more virulent in summer than in winter—more dangerous at night, when the vapors are concentrated on the surface of the soil, than in the day-time—more abundant in the plains, and in close confined places, than at a certain degree of elevation—more easily carried in the direction of the wind than in the opposite—and very often arrested altogether by water, or by a belt of forest or other luxuriant vegetation. In all these particulars, *endemic* are different from *epidemic* diseases, which bear no very obvious relation to the soil, and are not observed to be considerably modified either by the prevailing winds or the period of the day or night at which exposure to their influence takes place. The most marked type of an endemic disease is Ague (q. v.) or Intermittent Fever, which has all the habits mentioned above, and is to so marked a degree a denizen of particular tracts of country as to lead to their being in some instances almost depopulated. Many places in Italy are a prey to the *aria cattiva* or *malaria*, as it is popularly called; and hence, no doubt, even more than for protection from human foes, the custom so prevalent in that country of building the villages on the tops of hills, so as to secure immunity from the poisonous vapors raised by the solar heat from the plains lying on either side at the base of the Apennines. Terrestrial *miasms*, or such poisons as generate endemic diseases, are usually found in the neighborhood of marshy flats, or of uncultivated tracts of land at the confluence of rivers, or where a *delta*, or a wide channel subject to overflow, is formed at the upper end of a lake.

In proportion, too, as the heat of the sun is greater, the tendency to malarious emanations is increased; and in the tropics, accordingly, large tracts of jungle and forest are often rendered absolutely uninhabitable and almost impassable at certain seasons, by the invisible and odorless germs of intermittent, remittent, and even continued Fevers (q. v.), which are more fatal and unmanageable than the most terrible epidemic pestilences to those who are exposed to them. Such diseases are almost always sudden in their mode of attack, and they indicate the range of their influence by the number of persons attacked; but they are wholly free in most cases from the suspicion of communication by Contagion (q. v.), which is so frequent in the case of epidemic diseases. The precise nature of the malarious poison has never yet been discovered with any approach to exactness. It is known, however, to be almost invariably checked by drainage and cultivation of the soil; and hence many places in Europe, formerly very productive of endemic diseases, have now ceased to be so, as in the case of the Tuscan Maremma, and some parts of Kent and Essex, and of the Lothians in Scotland.

E'NDERBY LAND, discovered by Biscoe in 1831, lies in lat. 67° 30' S., long. 50° E. It appeared to the discoverer to be of considerable extent, and was closely bound by field ice, but owing to stress of weather and the extreme cold, it could not be approached within 20 or 30 miles, and Biscoe was thus unable to say whether the land he discovered was an island or a strip of continental coast.

ENDERMIC AND HYPODERMIC METHODS OF TREATMENT. These terms are, as the names imply, used to designate certain methods of making the skin an agent for the reception of medicines. The endermic method consists in raising a blister by the ordinary process, opening it by a small puncture, which must not be at the lowest part of the bladder, gently pressing out the fluid contents, and then injecting a medicinal solution, by means of a small syringe, through the puncture into the emptied sac; or, if the medicine is in the form of powder, it may be scattered over the raw surface. The endermic method is now almost entirely superseded by the hypodermic method, in which medicines are introduced into the subcutaneous cellular tissue by means of a very finely pointed syringe. For the invention of this process, the science of medicine is indebted to Dr. Alexander Wood of Edinburgh. It is chiefly, but not solely, to anodynes that these methods are especially applicable. It has been found that morphia given by Dr. Wood's method acts more speedily and more powerfully than when given by the mouth; moreover, the medicine given in this way does not disturb the functions of the stomach, and may be administered in those cases of irritation of that organ in which medicines introduced into it would be rejected by vomiting.

A solution of acetate of morphia, carefully freed from any excess of the acid, and of such strength that three minims shall contain one-third of a grain, is commonly employed, the dose varying from one to three minims, or from one-ninth to one-third of a grain of the salt. If the general effects of the morphia (as relief of pain and sleep) are required, any convenient part of the body, as, for instance, the fore-arm may be selected: the skin, pinched up between the fore-finger and thumb of the left hand, is penetrated by the point of the syringe, and the solution injected. When a local action is required, as in the case of various forms of neuralgia, the solution should be injected as near as possible to the seat of pain. As some patients are remarkably susceptible to the action of morphia administered in this method, it is advisable to begin with the smallest of the above-named doses.

A scientific committee appointed by the Royal Medical and Chirurgical Society of London to investigate the physiological and therapeutical effects of the hypodermic method of injection, accordingly sent in their Report, which was read in June 1867. Amongst the most important *physiological* facts which were observed, the following may be especially mentioned. Watery solutions of drugs subcutaneously injected were far less rapid in their action than when they were introduced into a vein. On comparing the effects of medicines subcutaneously injected with those produced when they were administered by the mouth, or by injection into the lower bowel, it was found that, in the case of some drugs, the local action was different according to the mode of administration, although the general effects produced were of the same kind. Thus, aconitine given by the mouth affected the salivary glands; when given by the rectum, it caused irritation of the gut; and when given by the skin, it occasioned local pain. The smallest dose fatal to rabbits was, by the mouth, $\frac{1}{16}$ th, by the rectum, $\frac{1}{8}$ th, and by the skin, $\frac{1}{32}$ th of a grain: it was thus five times as energetic when given subcutaneously as when given in the most usual way. The effects of morphia when injected under the skin were also more rapidly manifested and more intense than when given by the mouth or rectum. A solution of podophyllin, which, when administered by the mouth, acts as a powerful emolagogue (bile provoking) aperient, when injected into the skin, gives rise to free action of the kidneys. The investigations of the

therapeutic value of this mode of administering drugs were limited by the fact, that many substances (aconitine, for example) give rise to great local irritation when used subcutaneously. In cases of simple neuralgia, atropine was found to have a very beneficial effect when thus given, and in some cases more permanent relief followed its injection than that of morphia. The value of the latter drug was found to be much increased by this method, the required action being of longer duration, and being produced with greater rapidity and intensity. The same advantages followed this mode of giving quinine in intermittent fevers, but some caution is requisite in giving large doses, as irritation may arise from its presence under the skin.

Amongst the conclusions at which the committee arrives are the following: (1) That, as a general rule, only clear neutral solutions of drugs should be employed, decidedly acid or alkaline solutions being apt to cause irritation, and even local ulcers, at the point of application; (2) that, as in the case of podophyllin, symptoms are observed to follow the administration of some drugs by the skin, which are wanting when the same drugs are otherwise administered; and (3) that the advantages to be derived from this method of introducing drugs are (a) rapidity of action, (b) intensity of effect, (c) economy of material, (d) certainty of action, (e) facility of introduction in certain cases, (f) in some drugs, the avoidance of unpleasant symptoms.

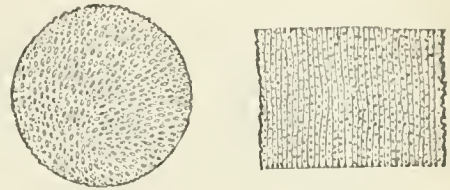
ENDIVE (*Cichorium Endivia*), an annual or biennial plant, of the same genus with Chicory (q. v.), said to be a native of China and Japan, but which is naturalized in the Levant, and has long been in cultivation as a garden vegetable; its blanched root-leaves being much used as salad, and also sometimes for stewing and in soups. The root-leaves are numerous, smooth, wavy at the margin. The varieties with much curled leaves are preferred. Some of the varieties *boll* of themselves, and are thus blanched; others require to be tied up. In Britain, the seed is usually sown from the middle of May to the end of June, and by a little care and protection, plants may be kept fit for use throughout most of the winter.

ENDLICHER, STEPHEN LADISLAS, a distinguished botanist, was born at Pressburg in Hungary, June 24, 1804. He was educated in his native town, Pesth, and Vienna, and then entered the church which he, however, abandoned in a few years. In 1827, he commenced his botanical and linguistic studies, and in the following year he was placed at the head of the imperial library at Vienna. In 1836, he was appointed keeper of the museum of natural history at Vienna, and in 1840 he became professor of botany in the university, and director of the botanic gardens. E. was much disturbed by the turn political events had taken in 1848 fell into a state of gloom, and in March 1849 put an end to his own life. A few of his works are upon ecclesiastical subjects, but the great bulk of his writings are botanical, the most important being connected with the systematic arrangement of plants. One of his earliest works was *Flora Posoniensis* (1830); in which he describes the plants growing in the neighborhood of Posen arranged according to the natural system. His most important work, *Genera Plantarum secundum ordines naturales deposita*, appeared from 1836 to 1840. In it he follows out with great elaboration the system of natural arrangement. It has had great influence on succeeding botanists, and is still one of the most complete works upon systematic botany. Among his other works are: *Prodromus Floræ Norfoliciæ* (1833); *Iconographia Generum Plantarum* (1838); *Mantissa Botanica* (1843); *Mantissa Botanica Altera* (1843); *Grundzüge der Botanik*, written along with Franz Unger (1843); &c.

ENDOCARDITIS, disease of the internal surface of the heart, resulting in the deposit of fibrin upon the valves. See **HEART, DISEASES OF**.

ENDOGENOUS PLANTS, or **ENDOGENS** (Gr. *endon*, within and *genos*, birth or origin), one of the great classes into which the vegetable kingdom is divided, the others receiving the corresponding designations of *Exogenous Plants* and *Acrogenous Plants*. The character from which this designation is derived is found in the structure of the stem, which does not increase in thickness by additional layers on the outside like the *exogenous* stem, familiarly illustrated in all the trees of the colder parts of the world, but receives its additions of woody matter in the interior; and in general does not continue to increase indefinitely in thickness like the *exogenous* stem, but is arrested when a certain thickness has been attained, different in different species, and afterwards increases only in length. When a transverse section is made of an endogenous stem, numerous bundles of vessels are seen dispersed irregularly in the cellular tissue, the younger and softer parts of the stem exhibiting the cellular tissue in greatest proportion, the older and lower parts chiefly abounding in vascular bundles, which are, however, somewhat scattered in the central part of the stem, and are densely aggregated towards the circumference, there, in the palms generally, forming very hard wood, in some of them wood so hard that it cannot be cut with a hatchet. The

stems of endogenous plants in the far greater number of cases produce terminal buds only, and not lateral buds, and are therefore unbranched. From the bases of the leaves, definite bundles of vascular tissue converge towards the center; but these extending downwards extend also outwards, and thus an interlacing of fibres takes place, which contributes not a little to the strength and compactness of the wood in the lower part of the stem. As the fibres extend downwards, they also become attenuated, spiral and porous vessels disappearing, and nothing but the most ligneous substance remaining. It is the hardening of the outer part of the stem which arrests its increase in thickness. Endogenous stems have not a distinct *pith*, nor any *medullary rays*. When the central part is soft and pith-like, yet it is not distinctly separated from the surrounding wood, and has no *medullary sheath*.



Transverse and Vertical Section of Endogenous Stem.

In many endogenous plants, as in the greater number of grasses, the center of the stem is hollow. This is not the case at first, when the stem begins to grow; and when any cause makes the growth of the stem unusually slow, so that it is much stunted, it remains solid; the fistular character of the stem is the result of its rapid growth, rupturing the cells of the central portion, which finally disappear. Endogenous stems have no *cambium* and no proper bark.

There is, indeed, a cellular *epidermis*; and there is also within it, and exterior to the hardest woody part of the stem, a comparatively soft layer of a corky substance, which is sometimes called bark, sometimes *false bark*, which does not separate from the wood below it without leaving myriads of little broken threads, the ends of the fibres which have extended into it from the hardest part of the stem. In those exogenous plants which produce lateral buds and branches, the fibres of the branches on descending to the stem extend on the outside of the proper stem, between its hardest portion and the false bark; and in this way a great thickness is sometimes attained, as in the dragon-tree. In the Grasses, a *plexus* of fibres takes place at the nodes, the fibres crossing from one side to the other. No British tree—and it may almost be said, no tree of temperate or colder climates—is endogenous. Almost all the endogenous trees are palms, although a few, as the dragon-tree, belong to other orders. Endogenous plants, however, are numerous in all parts of the world. Among endogenous plants are many of the plants most useful to mankind, particularly palms and grasses, all the true corn-plants being included among the latter. Nutritious substances are very extensively produced both in the fruit or seed, and in other parts; poisonous products are comparatively rare, although found in the *Araceæ*, *Liliaceæ*, *Melanthaceæ*, and other orders. Aromatic secretions are characteristic chiefly of one order, *Scitamineæ*. Besides palms and grasses, many of the endogenous plants are of great beauty, and many produce most beautiful flowers. Lilies and orchids may be mentioned as instances.

Endogenous plants are *monocotyledonous*; and the terms *endogenous* and *monocotyledonous* are therefore often employed indiscriminately to designate the class. But Lindley distinguishes a class of *Dictyogens* (q. v.), which, although monocotyledonous, have stems approaching to the exogenous character. The leaves of endogenous plants generally exhibit parallel venation, which is indeed strictly confined to them, although a venation resembling it, or rather simulating it, may be seen in some exogenous plants. The seed also germinates in a peculiar manner, different from that of exogenous plants, and to which the name *endorhizal* has been given, the radicle being protruded from within the substance of the embryo, and surrounded by a cellular sheath formed from the integument which it breaks in its egress.

ENDO'RSE. See **BILL**.

ENDORSE, in Heraldry, an Ordinary containing the fourth part of a pale. *Endorsed*, again, or *indorsed*, signifies that objects are placed on the shield back to back.

ENDOSMO'SE AND **EXOSMO'SE** (Gr. inward motion and outward motion), terms applied by Dutrochet, the first investigator, to the transfusion that takes place when two liquids or two gases of different densities are separated by an animal or a vegetable membrane. As the transmission has no necessary relation to outwards or inwards, the term *osmose*, or *osmotic action*, is now preferred. See **DIFFUSION**.

This action performs a very important part in living organisms, and explains many phenomena of the circulation of sap and the processes of nutrition, which were previously referred only to the wonderful action of vital energy. Thus, the blood continually streaming through the capillary vessels gives forth a portion to the surrounding cells, and so supplies them with the necessary chyle. This may, however, by the expansion of the capillary vessels (see INFLAMMATION), lead to immoderate exudation. On the other hand, the blood, in passing by, takes up a number of worn-out constituents of the juices of these cells, and in this way serves, by the exchange which it effects, to restore the body, and to disburden it of products which have become useless.—In plants also, osmose performs an important part in the process of nutrition and the motion of the sap. The substances in the cells of plants are usually denser than the fluids without, and thus a process of endosmose takes place, by which the plant is supplied in the first instance from the soil, being incapable, however, of appropriating any nourishment which is not presented in a liquid state to the fibrils of its roots; whilst that which the roots give off by exosmose, is supposed gradually to unfit the soil for the growth of the same kind of plant. The bursting of the capsules of some kinds of plants is owing to a process of endosmose going on in the cells, as in the fruit of the *Elatium* or Squirting Cucumber. Some of the *Entozoa*, as tape-worms, seem to live entirely by *endosmose*. See *OSMOSE*.

ENDRÖD, a large village of Hungary, in the county of Békés-Csanád, on the Körös, 90 miles east-south-east from Pesth. Pop. 9372. The surrounding district produces much corn, wine, flax, honey, and cattle.

ENDYMION, in Greek Mythology, was a son either of Zeus or of Aëthlios, and followed, according to some accounts, the occupation of a herdsman or hunter, but according to others, was king of Elis. On account of his uprightness, he is said to have received, at his own request, from Zeus, the gift of immortality, unfading youth, and everlasting sleep; but another version is, that Zeus having taken him up to Olympus, E. fell in love with Here (Juno), and was condemned by her enraged husband to eternal sleep on Mount Latmos. Others, again, prettily fable that Selene (the Moon), charmed by the beauty of the youth, conveyed him to Caria, and sent him to sleep on Mount Latmos, that she might nightly kiss him unobserved. The Eleans, on the contrary, declared that he died among them, and in proof of it were wont to show his monument. The myth of E. has been happily interpreted by Max Müller in his article on Comparative Mythology, in the *Oxford Essays* (1856). E., according to him, is one of the many names of the sun, but with special reference to the setting or dying sun, being formed from *enduo*, probably a dialectic variety of *duo*, the technical verb in Greek to express sunset. E. sleeps in the cave of Latmos, i. e., of night (from the same root as Leto or Latona, the night).

So far the myth poetically describes certain phenomena of nature, the sinking of the sun in the west, and the rising of the moon, that seems to follow his departing beams. But the original signification of the metaphors becoming lost, as might naturally happen when the words expressing them had only a local usage, it was, we may say, inevitable that people should transfer the metaphors to persons, and invent a history to supply the place of the vanished poetry. And this invention, or, more properly, explanation (for it was doubtless made in all good faith), is what properly constitutes the myth of Endymion. The story has been made the subject of a poem by Keats.

ENE'MA, (Gr. *en*, in, and *iemi*, I enter), a medicine or fluid substance conveyed into the body by injection, usually through the rectum or lower bowel. See *CLYSTER*.

ENEMIES, ADHERING TO THE QUEEN'S. By 25 Edw. III. st. 5, c. 2, it is declared that if a man 'be adherent to the king's enemies in his realm, giving them aid and comfort, in the realm or elsewhere,' he is to be held guilty of treason. Under this statute, the subjects of states at war with us are held to be enemies, though war has not been solemnly proclaimed. Every species of assistance, whether by joining in acts of hostility, or sending supplies or intelligence to the enemy, is deemed an act of adherence. To incite to hostilities the subjects of a state at amity with us, is not held to fall under this provision. But if the subjects of a friendly state make a hostile invasion, any British subject rendering assistance will be deemed guilty of treason under this clause. See *TREASON*.

ENEMY. An enemy, according to the civil law, is one who has publicly declared war against us, or we against him; all others are thieves or robbers. *Hostes hi sunt qui nobis. aut quibus nos, publice bellum decrevimus; ceteri latrones aut pradones sunt.*—*Digest*, i. 16, 118. Thus, in order to constitute an enemy, there must be a public declaration of war. This declaration must also be made by a duly organized state or kingdom, for a declaration of war by any turbulent body of men is not sufficient; and a hos-

tile act committed by private citizens will not justify a war, unless that act be sanctioned by the government. The purpose for which this public declaration is required, is stated by Grotius to be that it may be clearly known that the war is undertaken not as a venture, but by the will of the two people. Hostilities having been formally declared, every subject of the hostile nations becomes an enemy of the opposing state, as do likewise these independent nations which attach themselves to the interests of either party. According to ancient usage, the utmost violence and cruelty was lawful towards those who were enemies to the state; but by the humane principles which prevail in modern times, warfare is to be carried on subject to certain general rules, which are intended as much as may be to abridge the calamities of war, and to protect the rights of individuals. Thus, an army invading an enemy's country is bound to suffer, as far as possible, the peaceable inhabitants to remain unmolested.

Unnecessary devastation of the country and the seizure of property are also contrary to the laws of civilized war; and Grotius lays it down that the use of poisoned weapons, and of assassination, and violence to women, are to be reprobated. On the other hand, individuals taking up arms, without the sanction of the state, in order to annoy an invading enemy, are regarded as lawless marauders. The result of this distinction is, that such persons are not treated as prisoners of war, but are subject to be summarily dealt with by the commander of the invading army. As to the right of individuals to fit out vessels for the annoyance of the enemy, see *PRIVATEER* and *PIRACY*. It appears to be a recognized principle of international law, that the property of an alien enemy residing in either of the hostile states may be confiscated. The Americans, during the war with England, asserted this right in regard to British property found in their territory. But the usage of civilized nations for a long period has much modified the stern rule of law. It is provided by Magna Charta, cap. 30, that if merchants 'be of a land making war with us, and be found in our realm at the beginning of the wars, they shall be attached without any harm of body or goods, until it be known to us, or our chief justice, how our merchants be intreated there in the land making war against us; and if our merchants be well intreated there, theirs shall be likewise with us.' And by 27 Edw. III. c. 17, merchants of a foreign state at war with us were allowed forty days, after proclamation of hostilities, wherein to remove from the kingdom themselves and their goods; and if that space of time were not sufficient, forty days more were to be conceded to them. Vattel (iii. 4, 63), denies that the right to confiscate the goods of an alien enemy is a right inherent in a state by the law of nations, insisting that a sovereign having permitted foreigners to enter the state, and to continue there, had tacitly promised them full liberty and security for their return. Whatever be the principle, there is no doubt that the almost universal practice of modern nations has been to respect the property of individuals at the outbreak of hostilities. Provisions are frequently inserted into commercial treaties stipulating that, in case of war, the subjects of the enemy shall have time to depart, and even that they should be allowed to remain and carry on a peaceable trade. As to the practice in regard to *EMBARGO* and *LETTERS OF MARQUE*, see those articles. The rights to confiscate the debts of the subjects of a hostile nation appears to rest on the same basis as that of the confiscation of other property. Trade between the subjects of two hostile powers is absolutely suspended during hostilities, unless permitted by express sanction; and the importation of articles particularly useful in war is contraband. All such articles, whether supplied by subjects of the enemy, or of another state, are seized and confiscated. See *CONTRAHAND OF WAR*; see also *PRIZE* and *PRISONERS OF WAR*. On the subject of this article, see Grotius, *De Jure Belli et Pacis*, lib. iii. cc. 3 to 7; Kent's *Commentaries*, vol. i. c. 3.

ENERGICO, an Italian term in Music, meaning with energy and force; with strong articulation and accentuation, and a marked powerful delivery of the single notes, without losing in distinctness of execution.

ENERGY. See *FORCE*.

ENFANTIN, BARTHÉLEMY PROSPER, the chief representative of St. Simonism, and as such, usually styled Père Eufantin, was the son of a banker at Paris, where he was born in the year 1796. He became a pupil in the *Ecole Polytechnique* in 1812, but was expelled in 1814, in consequence of his having joined the pupils who left school and fought against the allies on the heights of Montmartre and St. Chaumont. He was afterwards a commercial traveller in Russia, then a banker's clerk, and in 1825 became director of the *Caisse Hypothécaire*. About this time, he became a disciple of St. Simon, whose ideas he developed, after the death of their author, in the *Producteur*. After the July revolution, E. associated himself with M. Bazard for the active propagation of St. Simonism. Bazard preached it in its relations to philosophy and politics; E., mainly in its relations to the social state. Soon, however, a schism broke out between the two on the question of marriage and

the relation of the sexes. Recognizing the 'mobility' of the affections, E. affirmed that they ought to be 'free,' and of course pronounced against the ties of marriage. E.'s views were pushed so far, that government deemed it necessary to interfere on the grounds of public decency. The 'Supreme Father' (as his disciples were wont rather profanely to call him) was, after a trial of two days, sentenced to two years' imprisonment, and to pay a fine of 100 francs. Being released at the expiration of a few months, E. went to Egypt, and, after an absence of two years, returned to France, and became a post-master and farmer in the vicinity of Lyon. In 1841, he came to Paris, and was appointed a member of the Scientific Commission for Algiers, and on his return from Africa, wrote a sensible, interesting book, entitled *Colonization de l'Algérie* (Paris, 1843). After the revolution of 1848, he edited the journal entitled *Le Crédit Public*, a paper retaining much of the old St. Simonian character, but which had to stop in 1850 for want of funds. E. afterwards held an important situation on the Lyon and Mediterranean Railway. His principal works are his *Doctrines de St. Simon*, in conjunction with others (1830); his *Traité d'Economie Politique; La Religion Saint-Simonienne* (1831); *Moral; Le Livre Nouveau* (1832); *Correspondance Philosophique et Religieuse* (1847); *Correspondance Politique* (1849); *La Vie Eternelle, Passé, Présente, Future* (1861). He died May 31, 1864.

ENFEOFFMENT. See FROFFMENT.

ENFIELD RIFLE FACTORY. See SMALL ARMS FACTORIES, ROYAL.

ENFILADE is a military term applied to a fire of musketry or artillery made in the direction of the length of a line of troops or of a line of rampart. A besieging battery so placed as to send its shot along any part of the line of a fortification, and inside the parapet, does great execution in dismounting the guns, which thus present the largest surface to the balls. Hence the lines of rampart should be planned that their prolongations may fall in situations inaccessible to the enemy. Where this is not possible, the lines are either broken, or are protected by Bonnets (q. v.), or by Traverses (q. v.), or Blindages (q. v.). In the siege of a fortress, the trenches of approach are cut in a zigzag, to prevent the defenders entilading them from the walls.

ENFRANCHISE, ENFRANCHISEMENT, to make free; the admission to certain liberties or privileges. Thus, a person made a denizen of the country, or receiving the freedom of a city or borough, is said to be enfranchised.

ENFRANCHISEMENT OF COPYHOLDS. See COPYHOLD.

ENGADI'NE, a famous valley in Switzerland in the canton of Grisons, second only to the Valais in length, extends north-east for about 50 miles along the banks of the Inn, from the foot of Mount Maloja to the village of Martinsbruck. It is divided into two portions—that toward the south-west, called the Upper Engadine, and that toward the north-east, the Lower Engadine. The latter is wild and bleak; pent up within narrow limits among the hills, and having a huge barrier of glaciers between it and Italy, its climate is dismal. Frost and snow occur in July, and winter prevails for nine months of the year. The Upper Engadine is more open, and possesses much fine meadow-land. The Inn, which enters the valley at its south-west or upper extremity, and flows through it, has many towns upon its banks, the highest of which, Silvaplana, is about 6000 feet above sea-level, while the lowest, Martinsbruck, is 3320 feet. The inhabitants devote themselves principally to the rearing of cattle; they also make cheese, and export it largely. More than one-half of the young men emigrate at an early age, and betake themselves to continental capitals, where they often attain comparative wealth, in which case they almost invariably return, build a house in their native valley, and therein spend the remainder of their days. Pop. about 11,000, almost all of the Reformed or Calvinistic Church. The language most generally spoken is the Ladin (a corruption of Latin), a Romanic tongue, but differing from the other Romanic dialects of the Rhaetian Alps, and bearing a resemblance to the Italian.

ENGAGEMENT, MILITARY, considered as a conflict between two armies or hostile forces, cannot be described within limits suitable for this work. Almost every term applicable to armies in the field bears relation, in some way or other, to a hostile engagement, and those terms will be found briefly noticed under their proper headings.

ENGAGEMENT, NAVAL, admits of more precise and terse illustration than a military engagement, because each ship of war is a unit in itself, bounded by a clearly marked watery margin from all the other ships of a fleet.

In the small war-vessels of ancient times, before the invention of gunpowder, a naval engagement usually began by running the galleys violently against each other, to crush or sink the enemy by means of the beak or prow. The prows were, for this purpose, armed with brazen or iron points. On the deck was sometimes a

kind of turret filled with soldiers, the probable precursor of the *forecastle* in modern ships, and there was also frequently a platform for accommodating swordsmen, slingers, and javelinmen. High and bulky ships, of no great length, were best for this kind of warfare. Sometimes a massive piece of iron or lead, called a *dolphin*, was let down violently from the yard-arm, to crush or break through some part of the enemy's vessel. The men fastened sickles to the end of long poles, to cut the enemy's rigging and sails. Other means for carrying on a hostile attack were *battering-rams*—heavy maces with very long handles, stone-throwing machines, and grappling-irons.

In modern ships, preparations for an engagement are made with the utmost coolness and precision. The boatswain and his mates communicate to all the crew the order to 'clear for action.' The men take their hammocks, lower them, tie them up, and carry them to the quarter-deck, poop, fore-castle, and other parts of the ship, where they are stowed between a double netting above the gunwale, and form a partial defence against the enemy's musketry. The sails, yards, booms, bowsprit, &c., are secured by strong chains and extra ropes, to prevent or lessen disaster if they are shot away. The boatswain and the carpenter collect together, and place at hand all kinds of pieces of wood, iron, rope, and canvas that may be useful in quickly repairing shot-holes and other damage. The gunner and his mates examine the cannon and the filled cartridges, and see that all the implements for gunnery are at hand. The master and his subordinate officers look to the trim and state of the sails. The lieutenants visit all the decks, to see that obstructions of every kind are removed. When the engagement is about to begin, the drums beat to arms. Every man repairs to his place. The marines are drawn up in rank and file on the quarter-deck, poop, and fore-castle. The surgeon and his assistants are ready in the cockpit to amputate limbs, extract bullets, and dress wounds. Then begins the battle, which varies in its character according to the number and kind of ships on each side, the nature of the sea, the direction of the wind, and a multitude of other circumstances. In the British navy, the order of battle for a fleet is ordinarily in two lines, each being divided into the Starboard and Port Division or squadron. When the battle is ended, if it has been a severe one, the probabilities are that many men have been killed or wounded, decks and sides battered and splintered, cannon dismounted, rigging, masts, yards, and sails destroyed or torn. The whole ship's crew, except those disabled, then work hard to get the vessel back into trim; an attempt that frequently cannot be realized without aid from other ships, or from the resources of a port.

ENGELHARDT, JOH. GEORG VEIT, a learned German theologian, was born 12th November 1791, at Neustadt on the Aisch, and studied at Erlangen, where, in 1820, he was appointed extraordinary professor, and in 1822 ordinary professor of theology. He died 13th September 1853. Patristic and medieval dogmatics, and Neoplatonism, are the subjects which he has chiefly investigated. In 1820, he published at Erlangen a translation of the first *Ennead* of Plotinus; in 1823 appeared his translation of the writings ascribed to Dionysius the Areopagite. His *Kirchengeschichtlichen Abhandlungen* (Erl. 1832), *Auslegung des speculativen Theils des Evangeliums Johannis durch einen deutschen mystischen Theologen* (Erl. 1839), and his contribution to the history of the mystical theology, entitled *Richard von St. Victor und Johannes Ruysbroek* (Erl. 1838), are works of great value, and have thrown a new light on many important points. Very useful, too, especially on account of the richness of their special notices, are his *Handbuch der Kirchengeschichte* (Erl. 1834), and *Dogmengeschichte* (Neustadt, 1839). E. in the course of his life, wrote many learned dissertations in the *Journal of Historical Theology*, among which may be specified his *Ueber die Hesychiasten*, and *Ueber Erasmus Sacerius*.

ENGHIEN, LOUIS ANTOINE HENRI DE BOURBON, DUC D', only son of Prince Henri Louis Joseph, Duc de Bourbon, was born at Chantilly, 2d August 1772. In 1789, he quitted France, and traveled through several countries of Europe. In 1792, he entered the corps of *émigrés* assembled by his grandfather, the Prince of Condé, on the Rhine, and commanded the vanguard from 1796 until 1799. At the peace of Lunéville, in the year 1801, he went to reside at Ettenheim, an old château on the German side of the Rhine, not far from Strasburg, and within the territories of the Duke of Baden. Here he married the Princess Charlotte of Rohan Rochefort, and lived as a private citizen. When the conspiracy of the Bourbon princes, headed by Cadoudal, Pichegru, &c., against the life and authority of Bonaparte, was discovered at Paris, the latter chose to believe that the Duc d'E. was privy to it, although there was not a tittle of evidence to prove this. Perhaps Bonaparte was afraid that the valor and humanity of the last descendant of the great Condé might one day prove dangerous to his power. Be that as it may, he unscrupulously resolved to seize the person of the duke. On the night of the 17th March 1804, the neutral territory of Baden was violated, and the château of Ettenheim surrounded with a body of

soldiers and gendarmes. The duke, at first, endeavored to defend himself; but the force was too great to be opposed, and he, with several friends and domestics was captured, and carried prisoner to Strasburg, and immediately after to Vincennes.

On the 20th of March, he was tried before a court-martial, consisting of eight officers, and after an examination of five hours, was condemned to death. Half an hour later, the sentence was put into execution. So cruel and audaciously criminal an act has fixed a deep stigma on the character of Bonaparte. M. Dupin has published the records of the trial, and shown the illegality of the proceedings of the military commission. This illegality was publicly acknowledged by General Hullin, the president of the court. After the Restoration, the bones of the judicially murdered duke were taken up, and interred in the chapel of the castle at Vincennes.

ENGINEER AND ENGINEERING. Engineering, the business of the engineer, is the art of designing and superintending the execution of works of a constructive character, such as roads, railways, bridges, canals, harbors, docks, works for supplying water to towns, drainage and sewerage works, mining machinery, and the working of metals.

It may be divided into two kinds—civil and military. The military engineer is an officer in the service of government, whose duties are principally to construct fortifications, to make surveys for warlike purposes, to facilitate the passage of an army by the construction of roads and bridges; in short, to execute all engineering works of a military nature; but he is also, especially in this country, called upon to undertake many works which more properly belong to the business of the civil engineer, such as the survey of the country—called the Ordnance Survey—the inspection of public works, and, in short, all the duties of a government engineer.

The civil engineering profession is subdivided into several sections, according to the special nature of the employment of its members. The railway engineer projects and superintends the execution of railways and all the works in connection with them, such as the alteration of roads and streams, the construction of viaducts, bridges, cuttings, and embankments. The hydraulic engineer constructs the works connected with the supply of water to towns, the filtering of water, its collection in reservoirs, and its distribution through a town or district; the irrigation and drainage of tracts of country; the protection of low lands from inundation, and the use of water as a motive-power. The dock and harbor engineer has the management of all works connected with the sea or navigable waters, such as the construction of piers, breakwaters, docks, harbors, and light-houses. The mechanical engineer is principally concerned in the manufacture of machinery, the working of metals, the construction of ships, steamers, canon, and all the various structures in which the metals bear a prominent part. Then there is the mining engineer, who discovers minerals and manages mines; there are engineers who are specially engaged in the drainage of towns, and many other less prominent divisions of the profession.

In all engineering works, the *contractor* takes a very important part; he executes the works from the designs, and under the direction and superintendence of the engineer, and on his ability and good management the success of undertakings very materially depends.

The engineering works of antiquity are both numerous and prominent, many of them remaining while all other traces of their constructors have been swept away. The most notable of the works belonging to very remote antiquity are the harbors of the Phœnicians, the palaces and sewerage of Nimroud, and the pyramids of Egypt; next in order come the harbors of ancient Greece, the bridge of boats across the Dardanelles made by Xerxes, to transport his immense army into Europe, and his canal across the isthmus of the peninsula of Mount Athos. The buildings of ancient Rome next claim attention—its theaters, temples, baths, and aqueducts, some of which carried water from distances of more than fifty miles into Rome; its roads, bridges, and drainage-works vie in extent and magnificence with the most celebrated works of modern times.

From that period down to the commencement of the 18th c., the most extensive works executed are the canals, embankments, and other hydraulic constructions used by the Dutch for the purposes of inland navigation, and to protect their low lands from the sea; the canals of North Italy, the cathedrals and fortifications of medieval Europe.

Civil engineering, as a distinct *profession*, may be said to have originated, in England, about the middle of the last century; since that time, the improvements in the steam-engine by James Watt, its subsequent application to the railway system by George Stephenson, and its use in navigation, have given a great impulse to commerce and civilization; which, in their turn, have created the necessity for the numerous and magnificent engineering works of modern times; such as the innumerable railways, roads, and canals that intersect this and foreign countries; the bridges, water-

works, docks, harbors, and vessels that facilitate our commerce and increase our comfort and prosperity. Among the most remarkable of these works may be mentioned the tubular bridges of the St. Lawrence and Menai Strait, the Niagara railway suspension bridge, and the electric telegraph system, which covers this country and the seas and countries of Europe, and connects us with the continents of America, Australia, and India. Among the more celebrated British engineers are the Stephensons, the Rennies, the Brunels, Telford, Smeaton, and Locke.

The education of those who would rise to eminence in the profession, must embrace a fair knowledge of pure mathematics and of the mixed sciences of natural philosophy, such as mechanics, hydrostatics, hydraulics, and optics. They should acquire a knowledge of the principles of projections, and should aim at being good draughtsmen and rapid and accurate arithmeticians.

Engineering is represented in this country by several institutions and societies, the principal of which is the London Institution of Civil Engineers, established in 1818, 'for facilitating the acquirement of professional knowledge, and for promoting mechanical philosophy'; there are also many schools and colleges throughout the kingdom in which engineering is made a special study.

In conclusion, it may be said that every day opens fresh fields to engineering science and labor; and that as the first beginnings of the art are lost in the obscurity of remote antiquity, so we see no termination to its usefulness and necessity.

The more important operations involved in engineering are treated of under such heads as BRIDGES, CANALS, AQUEDUCTS, EMBANKMENT, TUBULAR BRIDGE, ROADS AND ROAD-MAKING, RAILWAYS, RIVER, SUSPENSION BRIDGES, &c.

ENGINEERS, THE ROYAL CORPS OF, forms one component portion of the army of the British empire. A similar corps exists in all regular armies. It is the scientific and constructive branch, intrusted with the making and defending of all military *works*, and the attack and conquest of similar works belonging to an enemy. It is true that civilians are often employed to construct the buildings themselves, as a stated price; but the military engineers make the plans, and are responsible to the country for their efficiency. At the present time, for instance, and for a number of years past, contractors are at work on fortifications at Portsmouth and in other parts of the kingdom, but on plans and under orders for which the engineer department of the government is responsible.

The Royal Engineers of the United Kingdom form one regiment or corps. The officers, in time of peace, are scattered all over the world. There is no half-pay, except on *permanent* retirement; and no unemployed list. They have much wear and tear of body and mind, and are considered entitled to a competent retiring allowance at an earlier age than other officers. Their regular pay corresponds to the active pay of other officers of the same rank; but they exclusively receive in addition *extra* pay, amounting to one-half their ordinary pay when on duty at home, and equaling their ordinary pay when employed abroad or in the London district. There is an establishment of Engineers in each military command, to conduct and superintend all the military buildings and works. The entire force is under a particular department of the War-office, that of the inspector-general of Fortifications. Until the year 1765, the duties of military engineers were discharged by officers taken from the regular army. In that year, however, the corps of Engineers was formed, greatly to the advantage of the military service. In 1783, it was made a *royal* corps, and a distinctive uniform adopted. Several companies of artificers were, in 1812, converted into Sappers and Miners, and placed under the Engineers.

The non-commissioned officers and privates of this valuable corps are all workmen who have learned some mechanical trade; hence their skill in all constructive operations. The Ordnance Survey has been intrusted to the corps. For many purposes, the men are *lent*, to attend to special and peculiar work; and at such times their emolument is always increased. They often buy their discharge, in order to go into civil employments, when the prospects are good. The men enlist for twelve years, with power to re-engage (if wanted) for nine more; but they can purchase their discharge at any time. They have to pay more for their discharge than other corps in the army, having received more instruction at the national expense. Officers intended for the Engineers enter the Royal Military Academy as cadets by open competition, and pass out from time to time for commissions.

When in the corps, promotion is by seniority, the purchase system having never been introduced. The Army Estimates for 1883—1884 provided for the following number of officers and men in the corps of Royal Engineers:

Officers	424
Non-commissioned officers	788
Rank and file	4012
	5224
Horses	242

The sum set down for their pay for the year was £205,800, which, however, does not include any commissariat charges. The headquarters are at Chatham, where there are Engineer barracks. The corps is grouped into battalions and companies. In addition to the numbers shown above, there are 439 officers of Royal Engineers serving in India, their subordinates being natives.

ENGINEERS, in the Royal Navy, are the persons who attend to the machinery on board the war-steamer. When such steamers were at first adopted, men were obtained from private engineering establishments, or from merchant-steamers. In 1847 and 1848, many changes were made, to induce skilful and steady men to enter the service, and to maintain better discipline. The higher grades of them were raised from the rank of *warrant* officers to that of *commissioned* officers of a civil branch. There are now the grades of chief inspector of machinery afloat, chief-engineer, engineer, and assistant-engineer, the last rank being subdivided into two classes. All these are commissioned officers, and are strictly examined before admission; their rank and promotion being by selection, and dependent on skill, character, and length of service. A chief-engineer is expected to be able to make notes in the log of every particular concerning the engines and boilers; to draw rough sketches of the machinery, with figured dimensions fit to work from; to understand and manage everything relating to engines, boilers, and furnaces; to understand practical mechanism generally, and the principles of theoretical mechanism. The engineer and assistant-engineer are expected to possess, in a smaller degree, the same kinds of knowledge and skill. The pay varies from £511 for a chief inspector of machinery, down to £64 for a second-class assistant-engineer on harbor service.

The Navy Estimates for 1883—1884 provided for 197 chief-engineers, and 463 engineers and assistant-engineers.

ENGLAND, the southern and larger section of the island of Great Britain, and the most important member of the United Kingdom of Great Britain and Ireland. The geography of E. will be found under the head of GREAT BRITAIN, the present article being confined to a sketch of its history previous to the union with Scotland.

Of the inhabitants of E. before the Christian era, little is known. In some of the ancient geographers, there are a few scattered notices of a rude population, with whom a limited commerce in tin was carried on by the Phœnician merchants; and our information scarcely extends further. What is known of E. under the Roman occupation has already been embodied in the article BRITANNIA. An account of the country during the period intervening between the withdrawal of the Romans and the Norman Conquest will be found in the article ANGLO-SAXONS.

When William of Normandy landed in E. to claim the crown which Edward the Confessor had bequeathed to him, he found that the people had raised to the throne Harold, the son of a popular nobleman. The resources of the Saxons, however, had been wasted in domestic conflicts before the attack of William; and the battle of Hastings (1066 A.D.) gave E. with comparative ease to the Normans. The next twenty years saw the conquest completed, and nearly all the large landed estates of the Saxons pass, on every pretext except the true one, into the hands of the Normans. William claimed, indeed, to rule as sovereign by hereditary right, but this made little difference to the fact of conquest. All the high offices in the state and in the church passed into the hands of a new race. The Danes alone could retain either property or dignity. For long, some of the Saxons maintained an unequal resistance, retiring to the forests as the outlaws whose adventures furnished the materials for those favorite popular legends, where, as in Robin Hood, the spoiling of the richer classes is depicted as one of the chief virtues. In the course of time, the Normans were absorbed among the Saxons, their very language disappearing, though leaving many traces. From this union arose the English people and the English language as they now exist.

The union of the Normans with the Saxons was not fully effected so long as the Normans retained their foreign possessions. In King John's reign, the whole of these were lost, excepting Guienne and Poitou. Long wars under Henry III. and Edward I., and his famous son, the Black Prince, were continued, in the endeavor to regain the lost possessions; yet great victories like those of Cressy (1346 A.D.) and Poitiers (1356 A.D.) seemed to leave no result, for no sooner were the English armies withdrawn, than the populations returned to their French allegiance. After Agincourt (1415 A.D.), Henry V., when he had forced himself to be acknowledged heir to the French throne, was virtually king of France, and held his court in Paris; yet, in a few years more, the rebellion of Joan of Arc came at a time when E. was weakened with the Wars of the Roses, and (1451 A.D.) nothing of foreign ground was left to this country excepting Calais.

To their efforts to conquer France, the Norman kings added others. Henry II. conquered Ireland (1171 A.D.), Edward I. conquered Wales (1285 A.D.), and had almost added Scotland to his

dominions. The bravery of Wallace and Bruce defeated the armies of Edward II., his successor; and though the idea of the conquest of Scotland was always a favorite one, an opportunity for attempting it on a great scale never again presented itself.

The great struggles of the successors of William were with the ecclesiastics and with the barons. Sometimes in these the popular sympathies were with, and sometimes against the crown. The conqueror himself and his immediate successors had no difficulty in maintaining the superiority of the courts of justice over the ecclesiastics; but even a sovereign so bold and skilful as Henry II. was forced, after the outcry occasioned by the murder of Thomas à Becket (1170 A.D.), to yield the point. The right to nominate the higher ecclesiastics was also secured by the popes. The degradation of the English monarchy was at its lowest when King John consented (1213 A.D.) to hold the crown as a gift from Rome. The weaknesses of this monarch had good as well as evil results, for from him the barons won their Great Charter (1215 A.D.). From Henry II. something similar had already been gained; but it was the Magna Charta of John which firmly established two English principles—that no man should suffer arbitrary imprisonment, and that no tax should be imposed without the consent of the council of the nation. Under Edward I., the famous statute that no manner of tax should be imposed without the common consent of the bishops, barons, and burgesses of the realm, was passed (1296 A.D.); and before the time of Henry VII., the foundations of parliamentary government had been laid.

The union of the houses of York and Lancaster under Henry VII. begins a new period in English history. Part of his reign was disturbed by Perkin Warbeck and other pretenders to the throne, in support of whose claims the turbulent nobles found vent for their restlessness. But the greater part of his long reign was distinguished from preceding reigns as a time of peace and economy. During it, men's minds ripened for the great events of the next reign. Henry VIII. succeeded, under the most favorable auspices. He found the alliance of his now important country courted by both of his great contemporaries, Francis I. and Charles V. But the interest of the foreign complications of the reign merges in the struggle between the courts of E. and of Rome. The origin of the contest was the divorce which Henry desired to have from Catharine of Aragon, his brother's widow, to whom he had been married by papal license. Cranmer and the English Church pronounced the marriage to be null, but a formal decree of divorce by the head of the church was then thought necessary in Catholic Europe. Pope Clement and the consistory, influenced by Spanish counsels, delayed, by every possible means, the decision of the question. E., however, was ready enough to support Henry. Wickliffe and his adherents had done not a little to shake the attachment of the nation to a foreign spiritual authority, by preaching doctrines which dispensed with the necessity for it. A parliament met, when the Commons took the significant step of presenting a long memorial of complaints against the church. The pope, still showing no signs of yielding, bills followed, declaring the king the head of the church; rendering the inferior clergy amenable to the civil courts; abolishing the payment of the first year's fruits of ecclesiastical livings to Rome; and perhaps a more important thing than any of these, declaring that no convocation should meet unless the king should summon it, and that no ecclesiastical canons should have force except with the king's consent. To these measures the pope replied by refusing the divorce, and excommunicating the king (1533 A.D.). The breach thus became irreparable.

A new act was passed giving to the magistrates the power of judging in questions of heresy. The next step was the suppression of nearly 400 of the smaller monasteries. The subsidence of an insignificant popular reaction, incited by the lower clergy, was followed by the suppression of the great abbeys. All these changes, however, touched only matters of church government. On matters of faith, Henry and his parliaments were as orthodox as the most conservative could wish. They embodied the leading doctrines of Romanism, disputed by the Protestants, in an act of Parliament, known among the people as 'the bloody six articles,' and enforced conformity under severe penalties.

Henry was succeeded by Edward VI. His reign was marked by the general progress which the Reformation now made from questions of government to questions of doctrine. More thoroughly than ever the power of the clergy was sapped. The Book of Common Prayer (1548 A.D.) deprived them of the mysterious authority which the use of a foreign language in worship gave them in the eyes of the people, and the 42 Articles of the Church of England (1552 A.D.), the foundation of the present 39, denied, among other things, their power to work miracles in the elevation of the mass.

The next reign saw the inevitable reaction. The superstitious of the populace had been too rudely handled, and—as often happens before a crisis—there came a period of physical suffering. The conversion of cornfields into sheep-walks, induced by the high value of wool as an article of export, had thrown many out

of employment; and the country was, moreover, infested with the crowd of vagrants whom the monasteries had been wont to maintain. The popular dissatisfaction coupled these things with the Reformation. Thus the opportunity was prepared for the atrocities of the reign of Mary. The queen herself was interested, by her mother's honor and her own, to uphold the Romanist faith; and her gloomy temper, aggravated by her unhappy childless marriage, believed that it did true service to God when it gave the rein to the bigotry of Pole and Bonner. In her first parliament (1553 A.D.), the whole legislation of Edward VI. was repealed, leaving the Church of England one in ceremonial and doctrine with the Church of Rome. Another parliament (1555 A.D.) repealed the legislation of Henry VIII., thus re-establishing the papal supremacy. Everything that the reformers had done was thus undone. Still the adherents of the Reformation were numerous, and when legislation failed to convert them, the fires of Smithfield were tried. Hooper, Bishop of Gloucester, was one of the first to suffer. Latimer, Ridley, Crammer, followed, and the number who perished is not less than 300 by fire, and 100 by torture and the cruelties of confinement. Nothing more was wanted to turn the popular mind at once and for ever from the Church of Rome.

The accession of the Protestant princess Elizabeth came as a relief to the whole nation. The Romanists themselves were weary of the policy which made E. the tool of Spain, and were sickened with the cruelties which had been enacted. Elizabeth began by releasing from prison all confined on charges of heresy. Parliament followed (1559 A.D.) with acts restoring the royal supremacy over the church, and returning in general to the legislation of Edward VI. The Prayer-book and the Thirty-nine Articles were adjusted as they still exist. Fortunately for the country, the ministry of Elizabeth, guided by the able hand of Cecil, was one of peace. No opportunity was lost of aiding the Protestant cause throughout Europe; but Elizabeth had almost no open wars, and her long reign was disturbed by almost no domestic collisions. The mistake committed in detaining the queen of Scotland in an English prison, gave a constant incitement to disaffection among the adherents of the old faith, but no serious consequences ensued. Towards the close of the reign, Protestant and Catholic were alike patriotic in repelling the Armada (1588 A.D.). On the death of Elizabeth, the crowns of E. and Scotland were united.

The reign of James VI. does not present much that is remarkable. The plot, for which Sir Walter Raleigh suffered long afterwards, and the Gunpowder Plot—the insignificant proportions of which were so magnified for factious purposes—disturbed the earlier years; and the close of the reign found the nation engaged in an unfortunate war to assist the king's son-in-law, Frederick, Elector of Bohemia, against the Emperor Ferdinand II. of Germany. But for the greater portion of the 23 years of the reign, there was neither foreign nor domestic war. These years the king occupied industriously in rendering monarchy odious and contemptible. He lavished money on unworthy favorites, and to supply his extravagance, openly sold the dignities of the peerage and the other honors of the state. His personal demeanor was vain, weak, and ridiculous; but in contrast with the insignificance of his talents was his extravagant conception of the extent of his royal prerogative. His conduct occasioned great discontent in parliament, and but for his timidity, might have led to more serious consequences.

The misfortunes of Charles I. were the legitimate result of the principles of his father. Charles committed the mistake of repeating, in the 17th c., acts which the Plantagenet sovereigns had done with impunity in the 14th and 15th. One of his first acts was to exact a benevolence to carry on the war. Had he been successful, this might have been overlooked, but when the bad management of the Duke of Buckingham lost the fleet off Rochelle, the indignation of the Commons was without bounds. In place of taking measures to allay this feeling, the king dissolved the parliament, and resolved to govern without calling another. In 1630, he concluded peace, and for the next seven years, in council with Strafford and Laud, he carried on the government. Taxes were raised as before without parliamentary authority; and when the taxes failed, money was raised by selling to the Roman Catholics immunities from the penal laws against their worship.

Nevertheless, there were limits to these methods of raising money; and in 1637, when the king found himself involved in a war with Scotland, in consequence of his endeavor to introduce a liturgy there, he was compelled to call a parliament. The Commons refused supplies, and were again dissolved. In 1640, the king once more summoned a parliament. He found the temper of the House more indomitable than ever. In place of voting him supplies, they impeached his minister Strafford, and condemned him to death. The Commons then presented a grand remonstrance to the king, embodying all the grievances the nation had suffered since the death of Elizabeth. Matters proceeded from bad to worse, till an open rupture came, and an appeal was

made to arms. In August 1642, the king erected his standard at Nottingham, while the rebels took arms under the Earl of Essex. The first conflict was at Edgehill, where the loss on both sides, was severe and nearly equal. The fortune of war continued to vary, till at Marston Moor it turned against Charles, and at Naseby, in June 1645, he was finally defeated. He was executed on 30th January 1649.

The government for the next four years was conducted by parliament. Meanwhile, Cromwell was rising into distinction, and power gradually fell from the hands of parliament into those of the military. In 1653, Cromwell had himself proclaimed 'Protector.' He was now absolute monarch. He governed with a firm hand, and never was E. more respected abroad than during his time. In 1654, he concluded peace with Holland, and employed the gallant Admiral Blake in an expedition against the Spaniards, which ended brilliantly for the English navy. But the nation grew as discontented with the government of Cromwell as it had been with that of Charles. After the death of the Protector in 1658, and a short interval during which his son Richard held the office, parliament received with acclamations a proposal from Charles II. to return. In May 1660, the populace clamored with delight on the royal entry to London of him who, a few years before, had fled from Worcester for his life.

While Clarendon was minister, the government of Charles II. was well conducted. A war with Holland was brought to a successful ending in the conquest of New York. On Clarendon's resignation, the government passed into the hands of the ministry known as the Cabal. They were as profligate and as careless as the king himself. A succession of cruelties against the Catholics, for which the pretended revelations of Titus Oates and his imitators furnished the excuse, betokened rather the wanton temper of the sovereign and the nation, than any zeal for the Protestant religion. The only act which reflects much credit on any portion of the reign was the passing, in 1679, of the *Habeas Corpus* Act, designed more effectually to protect the liberty of the person. Strong efforts were made in parliament after that to pass the Exclusion Bill, the object of which was to exclude the Duke of York, as a Roman Catholic, from the succession. To the great satisfaction of the king, parliament rejected the bill. In 1681, parliament was dissolved, and Charles II. never called another.

After this there was a change for the worse in the character of the government; from being wantonly indifferent, it became sullenly mischievous. Presbyterians and Nonconformists were excluded from all offices. Among other arbitrary acts, may be mentioned the recall of their charters from London and many of the other principal cities, which were only restored, with diminished privileges, on payment of heavy fines. Conduct such as this made men more than ever afraid of the succession of the king's brother. A conspiracy to secure the succession to the Duke of Monmouth, an illegitimate son of the king, was formed: Lord Howard betrayed the conspiracy, and among others who suffered death for it were Lord Russell and Algernon Sidney.

When the king died, in 1685, James II. succeeded amid universal dissatisfaction. Monmouth's attempt to seize the throne, however, was mismanaged, and failed. The punishment of those who had aided his rising formed an occasion for the perpetration of great cruelties by Jeffreys, then chief justice of England. In the meantime, nothing could be fairer than the king's language. He issued a declaration in favor of general toleration, and announced that the penal laws against Catholics were no longer to be enforced. A second declaration to the same effect was issued, but he went further and added to it an order that the clergy should read it in all churches. The Archbishop of Canterbury and six bishops presented an address to the throne, humbly setting forth that their duty to maintain the Protestant establishment would not permit them to give obedience to the royal mandate. For this they were indicted as guilty of sedition. The trial of the bishops (1688 A.D.) was the turning-point of James's career. It created immense excitement, and when the jury returned a verdict of not guilty, even the soldiers joined in the tumultuous rejoicings.

William, Prince of Orange, who had married Mary, the eldest daughter of the king, had long been intriguing with the malcontents. He now landed in E. with a small body of troops. The soldiers, the leading nobles, even the king's own children, joining the prince, the king fled to France. Parliament then settled the crown jointly on William and Mary for life. James, with the assistance of Louis XIV., made one effort to regain his throne. He landed in Ireland, where the lord lieutenant, Tyrconnel, was devoted to his cause, and managed to raise an army. William defeated him at the battle of the Boyne; and the contest was soon after this terminated by the second flight of James to France. So easily was the great revolution of 1688 effected.

The domestic government of William was marked by his efforts to introduce a general toleration; but of his foreign administration, which led the country into costly wars, it is hardly possible to speak in very favorable terms. To reduce the threatening power of France, E., in alliance with Holland and Germany, em-

barked in a protracted contest. Its termination at the peace of Ryswick, in 1697, brought to E. nothing beyond an increase of reputation. William died in 1702.

Under Queen Anne, the war with France was renewed, and the Duke of Marlborough's splendid victories of Oudenarde, Blenheim, and Ramillies were achieved. With these the history of E. as a separate state closes. In 1707, the long-wished-for union with Scotland was accomplished; and after that, Great Britain, united under one legislature, as well as under one crown, has a common interest among nations, and therefore a common history.

A table of the English sovereigns is appended, beginning with Alfred, and continued, for convenience' sake, to the present time :

	Began to Reign.	Years of Reign.
ANGLO-SAXON LINE.		
Alfred, king of Wessex.....	871	30
Edward I., king of Wessex, Mercia, &c.	901	24
Athelstan, king of England.....	925	15
Edmund I.....	940	6
Edred.....	946	9
Edwy.....	955	4
Edgar.....	959	16
Edward II.....	975	3
Ethelred.....	978	38
Edmund II.....	1016	1
DANISH LINE.		
Canute.....	1017	19
Harold I.....	1036	3
Hardicanute.....	1039	2
SAXON LINE.		
Edward III.....	1041	25
Harold II.....	1066	
NORMAN LINE.		
William I.....	1066	21
William II.....	1087	13
Henry I.....	1100	35
HOUSE OF BLOIS.		
Stephen.....	1135	19
PLANTAGENET LINE.		
Henry II.....	1154	35
Richard I.....	1189	10
John.....	1199	17
Henry III.....	1216	56
Edward I.....	1272	35
Edward II.....	1307	20
Edward III.....	1327	50
Richard II.....	1377	22
HOUSE OF LANCASTER.		
Henry IV.....	1399	14
Henry V.....	1413	9
Henry VI.....	1422	39
HOUSE OF YORK.		
Edward IV.....	1461	22
Edward V.....	1483	
Richard III.....	1483	2
HOUSE OF TUDOR.		
Henry VII.....	1485	24
Henry VIII.....	1509	38
Edward VI.....	1547	6
Mary.....	1553	5
Elizabeth.....	1558	45
STUART LINE.		
James I.....	1603	22
Charles I.....	1625	24
Commonwealth.....	1649	10
STUART LINE.		
Charles II.....	1660	25
James II.....	1685	3
HOUSE OF ORANGE.		
William and Mary.....	1688	14
STUART LINE.		
Anne.....	1702	12

BRUNSWICK LINE.

	Began to Reign.	Years of Reign.
George I.....	1714	13
George II.....	1727	33
George III.....	1760	40
George IV.....	1820	10
William IV.....	1830	7
Victoria.....	1837	

ENGLAND, NEW. See NEW ENGLAND.

ENGLAND, CHURCH OF. A brief sketch of the origin and early history, as well as an outline of the doctrines and form of government of this church, will be found under the head **ANGLO-CATHOLIC CHURCH.** See also the articles **AUGUSTINE** and **DUNSTAN.** Up to the time of the Reformation, ecclesiastical affairs would be more properly described as the history of the Church in England; from that period the Church of England dates her existence. She, however, retains so much of antiquity, and her institutions, laws, and formularies are so interwoven with the history of the past, that it would be impossible to have any correct or connected view of them, and of her connection with the state, her characteristic feature, without at least glancing rapidly over the leading events between the Conquest and the reign of Henry VIII. During the three centuries from the Norman Conquest (1066) to the preaching of Wickliffe (1356), her history can be regarded only as a continual struggle between the ecclesiastical and civil power, and there would be little else to describe than the methods by which the mitre triumphed over the crown, and the crown invaded the rights and property of the church. In the time of William I., nearly half the country was in the hands of spiritual persons. He ejected the English clergy, and supplanted them with Normans; and although he was possessed of full power over the church, yet in his reign were sown the seeds of future papal encroachments. Papal legates were then first introduced into England, and the ecclesiastical courts separated from the civil. From this time, the increased influence of Rome may be traced to the defective titles, the usurpations, and the violent conduct of the kings. Thus, the defective title of Henry I. made him seek popularity by recalling the pious Anselm, who had incurred the displeasure of his brother William, and had fled the country. Anselm was devoted to the pope, who had espoused his quarrel, and refused to do homage to the king for the temporalities of his see, till at length Henry found himself obliged to surrender the right of *Investiture.* Thus, too, Stephen's usurpation opened the way for further encroachments; and Henry II., who found the power of Rome greatly augmented, helped to extend it further, by accepting a grant of Ireland from the pope. Then followed the opposition of Thomas à Becket, which arose out of the question of the punishment of ecclesiastics by the civil power. For the moment, it seemed that the quarrel was healed by the *Constitutions* agreed on at Clarendon (q. v.), but it broke out more violently than ever. The pope discharged Becket from his oath, and condemned the *Constitutions.* Becket had fled from the kingdom; and his subsequent return, murder, and canonization, all tended to strengthen the authority of the church. It was not, however, till the reign of John, when England was laid under an interdict, and the king resigned his crown to the pope, that the papal encroachments rose to their height; and the weak reign of Henry III., which followed, did nothing to abate them. Edward I. gave a check to the power of the clergy, subjected them to taxation, and passed the statute of Mortmain (1279), which prohibited the transfer of land without the king's consent.

There is little to be said as to innovations in doctrine during these three centuries; but it may be noted, that about the middle of this period, viz., 1213, the council of St. John Lateran declared transubstantiation, or the bodily presence of Christ in the consecrated elements, to be a tenet of the church.

It was in 1356 that a new period commenced. Wickliffe then published his first work, entitled *The Last Age of the Church*, directed against the covetousness of the Church of Rome. His doctrines correspond in many points with those now taught by the Church of England, but he differed from her in regard to the necessity of Episcopacy, which he rejected; he also believed in purgatory, and enjoined prayers for the dead. His chief objects of attack were the papal indulgences, and the doctrine of transubstantiation. It has been observed concerning the condemnation at Oxford of Wickliffe's opinions with respect to the latter, that 'this was the first plenary determination of the Church of England in the case, so that this doctrine, which brought so many to the stake, had but with us 140 years' prescription before the times of Martin Luther.' In a limited sense, he upheld the efficacy of the seven sacraments. Wickliffe had a large body of followers. They were called *Lollards*, probably from a German word, *lullen*, to sing with a low voice. The storm of persecution which he escaped by death, fell upon them. Henry IV. thought it necessary

to fortify his usurped position by assisting the bishops against the Lollards; and from this time to the Reformation, there was an uninterrupted succession of confessors and martyrs. Sir John Oldcastle, Lord Cobham, was the most illustrious of these sufferers. Fox gives a detailed account of nearly twenty individuals burned for heresy between the death of Lord Cobham and 1509, when Henry VIII. ascended the throne. To some extent, the blood of these martyrs was the seed of the Reformed Church; but we must not overlook the 'hidden seed' which was growing secretly, from the time that Wicliffe gave to his countrymen a translation of the Scriptures in their own tongue. The progress of learning, and especially the study of Greek, led to a better understanding of the sacred books, whilst the invention of printing (1442) caused a wider circulation of them.

The above causes, however, would probably have proved insufficient to produce the great change which was now impending, had not Henry VIII.'s divorce from Catharine of Spain led to a quarrel between him and the pope, which ended in the total abolition of the papal authority within the kingdom. Then began the REFORMATION in earnest. For the details of that great event, consult the article under that head, and the lives of such men as Wolsey, Sir Thomas More, Fisher, Clement, Luther, Cromwell, Cranmer, Latimer, and Ridley, &c. From this period may be dated the existence of the Church of England as a separate body, and her final separation from Rome. For the opinions of the church in Henry's reign, two important books which were then published should be consulted—viz., the *Bishop's Book*, or the *Godly and Pious Institution of a Christian Man*, and the *King's Book*, which was a republication of the same in a more perfect form in 1543, and called *The Necessary Erudition for any Christian Man*, and was called the *King's Book* because put forth by royal authority.

A book of *Articles devised by the Kinges Highnes Majestie to stablyshe Christen Unitie*, should also be consulted. It has been stated in the article ANGLICAN CHURCH, that the reformation in doctrine did not make much progress in Henry's reign; from these books it will be seen that it was rather retrograde. The monks, too, who were dispossessed at the dissolution of the monasteries, were dispersed amongst local cures, and kept alive the old opinions, and the lower orders were not as yet favorable to the new doctrines. Cranmer was the leader and presiding genius of the Reformed opinions; and the youth of Edward VI. left the king pliant in the hands of the archbishop. The Book of Homilies, put forth in 1540, the New Communion Service and Catechism in 1548, the first Book of Common Prayer in 1549, and the Forty-two Articles in 1553, all bear the impress of his hand, and it was these which advanced and fixed the doctrines of the Reformation. Nor was the temporal authority idle on the same side—Bonner and Gardiner were committed to prison, and both were deprived of their bishoprics. In fact, the way in which all the institutions of the Church of England were established in Edward VI.'s reign by the help of the civil magistrate, have brought upon her the charge of Erastianism. The civil power had just delivered her from a foreign tyranny; and when the weak health of the young king, the known sentiments of his successor, Mary, the ignorance of the common people, and the interested views of the old clergy, are considered, it cannot be a matter of surprise, still less of blame, that the same arm was relied upon for the establishment of the new forms of religion.

Although Mary promised at her accession that she would put constraint on no person's religion, her promise was not kept. Bonner and Gardiner were restored; the Book of Common Prayer and Catechism were declared heretical; the kingdom was reconciled to the see of Rome; a persecution of the chief reformers commenced—Rogers was burned at Smithfield, Hooper at Gloucester, Saunders at Coventry, Taylor at Hadley. The prisons were filled with 'heretics'; many fled beyond sea; some purchased safety by an outward conformity. Cranmer, Latimer, and Ridley perished in the flames at Oxford. Cardinal Pole was made primate. One benefit was conferred on the church by Mary—he surrendered all the church lands, as well as the first fruits and tenths, which had been seized by Henry. At last the death of Mary, with which that of the cardinal was all but simultaneous, delivered the church from its oppressors. The passing of the *Act of Uniformity* in the first year of Elizabeth's reign, restored the Common Prayer-book to general use, and enjoined the same dresses as were in use at the time of the first Prayer-book of Edward VI.

All the bishops except one, Kitchin of Llandaff, refused to take the oath of uniformity, and were ejected from their sees to the number of 14 (the eleven remaining sees were vacant by deaths), and 175 other beneficed clergy were deprived for the same cause—no very considerable number, when it is remembered that there were then 9400 benefices in England. There was some difficulty in filling up the vacant bishoprics and perhaps some slight informalities. Matthew Parker was made Archbishop of Canterbury. For the refutation of the fable of the NAG'S-HEAD CONSECRATION, see the article under that head.

In 1562, the Thirty-nine Articles were finally reviewed and subscribed. These, with the Book of Common Prayer, are the tests of orthodoxy in the Church of England.

But what was done to satisfy the scruples of the Protestant nonconformists? An attempt in this direction was made in the reign of James I. at the HAMPTON COURT CONFERENCE (q. v.). The result was another review of the Common Prayer-book; and this, with the new translation of the Bible, and the passing of the canons in 1604, were the principal ecclesiastical events of James's reign. These canons received the sanction of the crown, but not that of parliament; they are not, therefore, binding on the laity, but they are still binding on the clergy to some extent, and they regulate the practice of the ecclesiastical courts, and are the only rule, on some points, to which the bishops and clergy can appeal. See the articles, LAUD, and SCOTLAND, CHURCH OF, for the events of Charles I.'s reign. The great rebellion overthrew both church and state. The bishops were declared 'delinquents,' robbed of their property, and abolished; and the clergy were ejected from their benefices. Land was put to death in 1645. The Church of England had no corporate existence during this interval. With the restoration of the monarchy, 1660, came the restoration of the church. The reaction from Puritanism to Prelacy was complete. Attempts were made, but with small success, to win over the Puritan leaders; bishoprics were offered to Baxter, Calamy, and Reynolds; but the last only accepted. The SAVOY CONFERENCE (q. v.) was an unsuccessful, perhaps insincere attempt to comprehend the nonconformists in the Established Church. But the demands of the Presbyterians were most immoderate. Baxter went so far as to propose the substitution of an entirely new book of his own composition, in place of the Common Prayer-book. After the failure of the Savoy Conference, this was once more revived; and a new Act of Uniformity in 1662 made its use, as it now stands, compulsory in all the churches.

The Church of England passed through one more critical period before reaching that tranquillity in which, for upwards of a century, she slumbered too securely. In 1687, James II. published the famous Declaration of Indulgence, which filled up the measure of popular discontent, and finally cost him his crown. Although by this declaration, which was perfectly illegal, liberty of conscience was permitted to all his subjects, it was clearly understood that the liberty was intended only for the papists.

The nonconformists refused to accept the treacherous boon. Eighteen bishops out of twenty-five refused to publish the declaration, as ordered, in their dioceses. Seven of them—Sancroft, Lloyd, Ken, Turner, Lake, White, and Trelawny—drew up a remonstrance to the king; they were summoned before the privy council, and sent to the Tower. The whole city was in commotion; and great was the rejoicing when, on being brought to trial in Westminster Hall, they were acquitted. On the 5th of November following, 1688, the Prince of Orange landed in England. It is worthy of remark, that out of these seven bishops three refused to swear allegiance to him, and were joined by a considerable number of the clergy; these were called Non-jurors. In the first year of William and Mary's reign, the Toleration Act was passed, and dissent ceased to be illegal. Another attempt was made to comprehend the nonconformists in the church, but the lower house of Convocation was in no tolerant mood, and the attempt failed, but chiefly in consequence of the disturbances in Scotland. In 1717, Convocation was dissolved. After slumbering for nearly 140 years, it was once more called into life and action in the province of Canterbury in 1853, under the ministry of the Earl of Aberdeen, and a few years later the Convocation of York also took advantage of the liberty accorded by the crown on the advice of this government. See CONVOCATION.

That the Church of England, after fighting for its very existence against popery on the one hand, and against Puritanism on the other, should have subsided into inactivity during the dull reigns of the Georges, is less a matter of surprise than of regret. The peaceful enjoyment of her temporalities in a dull, irreligious, not to say infidel age, may easily account for, though it cannot excuse her idleness. But that in the rise of John Wesley, 1730, she should have failed to see a grand opportunity for herself, is a matter of both surprise and regret; she, however, let it pass; perhaps she can hardly hope that such another will ever again present itself. The utmost that can be hoped is, that she has seen her error. The next important event in the history of the church, is the Act of Union, which came into effect on the 1st of January 1801, and united the churches of England and Ireland in all matters of doctrine, worship, and discipline. The Reformation had made some progress in Ireland under Edward VI. Five Protestant bishops were appointed in 1550, and the English Bible and Liturgy were introduced in 1551; but from a variety of causes, the Reformed doctrines have never found much acceptance with the native population; and although a Protestant church was established by law, it was and is the church of the minority (see IRELAND). In 1635, the English Articles were received; and in

1662, the English Book of Common Prayer was adopted by convocation. Before the political union of the countries, the two churches were in full communion. By an act of the imperial parliament in 1833, ten of the Irish bishoprics were suppressed, and the funds thus obtained were applied to the augmentation of small livings and the building and repair of churches. There are now twelve Irish bishops. But in 1869, the Irish church was disestablished and disendowed; and this branch of the Anglican community now stands in much the same relation to the Church of England as does the Episcopal Church in Scotland.

In later times, three great controversies have shaken the English Church, which have led to some great reforms, some internal divisions, and the secession of some members to Rome, of a few to the ranks of dissent. These were the Tractarian, the Gorham, and the Essays-and-Reviews controversies. The former was occasioned by some Tracts which began to be published at Oxford in 1833, the object of which was to revive something of the spirit of catholic antiquity, and reform the abuses and slovenly practices which had crept into every part of the church system. See TRACTARIANISM. The Gorham Controversy (q. v.) related to the doctrine of baptismal regeneration. The Tractarians are accused of Romanizing tendencies; and their views, when carried to extremes, undoubtedly lead in that direction, as is proved by the numerous secessions to the church. With this extreme Low Church party, Episcopacy is rather an expedient than a necessary form of church government. They think but little of the efficacy of sacraments, and deny that regeneration necessarily takes place in infant baptism. Justification by faith, the atonement of the cross, and the Calvinistic doctrines on election, are their leading topics in preaching. See the lives of SIMON and of VENN for the views of this party.

The Essays-and-Reviews controversy (so called from a book thus named) concerned what are called BROAD CHURCH views, which are attributed to men of the Arnold school, and the followers of Mr. Maurice (q. v.). Those who hold them can scarcely be called a party, and are indeed, unwilling to be so considered; but if their position must be defined, they might be described as a party between, and somewhat antagonistic to, both the High and Low Church parties. The High Church party insist on the authority of the church and priesthood, the efficacy of sacraments when rightly received, and the necessity of apostolical succession in the matter of orders, and in their general teaching they take the Prayer-book as the exponent of Scripture. They are scrupulous in observing the rubrics, and have done much to revive the practice of daily-prayer in the churches, and the observance of the festivals. Order, unity, antiquity, and catholicity are what they profess to have in view. See RITUALISM.

There are at present, in round numbers, 13,000 benefices in England and Wales, of which a large number are new districts, which are being continually formed out of the old large and overpopulous parishes. These districts are called perpetual curacies, or incumbencies, and for the most part are but very slenderly endowed. The old benefices are either rectories, where the incumbent receives the *great* or *corn* tithes, or vicarages, where he receives the small tithe only. The great tithes had anciently been bestowed upon the neighboring monasteries, who undertook the cure of the souls and appointed vicars for the purpose, who lived on the small tithes and the offerings of the people. At the dissolution of the monasteries, many of the great tithes were given to laymen, and laymen now extensively hold them, and some to endowed colleges. The endowments were all by private beneficence, and there is no tenure so ancient as that by which the parish church holds her property.

The aggregate amount was ascertained by the commission appointed in 1830 to be as follows: Bishops, £181,631; deans and chapters, £360,095; parochial clergy, £3,251,159: total annual revenue, £3,792,885. The value of the property of the Irish Church was in 1869 estimated by Mr. Gladstone at £16,000,000. The church rates, amounting to £500,000 annually, were no part of the minister's endowment; they were exclusively devoted to the repairs of the church fabric, and the warming, lighting, cleaning, &c., of the church; and were under the exclusive control of the church-wardens. Of these there are two in each parish, one generally nominated by the minister, the other elected by the parishioners. The payment of church rates is no longer compulsory.

The Church of England has three orders of clergy—bishops, priests, and deacons. Generally, a degree at one of the English universities, or of Dublin, is required in a candidate for orders; but in Wales and some of the more populous districts, this condition is dispensed with. There are two archbishops (Canterbury and York) and 28 bishops in England; besides two archbishops and 10 bishops in Ireland. The archdeacons and rural deans assist the bishops in the management of their dioceses. The deans and canons rule the cathedrals with but slight power of interference on the part of the bishops.

The patronage of the church is in a great variety of hands—in

the crown, the bishops, the nobles, and gentry, and incorporate bodies such as colleges and cathedrals. Advowsons and next presentations may be sold as property, but a presentation may not be sold when a living is vacant. A clergyman is 'presented' to his living by the patron; he is admitted and inducted by the bishop or his appointee; he must 'read himself in,' i. e., he must read the Thirty-nine Articles after the morning or evening prayer within two months after induction. The bishop may refuse institution on the ground of false doctrine or immorality; but an appeal lies to the Arches Court and the Head Court of Appeal.

The Episcopal Church in Scotland is not, politically speaking, in union with that of England. But an act of parliament, passed in 1861, has taken away many restrictions imposed on Scottish Episcopalians after the battle of Culloden; and clergy ordained by Scotch bishops may now, under some slight restrictions, be presented to benefices in England. Events connected with the colonies have also drawn these two communions into closer alliance; and some bishops, selected by English authorities for foreign parts, have been consecrated in Scotland.

See the works on the history of the Church of England by Dixon, Molesworth, Hoare, J. H. Blunt, J. J. Blunt, Perry and Short, Marsden and Hardwick; also Fuller's *Church History*, Collier, Strype, Mosheim, Burnet, and Clarendon. Among the great divines whose works should be consulted for further information regarding the views of the church, may be named Barrow, Pearson, Hooker, Jeremy Taylor, Lightfoot, Hammond, Sandercock, South, Tillotson, Bishop Butler, Atterbury, Bull, Sherlock, and others.

ENGLANTÉ, in Heraldry, is bearing acorns or other similar glands.

ENGLESHERY, ENGLESBURY, i. e., being an Englishman. The presentment of Englesherly is thus explained, Hale's *Pl. of Crown*, p. 446: 'Anciently there was a law introduced by Canutus the Dane, that if any man were slain in the fields, and the manslayer were unknown, and could not be taken, the township where he was slain should be amerced to sixty-six marks; and if it were not sufficient to pay it, the hundred should be charged, unless it could be made appear before the coroner, upon the view of the body, that the party slain was an *Englesherman*; and this making it appear was various according to the custom of several places, but most ordinarily it was by the testimony of two males of the part of the father of him that was slain, and by two females of the part of his mother.' William the Conqueror continued this law. Presentment of Englesherly was taken away 21 Edw. III. st. 1, c. 4.

ENGLISH, forms the first part of several geographical names. —1. English Cove is a bay of the Pacific Ocean, on the south-west coast of New Ireland, in lat. 4° 54' S., and long. 152° 35' E.—2. English Harbor, on the south side of Antigua, is one of the best havens in the West Indies. It is situated in lat. 17° 3' N., and long. 61° 45' W.—3. English Harbor is on the Pacific shore of Costa Rica, in Central America, lying in lat. 8° 50' N., and long. 83° 55' W.—4. English River is an estuary on the west side of Delagoa Bay, an inlet of the Indian Ocean, in Africa. It is about lat. 25° 58' S., and long. 32° 36' E.—5. English River, otherwise known as Mississippi or Great Water, enters Hudson's Bay from the west, at Fort Churchill, about lat. 59° N., and long. 94° W., after an estimated course of 630 miles.

ENGLISH or BRITISH CHANNEL (*La Mancha* or the *Sleeve* of the French, and the *Oceanus Britannicus* of the Romans) is the narrow sea which separates England and France, having on the north the English counties of Kent, Sussex, Hants, Dorset, Devon, and Cornwall; and on the south the French provinces of Artois, Picardy, Normandy, and Bretagne. On the east, it joins the North Sea, at the Strait of Dover, where it is narrowest, being only 21 miles wide from Dover to Cape Grisnez. From this strait it runs west south-west for 280 miles, and joins the Atlantic Ocean at the Chops, with a breadth of 100 miles between the Scilly Isles and Ushant Isle. With an average breadth of 70 miles, it is 90 miles wide from Brighton to Havre; 60 miles from Portland Point to Cape La Hague; 140 miles—its greatest breadth—from Sidmouth to St. Malo; and 100 to 110 miles west of the latter line. It occupies 23,900 square geographical miles, and includes the Scilly Isles, Channel Isles, Ushant Isle, Isle of Wight, and many islets and rocks, especially off the coast of Bretagne. It is shallowest at the Strait of Dover, where a chalk-ridge at the depth of twelve or thirteen fathoms joins England and France. West of this, it deepens to sixty fathoms, with some banks at three to five fathoms, and some hollows five to thirty fathoms deeper than the parts around. A coarse gravel covers the bottom. The English coast-line of the E. C. is 390 miles long, with an inshore depth of twelve to fifty-five fathoms and the French coast-line of the E. C. is 570 miles long. Westerly winds prevail in the E. C., and the current, though imperceptible, is always from west to east. The E. C. abounds in fish, of which the chief are pilchard, mackerel, and oysters.

ENGLISH CONSTITUTION. See PARLIAMENT.

ENGLISH DRAMA. See DRAMA.

ENGLISH LANGUAGE, which is now spoken by nearly 100 millions of the earth's inhabitants, is in its vocabulary one of the most heterogeneous that ever existed; a fact, the causes of which are to be traced in the history of England (q. v.). Its composition and grammatical character are thus described by M. Müller, in his *Lectures on the Science of Language* (1861). 'There is, perhaps, no language so full of words evidently derived from the most distant sources as English. Every country of the globe seems to have brought some of its verbal manufactures to the intellectual market of England. Latin, Greek, Hebrew, Celtic, Saxon, Danish, French, Spanish, Italian, German—nay, even Hindustani, Malay, and Chinese words—lie mixed together in the English dictionary. On the evidence of words alone, it would be impossible to classify English with any other of the established stocks and stems of human speech. Leaving out of consideration the smaller ingredients, we find, on comparing the Teutonic with the Latin, or Neo-Latin, or Norman elements in English, that the latter have a decided majority over the home-grown Saxon terms. . . . M. Thommerel, who counted every word in the dictionaries of Robertson and Webster, has established the fact, that the number of Teutonic or Saxon words in English amounts to only 13,230 against 29,853 words which can either mediately or immediately be traced to a Latin source. On the evidence of its dictionary, therefore, and treating English as a mixed language, it would have to be classified together with French, Italian, and Spanish as one of the Romance or Neo-Latin dialects. Languages, however, though mixed in their dictionary, can never be mixed in their grammar. . . . We may form whole sentences in English consisting entirely of Latin or Romance words; yet whatever there is left of grammar in English bears unmistakable traces of Teutonic workmanship. What may now be called grammar in English, is little more than the terminations of the genitive singular and nominative plural of nouns, the degrees of comparison, and a few of the persons and tenses of the verb. Yet the single *s*, used as the exponent of the third person singular of the indicative present, is irrefragable evidence that in a scientific classification of languages, English, though it did not retain a single word of Saxon origin, would have to be classed as Saxon, and as a branch of the great Teutonic stem of the Aryan family of speech.' See LANGUAGE.

In tracing the growth of the English language, the history is usually divided into four leading periods: the *Anglo-Saxon Period* (440 A.D.—1066 A.D.); the *Semi-Saxon Period* (from 1066 A.D.—1250 A.D.); the *Early English Period*, comprising the two periods of *Old and Middle English* (from 1250 A.D.—1550 A.D.); and the *Modern English Period* (from 1550 A.D. to the present time). But this nomenclature and these divisions are now impugned by an increasing number of scholars, who affirm, not without reason, that English was always English, and never 'Anglo-Saxon'; that the fact of its being inflected in the period before the Norman Conquest, and losing most of its inflections in later times, is no reason at all for speaking of it as if it were two or even three different languages, and that we have no warrant in the usage of the inflected period for calling our forefathers or their speech anything but English.

It is certainly very misleading to name the period immediately succeeding the Conquest *Semi-Saxon*, because it induces people to imagine that the so-called 'Saxon,' that is, the English, element of our language had begun to be mixed up with foreign ingredients, though, in point of fact, its two great monuments, *The Chronicle*, and Layamon's *Brut*, are all but absolutely free from such. It is probable, therefore, that the old divisions and their designations will before long be abandoned, and they are only retained here out of respect to a usage which has penetrated modern English literature.

As early as the 5th c., Teutonic invaders from the continent settled in this country, and drove the original Celtic-speaking inhabitants to the north and west of the island; so that before the battle of Hastings (1066), the tongue of the conquerors had been spoken in England for at least 600 years. The final absorption, after numerous conflicts, by the kings of Wessex, or West Saxons, of the various states of the 'Heptarchy,' in the 9th c., went far to make the ruling speech of the land identical with that of Berkshire and Hants, the recognized center of the predominant sept. The use, besides, of this Southern Anglo-Teutonic speech as the chief instrument of literary communication, was permanently confirmed by the influence of King Alfred, a native of Berks. Further back than the time of this literary monarch, few existing remains of the language permit us to go; yet, from the writings of Cædmon, who was a North Anglian, and a few ecclesiastical MSS. of the kingdom of Northumbria, which extended from the Humber to the Firth of Forth, it has been generally concluded that at least two dialects must have been used in the island—a northern and a southern one. The Anglian or Northern dialect

was, to some slight extent, marked by Scandinavian features; while the Saxon or Southern dialect was more purely Low-Germanic, though the Anglian was also Low-German in all essentials. Some have accounted for the partial approximation of the Anglian dialect to Scandinavian by the fact that the Danes, at a later period, effected a settlement in the north-east of England; but, on the other hand, it is argued that 'certain peculiarities of a Scandinavian character are to be found in the Anglian, even of a date anterior to the first Danish occupation of a part of England in the latter half of the ninth century.' Nor would this be at all surprising if we admit that the Angles came from that corner of Slesvig still called 'Angeln,' or indeed from any region north of the Elbe. Some philologists, again, insist on distributing the Anglo-Saxon language into more dialects than two; but it will be sufficient if the reader bear in mind the two which have been mentioned. It is important to notice here that neither the Anglian nor the Saxon borrowed almost anything from the language of the conquered Britons; in other words, English is very nearly free of any Celtic element. On the other hand, a considerable, but not large, number of Latin words found their way into the English vocabulary before the Norman Conquest, through the introduction of Latin Christianity, and the translation of Latin authors into English.

The period in the history of our English tongue incorrectly described as *Semi-Saxon*, because the inflections that marked the earlier stage then began to give way, dates from a generation after the Conquest until near the middle of the 13th century. Like every transition era, it was a period of confusion, both to those using the language, and to those desirous of tracing its history. The monks of the time, accustomed to the use of medieval Latin, had in a great measure forgotten the grammar of their native language; and when they attempted to write it, did so very badly. The *Chronicle*, which in its latest form comes down to 1154, and Layamon's *Brut*, written about 1190 or 1200, exhibit traces of the breaking up of the grammar. The inflections and genders of the substantives, the definite and indefinite declensions of adjectives, are for the most part disregarded; a marked partiality is shown for weak preterites and participles; there is a constant substitution of *en* for *on* in the plurals of verbs; and the final *e* is often discarded; besides a great uncertainty prevailing in the government of prepositions. As regards the vocabulary itself, although employed in literature a century and a half after the Norman Conquest, it exhibits, as already noticed, but few traces of Norman-French (only 90 words in 57,000 verses); proving beyond question that the immediate effects of that great change were by no means so important on the English tongue as they were at one time believed to be.

When we come to the *third* period in the history of English, commonly called *Early English*, we have escaped most of the perplexities which attach themselves to the previous stage of our language. The tendency of the language to substitute an *analytical* for a *synthetical* structure is now seen vigorously at work. The 'Anglo-Saxon' was tolerably rich in inflections, which are now largely got rid of. The various modifications of an idea are expressed by some relational word or words attached to the leading idea. During the second or semi-inflected period, the verbs suffered much less inflectional change than the substantives and adjectives; this will be found to hold throughout the entire 250 years of the era of reconstruction. In the fine poem of *The Owl and the Nightingale*, the Anglo-Saxon vowels *a*, *e*, *u*, in final syllables, are all represented by *e*, and the final *n*, of the infinitive is beginning to disappear. In the *Chronicle* of Robert of Gloucester, we encounter, besides, a great number of French words (Dr. Marsh found 4 per cent. in 10 pages), which had gradually become familiar to the people, through the presence of their Norman masters, and through the efforts of the latter to speak English after it was found impossible to supplant it by Norman French. The presence of French is, besides, very noticeable in the poetry of Chaucer and Gower; but there is no ground for the statement that these writers corrupted the language by a large admixture of novel French words. Dr. Morris is quite correct when he says (introduction to Chaucer's *Prologue*, &c., Clarendon Press series), that Chaucer, 'with few exceptions, employed only such terms as were in use in the *spoken* language, and stamped them with the impress of his genius, so that they became current coin of the literary realm.' And Mr. Skeat remarks (introduction to *Piers the Plowman*, same series), that 'Langland does the very same thing, employing Norman-French words freely whenever he wishes to do so.'

As to Scotland, again, in the Anglian counties lying south of the Forth, and as far north of it as English had got a footing, the language also underwent such changes as we have noted in the more southern dialects. Barbour, a Scottish contemporary of Chaucer, wrote purer English than Chaucer did, only because he used less French. Regarding the north-eastern dialects of Scotland, indeed, some diversity of opinion exists. Some antiquaries are of opinion that the large infusion of Norse or Scandinavian

elements in these dialects is to be accounted for by the fact of a Norwegian kingdom having been maintained there more or less from the 9th to the 11th century; while others allege that the language of the north-east of Scotland is in substance and grammar as decidedly Anglian as that of Norfolk or Yorkshire.

We may here notice the question which has often been asked: Which of the early dialects spoken in England is the origin of the form now used? We have seen that in the pre-Norman period *two* were employed for literary purposes, a Northern or Anglian, and a Southern or Saxon, the latter of which, through political causes, was perhaps considered the more classical of the two. In the period, however, succeeding the Norman conquest, and more especially after 1250, we find not *two* but *three* dialects; a Northern, a Midland, and a Southern. The cause of this was probably the breaking up of the supremacy of Wessex after the battle of Hastings. Circumstances now gave prominence to the Midland counties, in which arose the great universities, the rich monasteries, and many other religious foundations. One of its subdivisions, the east midland, was the dialect in which Orm, Robert of Brunne, Wicliffe, Gower, and, above all, Chaucer, wrote. It had then become the speech of the metropolis, and had probably forced its way south of the Thames into Kent and Surrey. This, therefore, may be considered the immediate parent of modern English, but inasmuch as the Midland gathered into itself from its very position many of the peculiarities of the dialects spoken north and south of it, Sir Frederick Madden's view (Layamon's *Brut*, 1851), that we must look for the real groundwork of modern English in a gradual coalescence of the various dialects, may still be considered substantially correct.

ENGLISH LITERATURE, like every other mental product, is qualified by the history of the nation to which it belongs. The great social eras of a country's history have always been found to correspond with the great intellectual eras of her growth. It will, however, be sufficient for our purpose to arrange the literary annals of England into three periods: 1. The period antecedent to the Norman Conquest; 2. The period extending from the Norman Conquest to the English Reformation; and 3. The period extending from the English Reformation to the present day.

1. *The Period antecedent to the Conquest.*—This period possesses a literature composed in three distinct languages—the *Celtic*, the *Latin*, and the *English*. Regarding the Celtic literature, see CELTIC NATIONS, IRISH LITERATURE, and WELSH LITERATURE. The introduction of Latin literature into this country was considerably later than the Roman invasion of it. The cultivation of the letters of Rome followed as a necessary consequence on the introduction of Christianity into the country. Towards the close of the 6th c., St. Augustine landed in the south of England, and laid the foundation of the Anglo-Catholic Church. These great evangelists, however, rather prepared the way for literary effort on the part of others, than were themselves literary. The earliest names that we encounter are Gildas, Nennius, Bede, Alcuin, Asser, and Erigena. After the immigration of the Angles and Saxons into Britain, this people began to form a literature of their own. Their three historical poems—the Gleeman's Song, the Battle of Finnesburgh, and the Tale of Beowulf (q. v.)—are mainly versions of events which happened on the continent before the descent on the shores of England. Except the remarkable religious poems of the Northumbrian monk Caedmon, in the 7th c., little more of any moment in verse has been handed down to us by the English people who lived before the Conquest. But this people, though comparatively poor in poetry, are eminently simple and straightforward prose writers. King Alfred discarded Latin in all his communications with his subjects, and in consequence the native language made an impressive start throughout the whole of England. From the *Chronicle*, which is made up from the MS. of several conventual records, modern scholars have derived special and valuable information. Portions of the sacred Scriptures were translated into English, several of the leading men of the time, such as Aldhelm, Bede, and Alfred, lending their assistance. Sermons and grammars, glossaries and medical treatises, geographies and dialogues between Solomon and Saturn, make up the file of this period of the literature.

2. *The Period extending from the Norman Conquest to the English Reformation.*—The Conquest had the effect of changing the language of the court, the schools, and the tribunals of justice; it took but little effect on the native inhabitants. In a few centuries, owing partly to the obstinacy with which the English people clung to their mother-tongue, and partly to the circumstance that long settlement in England and political antagonism to France had practically changed the descendants of the Norman conquerors into English nobles, and inspired them with English feelings, the latter began to abandon the use of French. 'In 1349, boys ceased to learn their Latin through the medium of this tongue; and in 1362 (the 36th year of Edward III.), it was directed by act of parliament that all pleadings in the law-courts should henceforth be conducted in English, because, as is stated in the preamble to

the act, French was become much unknown in the realm' (Morris's *Historical Outlines of English Accidence*, 1872). In a generation or two after the Conquest, classical and theological learning made very considerable progress. Monasteries were busy, and the English universities were both by this time founded; while an interchange of teachers and pupils constantly went on between the English seminaries and those of France and other countries.

Laufraue and Anselm, Hales and Duns Scotus, Michael Scot and Roger Bacon, had attained to a great eminence in the speculative and in physical philosophy. Doubtless their thinking was more characterized by its hair-splitting ingenuity than by its solidity, but the 12th and 13th centuries stand out in a distinguished manner in England, and indeed throughout Europe, for their peculiar devotion to speculative studies. But all these philosophers wrote in Latin, as did the historical writers of the same period, of whom the chief were William of Malmesbury, Geoffrey of Monmouth, Giraldus Cambrensis, and Matthew Paris. A literary feature of the age which must not be overlooked was the frequency of satire expressed in rhymed Latin verse. The most notable of the medieval satirists was Walter Mapes, to whom is ascribed (though the evidence of his authorship is not conclusive) certain clever half-scurrilous poems, from one of which the *Confessio Goliath*, have been extracted a number of verses, commonly but erroneously spoken of as a 'drinking-song' (see MAPES). The satire passed from the clergy, and was directed against the feeble king (John). De Montfort and the other great barons who distinguished themselves at Runnymede, are the theme of popular praise. In the same Latin tongue was composed the oldest legendary work of the Middle Ages. The *Gesta Romanorum* (q. v.) is a compilation of uncertain origin. The stories themselves are in many cases of great antiquity, and in their earliest forms can be traced to the distant East. In their Latin dress they were the property, not of England only, but of all Western Christendom, and their only claim to notice in a special survey of English literature arises from the fact that their editor, Elicandus, was perhaps an Englishman, and that they have furnished (at second or third hand) incidents and plots to the genius of Shakspeare and Scott. In the same relation to English literature stands *The Seven Wise Masters*, traceable back to India, but known to all Western Europe in a Latin form, and to England in particular under the title of the *Process of the Seven Sages*. The French Fabliaux affected our literature but little before the time of Chaucer. On the other hand, the romances of chivalry, rude and spirited, pathetic and imaginative, are well worth the attention of the student of English literature. The best of these, first written in French but afterwards translated into English, celebrate the glory and fall of King Arthur and his knights of the Round Table, of which splendid use has recently been made by Alfred Tennyson in his *Idylls of the King*.

Meanwhile the English tongue was undergoing those serious grammatical and phonetic changes to which reference has already been made. During this half-chaotic stage it was scarcely fit to be a vehicle of literary expression, even if the ignorance and helplessness of the conquered people had not of themselves been sufficient to prevent the growth of a vernacular literature. The first indication of reviving life is the appearance of Layamon's *Brut* (see LAYAMON,) about the close of the 12th century. The next century is comparatively rich in writers who use the English tongue, and whose works, if not masterpieces of artistic skill, are at least invaluable for linguistic purposes. The most important of these writers are Orm, Guildford, and Robert of Gloucester.

The period of what is called *Early English*, embracing the 14th and 15th centuries, is one of great importance, both in the progress of English history and of English literature. The translation (the first ever executed) of the Bible into English, which was completed by Wicliffe about 1380, is a work of great value, not only as a monument in the religious history of our nation, but in a philological point of view, being, as it is, all but first among the prose-writings in that form of the English tongue which is now in use. The principal book which precedes it, and the very oldest written in 'Early English,' is Sir John Mandeville's account of his eastern travels (1356). Somewhat later (between 1390 and 1400), Geoffrey Chaucer, the genuine father of English poetry, published his *Canterbury Tales*. A shrewd and sagacious observer, he has left behind him in these *Tales* a series of sportive and pathetic narratives, told with such a wonderful power of tenderness and humor, in such a simple, healthy style (although his vocabulary is largely modified by French, and is by no means a 'well of English undefiled'), that they have been the wonder and delight of all succeeding times. Laurence Minot, Richard Rolle, Langland, author of *Piers the Plowman*, and Gower, fitly close round Chaucer as contemporaries who wrote more or less vigorous verse. About the same period flourished in Scotland John Barbour, whose epic narrative, *The Brus*, written about 1376, is incomparably the greatest of all the metrical chronicles. In the following c. (the 15th), and in the early part of the 16th, occur in England the names of John

Lydgate (1430), whose *London Lyckpeny* is still agreeable reading; Alexander Barclay, whose *Ship of Fools* was printed in 1509; John Skelton, author of the scurrilous satires of *Colin Clout* and *Why Come ye not to Court?* (died 1529); Howard, Earl of Surrey (beheaded 1546–1547), who wrote the first sonnets and the first blank verse in the English tongue; and Sir Thomas Wyatt (died 1541). The prose writers of this period are Sir John Fortescue, chief-justice of the King's Bench under Henry VI., who flourished 1430–1470, and who wrote among other things, a tract on the *Difference between an Absolute and Limited Monarchy, as it more particularly regards the English Constitution*; William Caxton, who introduced printing into Britain in 1477—the first book ever printed in this country being a translation of the French work *Le Recueil des Histoires de Troye*; Sir Thomas Malory, whose *Morte Darthur* (1469–1470) is the final form of the Arthurian romance; Hall, an English lawyer (died 1547), who wrote a chronicle of the *Wars of the Roses*; and Tyndale, burned (1536) for heresy.

In Scotland, during the same period, we encounter in poetry the names of James I., king of Scotland (murdered 1437), author of the *King's Quhair*, &c.; Andrew Wyntoun, prior of Lochleven, whose *Orygynale Chronykil of Scotland* was completed about 1420; Blind Harry, author of *The Adventures of William Wallace*, a work written about 1460, and long exceedingly popular with the Scottish peasantry; Robert Henryson (died circa 1500), author of *The Testament of Cresseid*, &c.; William Dunbar (died about 1520), whose *Dance of the Seven Deadly Sins* shows him to have possessed great boldness and vigor in his delineations of character; and Gavin Douglas (died 1522), whose best work is a translation of Virgil's *Æneid* into English verse—at least into what both Scotchmen and Englishmen then reckoned English verse.

3. *The Period extending from the English Reformation to the Present Day.*—Among the brilliant works of the Elizabethan age, there is probably none of which we may not detect germs in some of the efforts which were made in the century that preceded. In theology, the names of Latimer (burned 1555), of Crammer (burned 1556), and of Ridley (burned 1555), shine forth conspicuously; and it is sufficient to mention Sir Thomas More (beheaded 1535), author of *Utopia*, a curious philosophical work, and Roger Ascham (died 1568), as excellent miscellaneous writers of that time. The last mentioned, indeed, exercised no inconsiderable influence on the development of the English tongue, and his *Scholemaster* is a work that is even yet influential. We may here mention the Scotchmen, Mair or Major, Sir David Lyndsay, Boece, Melville, and, above all, George Buchanan, who is universally admitted to have been one of the finest classical scholars that ever appeared in Christendom.

The origin of the English drama is discussed in the articles **DRAMA** and **MYSTERIES AND MIRACLE PLAYS**. It is therefore only necessary here to note that the first English comedy, *Ralph Roister Doister*, was written by Nicholas Udall about 1552–1553, and the first English tragedy, *Gorboduc* or *Ferrex and Porrex*, by Sackville and Norton a few years later. The era on which we are next to look, the Elizabethan, is the most brilliant in the literary history of England. We may quote here the words of Lord Jeffrey: 'In point of real force and originality of genius, neither the age of Pericles, nor the age of Augustus, nor the times of Leo X. or of Louis XIV., can come at all into comparison. For in that short period we shall find the names of almost all the great men that this nation has ever produced; the names of Shakspeare, and Bacon, and Spenser, and Sidney; of Raleigh, and Hooker, and Taylor; of Napier, and Milton, and Cudworth, and Hobbes; and many others—men, all of them not merely of great talents and accomplishments, but of vast compass and reach of understanding, and of minds truly creative; not men who perfected art by the delicacy of their taste, or digested knowledge by the justness of their reasonings; but men who made vast and substantial additions to the materials upon which taste and reason must hereafter be employed, and who enlarged to an incredible and unparalleled extent both the stores and the resources of the human faculties.' Even the minor dramatists of the time, such as Marlowe and Chapman, Beaumont and Fletcher, Jonson and Drummond, are all nearly the equals of any succeeding poets that have appeared.

In the latter half of this period a new class of poetic writers started up, who were lyrical rather than dramatic, and whose occasional verses, sometimes descriptive, sometimes amatory, and sometimes religious, are characterized by a bright and delicate fancy, as if morning sunbeams glittered on their pages. These are George Wither, William Browne, Francis Quarles, and George Herbert, 'the sweet psalmist of the 17th century' (as Emerson calls him). The last forty years of the 17th c. are generally known as the age of the Restoration and the Revolution. During this period, the literature of the stage was disgraced by its indecency. Charles II. and his court had brought back with them from France a love of polite profligacy, which found its most fitting expression in the comedy of intrigue. Four names stand out conspicuous as 'sinners above all men in that genera-

tion'—Wycherly, Congreve, Vambrugh, and Farquhar. Yet theology could boast of such names as Baxter, Owen, Calamy, Collier, Leighton, South, Tillotson, and Barrow. This was also the epoch when the great Milton, driven into the shades of obscurity by political adversities, fulfilled the uttered hope of his youth, and wrote 'something which posterity will not willingly let die.' About this time, too, Walton angled, and Butler burlesqued dissent; Marvell turned his keen irony against the High Church; Locke and Newton speculated and discovered; and John Dryden, the literary chief of the time, 'found the English language' according to Dr. Johnson, 'of brick, and left it of marble.'

The literary history of the 18th c., and of the reign of Queen Anne, has been variously estimated. 'If it was overvalued,' says Professor Spalding, 'by those who lived in it, and in the age that succeeded, it has been undervalued in our own day. It was long glorified as the Augustan age of English literature; but among ourselves it has been set aside as a skeptical, utilitarian age, when poetry could find no higher field than didactic discussion, and prose found nothing to amuse but comic and domestic narrative, or bitter and stinging satire. The truth, as usual, lies in the middle. This age was far from being superior to every era that had gone before it, and it was not quite so low as some of its hostile critics have represented. One thing, however, is beyond dispute, viz., that the *form*, both in poetry and in prose, had come to be much more regarded than the *matter*. Addison, Swift, and Johnson may be taken as types of the prose writers of this century. The first for ease and grace is unmatched in any age; the second stands equally high for rough and pointed vigor; and the third is famous for his ponderous, finely balanced sentences, the dignity of which not unfrequently surpassed the sense. Defoe created no school, but the author of *Robinson Crusoe* will live forever. The poetry of the time is represented by Pope, and it has been gravely asked whether he was a poet at all. He certainly versified with brilliant elegance, and the terror which his polished epigrams excited in the breasts of his enemies, showed him to possess a force of genius which at least demands our admiration. Young and Akenside were perhaps animated by a higher poetic sense, but they accomplished much less; and the same may also be said of Thomson, Gray, Collins, Beattie, and Cowper. Incomparably the greatest poet, however, of the 18th c., was Robert Burns, though he wrote in a dialect of English that has since become a *patois*, and even then, though used by a nation, was not the recognized standard of literary expression. Richardson, Fielding, Smollett, Sterne, Goldsmith, and Mackenzie are its novelists; Hume, Robertson, and Gibbon, its historians; Butler, Berkeley, Clarke, Shaftesbury, Hume, Paley, and Adam Smith its philosophers.

The 19th c., though full of interest for us, is from the novelty and the variety of the intellectual character employed in it, one of the most difficult to analyze of the whole range of English literature. It has been a time of extraordinary activity; books have been multiplied to an unprecedented degree, and readers have increased in an equal proportion. It cannot be doubted, however, that the first quarter of this century is greater in *pure* literature than any subsequent portion of it. It is greater, besides, in poetry than in prose. The early names of Coleridge and Wordsworth, of Scott and Byron, of Shelley and Keats, of Campbell and Southey, are higher than any now prominent except that of Tennyson and perhaps Browning. The 19th c. is the age of novels and romances, of reviews and periodicals. Jeffrey and Sydney Smith, Hazlitt and John Foster, De Quincey and Carlyle, are the great names in review-literature; Hall, Chalmers, Irving, Robertson (of Brighton), Newman, Liddon, Vaughan, and Farrar in pulpit oratory; Stewart, Mackintosh, Bentham, Brown, Hamilton, Ferrier, Mill, Herbert Spencer, and Bain in philosophy; Dickens, Thackeray, Bulwer Lytton, Charlotte Brontë, 'George Eliot,' Mrs. Oliphant, Mrs. Craik, Reade, Trollope, Black, Hardy, Blackmore, and Macdonald as novelists. As historians, we have Hallam, Macaulay, Thirlwall, Grote, Milman, Carlyle, Froude, Burton, Alison, Kinglake, and Freeman. Ruskin's writings on art mark an epoch in the intellectual history of contemporary England. Amongst poets are Tennyson, the Brownings, Matthew Arnold, Swinburne, and Morris. To the most extensive and ever-increasing literature of travel, Livingstone, Burton, Speke, Baker, Stanley, and Miss Bird have contributed largely. The harvest of biography is also a large and increasing one, and includes, amongst many others, Lockhart's *Scott*, Carlyle's *Sterling*, and Stanley's *Arnold*. In the new world beyond the Atlantic, some of the leading names are Washington Irving, Poe, Longfellow, Bryant, Emerson, Cooper, Whittier, Lowell, Holmes, Hawthorne, Henry James, Bret Harte, Whitman, Clemens, Prescott, Bancroft, and Motley. Much of the literature of the 18 and 19th centuries is devoted to science, which can show a crowd of illustrious names too numerous to mention. Besides, in scientific works, the *matter* is of so much greater importance, and so much more attended to than the *form*, that it is not customary to include

scientific writers in a survey of literature proper, though Tyndall and Huxley might well be named as authors who write English with beauty and force.—See Chambers's *Cyclopædia of English Literature*; Morley's *Library of E. L.*; his *First Sketch of E. L.*; Stopford Brooke's *Primer of E. L.*; Marsh's *History*; the *English Literature* by Taine (transl. by Van Laun); Mrs. Oliphant's *Literary History of England* (1882).

ENGRAILED, in Heraldry, a line composed of a series of little half-moons, or semicircles, supposed to have been made in it by hail. Engrailed is the opposite of invected.

ENGRAVING, in its widest sense, is the art of incising designs, writing, &c., on any hard substance, such as stone, metal, or wood. Many branches of the art are of great antiquity; such as gem-engraving, cameo-cutting, and die-sinking. The more important of these ornamental and useful kinds of engraving are described under their proper heads. But in a narrower sense, engraving is the special designation of the art of cutting or indenting the surface of metal plates or blocks of wood with designs, for the purpose of taking off impressions or *prints* of the designs on paper. This department of art arose as late as the 15th c., the earliest wood-engraving with a date being 1423, and the earliest dated engraving from a metal plate being 1461.

Wood-engraving differs from engraving on metal in this, that on a metal plate the traces or marks which are to appear on the paper are cut or sunk into the plate, and when printed from are filled with ink, while the rest of the surface is kept clean; whereas in wood-engraving they are left prominent or in relief, and the blank parts of the design are cut away. Hence a wood-cut acts as a *type*, and is inked and printed from in the usual way. See **PRINTING**. This makes wood-engraving peculiarly suitable for the illustration of books; as the blocks can be printed from along with the letter-press; while the impressions from a metal plate must be taken by themselves, and by a slow process. The further treatment of the important art of **WOOD-ENGRAVING** is reserved for a separate article; our attention at present being confined to engraving on metal.

It is beyond our scope to enter into the practical details of the various processes; we can only aim at enabling a reader altogether ignorant of them to conceive how the effects may be produced, and to understand the terms currently used in speaking of this kind of art.

The metals most commonly used for engraving are copper and steel, the former having the advantage of being more easily worked, the latter of greater durability. The processes of working are essentially the same in both. The several manners or styles of engraving are distinguished as *Line-engraving*, *Mezzotinto*, *Stippling*, and *Aquatint*.

1. *Line-engraving*—in which, as the name implies, the effect is produced by a combination of lines—is executed either by direct incision with the graver or the dry point, or by a combination of incision with *etching*—a chemical process to be immediately described. The *graver* or *burin* is usually in the form of a quadrangular prism, fitted into a short handle. In making the incision, the graver is pushed forward in the direction of the line required, being held by the handle, at an angle very slightly inclined to the plane of the copper. A *scraper* is required to scrape off the burr or burr which is formed by the action of the graver and dry-point. The *rubber* is a roll of cloth dipped in oil, and is used to make the surface smooth. A *burnisher* is required to polish the plate, and erase any scratches which it may accidentally receive, and also to make lighter any part of the work which may have been made too dark. The *dry-point* is like a sewing-needle fixed into a handle, and is used to cut or scratch the finer lines. The graver cuts the copper clean out, the dry-point throws it up on each side, and in some cases this is not scraped off, but made use of till it is worn off, as it gives richness to the line.

In etching, the first step is to cover the plate with a composition of wax, asphaltum, gum mastic, resin, &c., dissolved by heat; an outline of the design, made on paper in pencil or red chalk, is then 'transferred' to the surface of this composition, by being passed through a press. The subject is then drawn on the ground with the etching-point, which cuts through it, and exposes the copper. *Etching-points* or *needles* resemble large sewing-needles shortened, and fixed into handles four or five inches long; some are made oval, to produce broader lines. A rim of wax being put around the plate, acid is poured on, and corrodes the copper not protected by the ground. If the acid is found not to have acted sufficiently, it may be applied again to the whole design, or only to portions of it, by *stopping up*, with a mixture of lamp-black and Venice turpentine applied with a camel-hair pencil, what has been sufficiently *bitten in*.

When a series of parallel lines are wanted, as in backgrounds, &c., an ingenious machine called a ruler is employed, the accuracy of whose operation is exceedingly perfect. This is made to act on etching-ground by a point or diamond connected with the

apparatus, and the tracings are bit in with aquafortis in the ordinary way.

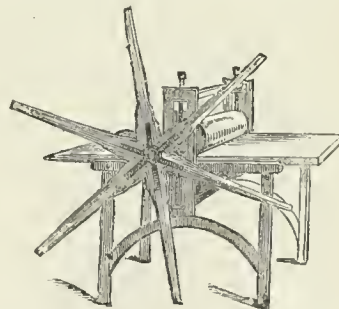
2. The process of *mezzotinto* is by no means so difficult as line-engraving. The plate is prepared by being indented or laced all over by an instrument with a serrated edge, called a *cradle*, which is rocked to and fro upon it in all directions. The burr or nap, thus produced retains the printer's ink, and if printed, a uniform dark surface would be the result. On this plate, after a tracing has been transferred, the engraver goes to work with tools called *scrapers* and *burnishers*—those parts of the ground most smoothed being the highest lights, and the ground the least operated on producing the deepest shadows. As the work proceeds, it may be blackened with ink, applied with a printer's ball or otherwise, in order to ascertain the effect. The design is sometimes etched on the plate by the ordinary process, before the *mezzotinto* ground is laid.

3. *Aquatint Engraving*.—By this method, the effect of drawings in Indian ink is produced; and at one time it was greatly made use of in rendering the drawings of Paul Sandby and our early water-color painters, and particularly prints for drawing-books. In this process, which is a very complex kind of etching, the ground which is composed of pulverized rosin and spirits of wine, assumes when dry a granulated form; and the aquafortis acting on the metal between the particles, reduces the surface to a state that an impression from it resembles a tint or wash of color on paper. David Allan engraved his celebrated illustrations of the *Gentle Shepherd* in this manner. It has now gone almost entirely out of use, having, like engraving in imitations of drawings in chalk or pencil, been in a great degree superseded by lithography.

4. In engraving in *stipple*, which was much in vogue in the end of the last century, the drawing and effect are produced by small dots, in place of lines. Ryland, Bartolozzi, and Sherwin, excelled in this style. It is well suited for portraits; several of Raeburn's have been capitally engraved in stipple by Walker. It involves much more labor than *mezzotinto* and is now little practised.

Plate-printing.—Copper-plates, engraved in any of the above styles, are ready for press as soon as they are finished by the engraver. The method of printing from them is very simple. Their engraved surface is daubed over with a thick oleaginous ink, so that the lines are effectually filled. As this dirties the whole face of the plate, it is necessary to clean it, which is done by the workman wiping it first with a piece of cloth, and then with the palms of his hands, rubbed on fine whitening.

It may be calculated that a hundred times more ink is thus removed than actually remains in the indentations; however, such is necessary. The plate being thoroughly cleaned, it is laid on a press (see fig.), with a piece of damped paper over it; and being wound beneath a roller covered with blanket-stuff, it is forced to



yield an impression on the paper. The plate requires to be kept at a moderate warmth during the operation. The frequent rubbing of the plate with the hand to clean it, as may be supposed, tends greatly to wear it down; and such is the wear chiefly from this cause, that few copper-plates will yield more than a few thousands of impressions in good order. The earliest, called *proofs*, are always the best and most highly prized.

In consequence of this defect in copper, the practice of *engraving steel-plates*, for all subjects requiring a great many impressions, has now become very common. This process was introduced by the late Mr. Perkins of London, who originally softened the plates, engraved them, and then rehardened them—a practice now abandoned, as ordinary steel-plates can be worked upon by the burin, dry-point, scraper, and burnisher with perfect facility. Etching on steel-plates is executed much in the same way as in the process on copper. An engraving on a steel-plate may be transferred in relief to a softened steel cylinder by pressure; and this cylinder, after being hardened, may again transfer the design by rolling it upon a fresh steel-plate; and thus the design may be multiplied at pleasure.

History of Engraving.—This most important invention, by which the productions of art are diffused without limit, is said to have been accidental, and is claimed for Tommaso Finiguerra, who

first took impressions on paper about the year 1440. His employment was executing ornamental engraving, chiefly on articles used in religious services, such as small portable shrines, or altarpieces. These were generally made of silver, and the designs engraved on them were filled up with a black composition, that hardened in a short time. This composition was called in Italian *niello* (from Lat. *nigellus*, dim. of *niger*, black), and the workers in it *niellatori*. It was the practice of Finiguerra, in the course of executing his work, to prove it by rubbing lampblack and oil into, and pressing paper over it; he thus obtained an impression of his work up to a particular stage, and was enabled safely to carry it on till it was completed.

Finiguerra's title to the invention has been disputed; and in a recent work by J. D. Passavant, *Le Peintre-Graveur* (Leip. 1860), a strong case seems to be made out for its German origin. Be that as it may, the principal early Italian engravers who followed Finiguerra, were Bacio Baldini (born about 1436, died 1515); Sandro Botticelli (born 1437, died 1515)—he embellished an edition of Dante's *Inferno*, brought out in 1481; Antonio Pollajuoli (born 1426, died 1498, at Florence); Andrea Mantegna (born at Padua 1431, died at Mantua 1505); and Marc Antonio Raymondi (born at Bologna 1487 or 1488, died 1539), who executed his chief works at Rome. The most celebrated early German engravers were Martin Schoeegauer (born at Colmar about 1455, died 1499); Israel van Meckeln, or Meckenen (born at Meckenen on the Mense about 1450, and died 1523); Michel Wohlgemuth, who died in 1519; Albert Dürer (born at Nürnberg in 1471, died in 1528); and Lucas van Leyden (born at Leyden 1494, died 1533). The engravings of all these artists are very valuable, not only from their scarceness, and as illustrating the early history and progress of the art, but as exemplifying many high qualities that have never been surpassed in later times. The most of them were painters, and engraved their own works, except Marc Antonio, who engraved chiefly those of Raphael, by whom he was employed, and who occasionally overlooked and directed him. All those engravers, and their immediate followers, executed their works with the graver; but soon after, engravings came to be generally executed by two processes—etching, and cutting with the graver or the dry-point. The works of these early masters are often remarkable for character and expression, as those, for instance, by Mantegna; and for the correctness and high style of the drawing, for which qualities Marc Antonio has never been surpassed; also for finish of the most careful and elaborate kind, which has been carried further by Albert Dürer and Lucas van Leyden than by any other engravers. The styles of these earlier engravers were cultivated by numerous successors, several of whom followed their masters as closely as they could, while others diverged into something like originality: the chief names are Agostino Veneziano, about 1620; Nicolas Belin da Modena, and Giov. Ghisi, 1630; Luc. Damesz, who died in 1533; Giov. Giac. Caraglio, and Marco da Ravenna, about 1640; Giul. Bonasone, born at Bologna in 1498, died in Rome in 1564; Eneas Vicius, George Vens, Henrid Aldegraf, and Jean Sebast. Bœhm, about 1550; Adrian, Charles, William, and John Collert, Adam and George Ghisi, Suterann, Virgilius Solis Cornelius Cort, Martin Rota, and others, ranging from the middle to the end of the 16th century. Agost. Caracci, the celebrated painter, executed many spirited engravings. Saenredam, De Bruyn, Galle, Kellerthaller, Alberti, De Goudt, C. de Pass, Sadeler, are names of well-known engravers that enter on the 17th century. Henry Goltzius is noted for the number and variety of his works, and his imitations of the styles of the older masters. In the plates of engravers towards the middle of the 17th, and beginning of the 18th c., a large proportion of the work consists of etching, the graver being chiefly used for deepening and clearing up the etching. This arose from the manner of working being well adapted for rendering the style of the painters of that period, whose works were distinguished for freedom of execution or touch, and clearness and transparency.

The most noted engravers of this period were the Visschers, who flourished between 1610 and 1650, and engraved many of Berghem's pictures; Bolswert, 1620; Lucas Vosterman the Elder, 1630; Suyderhoef, about 1640. These engravers rendered many of the works of Rubens in a very spirited manner. Coryn Boel—whose engravings from Teniers are in some respects superior even to Le Bas—Troyen, and Van Kessel, are worthy contemporaries.

In the age of Louis XIV., a race of engravers of portraits arose, who carried execution with the graver almost to perfection. The works of the artists they engraved from were florid in style, with a great display of drapery and lace, and accessories in the backgrounds elaborately executed. Among these engravers the following rank highest: Gerard Edelinek (b. Antwerp 1627, d. Paris 1707)—he was one of the best engravers of the period, and specially patronized by Louis XIV.; Masson (b. 1636, d. 1700); Larmessin (b. 1640, d. 1694); Drevet the Elder (b. 1664, d. 1739); Drevet the Younger (b. 1697); Gerard Andran (b. 1640, d. 1703). There was a large family of Andrans engravers, but Gerard was the most celebrated, indeed he was one of the best of the French

engravers. Among engravers of talent in England may be mentioned Robert Walker (b. 1572); William Faithorne (b. London between 1620 and 1630, d. 1694) executed many excellent engravings of portraits; George Vertue (b. London 1684, d. 1756), a good engraver, and a man of general information and taste in matters of art; John Smith (b. London, 1654 d. 1722) executed in mezzotinto a vast number of interesting portraits. In the 18th c., there were numerous excellent engravers, by whose works the tastes for the pictures of the Dutch school of the 17th c. has been widely extended. Two of the most distinguished of these were John Philip le Bas (b. Paris 1708, d. 1782) and John George Wille (b. Königsberg 1717, d. 1808). Their styles are totally dissimilar. Le Bas's plates are chiefly etched, and remarkable for spirit and sharpness of touch and transparency; accordingly, mostly all his works are after painters who excelled in these qualities, particularly Teniers. Wille's engravings, again are of the most careful and elaborate description, and his best prints are after Gerard Dow, Terburg, Mieris, and Metz—masters distinguished for the high finish of their pictures. He worked with the graver; and his plates are distinguished by the precision and clearness with which the lines are cut.

It was about the middle and latter portion of last century that engraving reached its highest point in England. The works of William Hogarth (b. London, 1698, d. 1764) are of world-wide celebrity, but that is owing mainly to the excellence and dramatic interest of the pictures from which the engravings are made, though, no doubt, his prints are engraved in a firm clear style, similar to that practised by the French engravers of the time, several of whom were employed by him.

It was Sir Robert Strange (b. Orkney 1721, d. London 1792), an engraver of figures, and William Woollet (b. Maidstone 1735, d. London 1785), a landscape-engraver, who imparted to English engraving those qualities and characteristics that enable us to claim a style of engraving that is national, differing from other styles, and that has arisen and been best carried out in this country. In drawing and form, Strange was rather defective; but he excelled in what engravers call color, or the art of producing, by means of variety of line, a texture or quality that compensates for the want of color, by giving to the engraving something of the richness produced by color in a picture. His imitation of the softness and semi-transparency of flesh was particularly successful, and superior to that of the French engravers, whose works, though in most respects admirable, failed in that respect, and had, in the more delicate parts, a hard or metallic look. Woollet treated landscape-engraving in a manner totally new, imparting to it more firmness and decision, by making great use of the graver. His works have more finish and force than former landscape-engravers, but they are in some degree liable to the objection of hardness, in the treatment of foliage in particular. The works of these two engravers have had a marked influence on art, not only in this country, but abroad. The merit of Strange's style was acknowledged on the continent; he was elected a member of the Academies of Florence, Bologna, Parma, and Rome. At the end of last century, art had fallen very low on the continent, but a regeneration was beginning; and in Italy, engravers were then arising, such as Volpato and Cunego, who studied and imitated the softness and, technically speaking, fleshiness of texture that distinguished the works of the British engraver; those, again, were followed by Raphael Morghen, Longhi, Mercuri, and others, in Italy; by Boucher Desnoyers, Forster, &c., in France; and by Müller, Keller, Gruner, and numerous other engravers in Germany. By them, engraving has been carried to the highest pitch. Amongst their works, the following are *chefs-d'œuvre*: 'The Last Supper,' after Da Vinci, by R. Morghen; the 'Sposalizia,' after Raphael, by Longhi; 'La Belle Jardinière,' and other works, after Raphael, by Boucher Desnoyers, who has engraved the works of Raphael perhaps on the whole better than any other engraver; 'The Madonna de San Sisto,' by Müller, and 'The Dispute on the Sacrament,' after Raphael, of Keller. No engravings executed in this country come up to the works of these last-named masters, who have engraved works of a higher class than the majority of those done by Strange, while the drawing and general treatment of their works are in a purer and more correct style. However, the engravings of Burnet, Raimbach, Stewart, and others after Wilkie and contemporary British painters, deservedly hold the highest place among works of the class to which they belong, and betoken clearly the great influence which Strange exercised on their style. At present, few figure-subjects are executed in the line-manner, and that art has certainly fallen in this country. This may be accounted for, perhaps, by the great use made of mechanical appliances, in portions of the work, to save time, and by the preference shown for mezzotinto-engraving as practised at present, that is, with a mixture of lining or stippling.

The greater number of Landseer's works have been engraved in that way, and it is now adopted for rendering the works of John Phillip and Millais, and the leading artists of the day. Several, however, of Landseer's earlier works have been engraved

in the line manner, particularly his pictures of 'Drovers leaving the Grampians,' and 'The Watering-place,' by Watt, which are capital examples of line-engraving. There is no good modern school of landscape-engraving on the continent; the influence of Woollet was entirely confined to this country, where landscape-engraving, particularly in illustrated works after Turner, has attained great excellence.

Towards the end of last century, mezzotinto-engraving was practised in England with great success; arising from its being peculiarly adapted to render effectively the works of Sir Joshua Reynolds. M'Ardell, Earlom, Watson, Smith, Valentine Green, and Ward were among the best engravers of his works. The invention of this process is generally given to Prince Rupert, others ascribe it to Dr. Wren, 1662, and state that Prince Rupert merely improved on the invention. It has been practised very generally from the time of its invention, but attained its highest position in Sir Joshua's time; and it is very successfully carried out now, in an altered manner, additional force being aimed at, by means of stippling and etching. It is well calculated for producing broad effects: Turner's *Liber Studiorum*, and the land-scapes after Constable, are admirable examples of its capabilities in this way; the effect in Turner's plates, however, is heightened by etching.

Etching has been already described as a part of the process of engraving; but as practised by painters, it is classed as a distinct art. The plate is prepared with a ground, and corroded in the same way; but the treatment is more free. Not being tied to the task of literary copying or translating the idea of another, like the engraver, the painter has scope to impart a spirit to his work peculiarly suggestive of what he intends to embody; his idea is represented directly, and not at second-hand, as it were. The etchings of Rembrandt, Paul Potter, Karl du Jardin, Adrian Vandewelde, Teniers, Ostade, Berghem, Backhuysen, Van Dyck, Claude, Salvator, Rosa, Canaletti, and other painters, are very highly valued, as conveying more completely the feeling of the painter than the best engravings. Etching was more practised by the old than by modern painters; yet Wilkie, Landseer, and other modern artists, have etched various plates, remarkable for character and spirit.

English Works on Engraving—Sculpture, or the History and Art of Chalcography and Engraving on Copper, by John Evelyn (Lond. 12mo, 1663; 8vo, 1755); *The Art of Engraving and Etching, with the Way of Printing Copper-plates*, by M. Faithorne (Lond. 1702); *Sculptura Historico-technico, or the History and Art of Engraving, extracted from Baldinucci Florent, Le Compt, Faithorne, and other authors* (4to, 1747—1770); *An Essay upon Prints*, by Gilpin (Lond. 1767—1781); Strutt's *Biographical Dictionary of Engravers* (1785); Landseer's *Lectures on Engraving* (1806); *The Origin and Early History of Engraving*, by William Young Otley (1816); *Histoire de la Gravure*, by George Duplessis (1880); *The Graphic Arts*, by P. J. Hamerton (1882)—a very comprehensive and excellent work.

Of late years, many inventions have been introduced, having for their object to supersede the slow and laborious manual operations of engraving by means of machinery and other appliances. It is, however, to business and ornamental purposes that they are chiefly applicable, and not to the production of artistic work of the kind treated of in this article. The subject will be noticed under MACHINE ENGRAVING, MEDALS, GLASS, &c. With regard to the reproduction of plates, and other applications of galvanic electricity to engraving, see GALVANISM and MAGNETO-ELECTRICITY. See also PHOTOGRAPHIC ENGRAVING.

ENGRAVINGS, PROPERTY OF. The property of engravings and prints is secured by statutes similar to those for the protection of literary property. By 8 Geo. II. c. 13, the property of historical and other prints was declared to be invested in the inventor for 14 years. The proprietor's name must be affixed to each print, and the statute imposes a penalty on printsellers and others pirating the same. The provisions of this statute were extended by 7 Geo. III. c. 38, which secures to the widow of William Hogarth the sole right of printing and reprinting his works for the period of 20 years. The other acts are 17 Geo. III. c. 57, 6 and 7 Will. IV. c. 59—which extends the former acts to the whole United Kingdom—and 15 Vict. c. 12. The remedy was also simplified by 25 and 26 Vict. c. 68, enabling justices of the peace and the sheriff to act summarily in recovering penalties. The act 15 Vict. c. 12, was passed to explain the international copyright acts, and to explain the acts relating to copyright in engravings—reduces the duties on foreign engravings, and extends the protection of the acts to prints taken by lithography, or 'any other mechanical process by which prints or impressions of drawings or designs are capable of being multiplied indefinitely'—a clause which has now been found to cover photographs.

ENGROSSING AND REGRA'TING. An engrosser, regrater, or forestaller is a person who buys grain, flesh, fish, or other articles of food, with the intention of selling them again at an enhanced price, either in the same fair or market, or in another in the neighborhood, or who purchases or contracts for corn while

still in the field. These practices were regarded as criminal in most countries, before the laws by which trade is regulated were properly understood. In England, they were forbidden by various statutes, from the time of Edward VI. to that of Queen Anne. These statutes were repealed by 12 Geo. III. c. 71, on the preamble that it hath been found by experience, that the restraints laid upon the dealing in corn, meal, flour, cattle, and sundry other sorts of victuals, by preventing a free trade in the said commodities, have a tendency to discourage the growth, and to enhance the price of the same. It was found, however, that engrossing was not only a statutory but a common law offence, and a prosecution for it in the latter character actually took place in the present century. The Act 7 and 8 Vict. c. 24, for abolishing the offences of forestalling, regrating, and engrossing, was consequently passed.

Besides declaring that the several offences of badgering, engrossing, forestalling, and regrating be utterly taken away and abolished, and that no information or prosecution shall lie either at common law or by virtue of any statute, either in England, Scotland, or Ireland, this statute repeals a whole host of earlier enactments in restraint of trade, which had been omitted in the statute in the time of George III., above referred to. The rubrics of these enactments give a curious picture not only of the trading errors, but in many other respects of the obsolete customs of our ancestors. The first, for example (51 Henry III), is called a 'Statute of the Pillory and Tumbrel, and of the the Assize of Bread and Ale.' Then there is an act passed in several reigns which provides for the punishment of 'a butcher or cook that buyeth flesh of Jews, and selleth the same to Christians.'

Notwithstanding the doctrine of the Scottish law, that statutes may be repealed by mere desuetude, it was thought safer to include the Scottish statutes to the same effect. The earliest is 1503, c. 38, and the latest 1661, c. 280.

The statute 6 and 7 Vict. c. 24 does not apply to the spreading of false rumors, with the intent to enhance or deery the price of merchandise, or preventing goods from being brought to market by force or threats, which continue to be punishable as if that act had not been made.

ENGROSSING A DEED. See INGROSSING.

ENGUE'RA, a town of Spain, in the province of Valencia, 43 miles south-west of the town of that name. It is poorly built, and has narrow and irregular streets. It has manufactures of linen and woollen goods, and some trade in cattle and agricultural produce. Pop. (1877) 6358.

ENGUICHÉ. A hunting-horn, the rim around the mouth of which is of a different color from the horn itself, is said heraldically to be enguiché, of the color in question.

ENHARMON'IC, a term applied in Music when the name of a note is changed without any sensible difference of sound, such as C, D, F and G sharp. Correctly speaking, there is or ought to be, a difference; but on keyed instruments, such as the organ and pianoforte, there can be none, as the same key serves for both sharp and flat, while with a just equal temperament the ear is in no way offended. In harmony, the principal seat of enharmonic change is in the chord of the diminished seventh, which, by a change of the notes, may be treated fundamentally in four different ways, without any sensible difference in the intonation.

ENKHUI'SEN, a fortified town and seaport of the Netherlands, in the province of North Holland, is situated on the western shore of the Zuider Zee, about 30 m. N.E. of Amsterdam. It is built with great regularity, and is of a circular form. The most important public building is an elegant town-house, with a lofty tower. There are two Dutch Reformed Churches, to which five-sixths of the people belong, the rest being Lutherans, Roman Catholics, Moravians, and Jews. The chief industries are ship and boat-building, rope-spinning, sail-making, refining salt, brewing, &c. There is a small trade in butter, cheese, corn, timber, cattle, and fish. Several vessels are engaged in the herring-fishing. Pop. (1880) 5774.

ENLISTMENT is the mode by which the English army is supplied with troops, as distinguished from the CONSCRIPTION prevailing in many other countries. Enlistment was in private hands until the year 1802, middlemen procuring recruits, and receiving a profit or commission for their trouble. This system being subject to much abuse, the matter was taken into the hands of the government in the above-named year, and is now managed by the adjutant-general. Formerly, a soldier enlisted for life, and could never look forward to a period of freedom; or, at best, he could not retire on a pension while still possessed of a fair share of health and strength. This system was changed in 1847, by an act relating to limited enlistment; which provided that a man should enlist for 10 years for the infantry, or for 12 for the cavalry or artillery. At the expiration of this period, he could either quit the army, without pension; or re-enlist for the remainder of 21 years for the infantry, or 24 years for cavalry or artillery.

This second period of service entitled the soldier to a pension for life, after his discharge; and, in 1868, two-pence a day was added to the pay of every soldier who re-enlisted (or re-engaged). This system of enlistment provided soldiers; but did nothing for the growth of trained reserves, with which to bring the army to fighting strength in the event of war. The 'Army Enlistment Act,' of 1870, seeks to remedy this defect, by allowing men to enlist for 12 years, with the understanding that 6 years or less shall be passed with the colors, and the remainder with the reserve. This is known as 'short service;' and, under the system, from 1876 onward, a reserve of trained soldiers will be formed. It is estimated that with an army of 180,000 men, of whom three-fourths are to serve only six years with the colors, there will accrue by 1882, a reserve of 100,000 trained men, all under 32 years of age. If apprentices enlist, the master may recover them under certain conditions detailed in the Mutiny Act (q. v.) (the place of which is now taken by the Army Discipline and Regulation Act of 1879). Servants enlisting before the term of their engagement, are validly enlisted, and are entitled to wages up to the date of enlistment. Periods of imprisonment are not reckoned as part of the time of limited enlistment. A recruit enlists into either one of the 70 sub-district brigades, each of which comprises either a two-battalion regiment, or two single-battalion regiments, or he enlists for general service in any regiment to which the Adjutant-general may post him; but artificers, as armorers, &c., are usually enlisted for general service, so that their services may be made available where most required. The Army Discipline and Regulation Act of 1879 made several important alterations in regard to enlistment. The recruit had always to appear before a magistrate, but formerly could not refuse to take the oath without paying a fine of twenty shillings. Now he is not enlisted until he appear before the magistrate, who causes to be read to him a series of authorized questions, and satisfies himself that the man is not under the influence of liquor and voluntarily agrees to enlist. The recruit then signs the declaration, takes the oath, and is attested by the magistrate. If the recruit does not so appear, or appearing does not assent, no further proceedings are taken. If within three months of his attestation a recruit pays a sum not exceeding ten pounds, he is now entitled to be discharged.

ENLISTMENT, in the Navy, is managed by the Admiralty, and is changed from time to time in its details, according to the degree of willingness among seafaring men to enter the service. In 1830, an act was passed to give certain additional advantages to volunteer seamen. In 1835, another act empowered the crown to double the amount of bounty given to a volunteer, if he was already a seaman. In 1847, it was enacted that such persons as were entitled, if enlisted, to double bounty, should form a select class; and that ship-owners should not be allowed to hire such persons as crews for merchant-ships, if the government thought proper to issue a proclamation to that effect. At the commencement of the war with Russia, in 1854, it was deemed expedient not only to give extra bounties to seamen willing to enlist, but to make a money-present to seamen already in the navy, as an equivalent advantage. The bounty given to seamen varies from time to time, according to the exigencies of the service; but recent legislation has established a distinction between *limited* and *continuous* service. A seaman may enlist for five or for ten years, or for the period the ship he enters is in commission; if for the longer period, he receives higher pay and other advantages. At the end of this longer period, he may demand his discharge; and, if abroad, he may claim to be brought home free of expense. His commanding officer may, in emergency, retain his further service for six months, on payment of another increase of pay. The crown, besides, possesses a power of compelling renewed service from seamen under certain conditions, in case of invasion or other national peril.

Other matters bearing on this subject will be found noticed under BOUNTY, COAST VOLUNTEERS, IMPRESSMENT, and MANNING THE NAVY.

ENMANCHÉ, or EMANCHÉ. See MANCHE.

ENNEMOSER, JOSEPH, known as a medico-philosophic writer, was born 15th November 1787, at Hintersee, in the Tyrol, and commenced his academic studies at Innsbruck in 1806. On the rising of the Tyrolese against the French in 1809, E. followed Andreas Hofer as his secretary, and honorably distinguished himself in battle on several occasions. At the close of the war, he went to Erlangen, and subsequently to Vienna, for the purpose of concluding his studies. Here, however, he experienced the greatest difficulty in procuring the means of subsistence, but fortunately fell in with a merchant from Altona, in whose company he traveled for some time. When Napoleon declared war against Russia in 1812, E. was despatched to England, to solicit aid for the Tyrolese in their meditated insurrection against the French domination. He was afterwards appointed by Friedrich Wilhelm III., king of Prussia, an officer in a regiment of volunteers, and soon gathered about him a company of Tyrolese marksmen, who were of great service during the campaigns of 1813 and 1814. After the

peace of Paris, E. went to Berlin, where he finished his curriculum, and in 1816 took his degree of Doctor of Medicine.

In 1819, he was made Professor of Medicine at the new university of Bonn, where he lectured on Anthropology, Physical Therapeutics, and Pathology. A love of his native country induced him to settle as a physician in Innsbruck, but in 1841 he went to Munich, where he obtained a great reputation by the application of magnetism as a curative power. Among his writings may be mentioned, *Der Magnetismus in seiner geschichtlichen Entwicklung* (Leip. 1819), which is reckoned his principal work; *Historisch-psychologische Untersuchungen über den Ursprung und das Wesen der Menschlichen Seele* (Bonn, 1824); *Anthropologische Ansichten zur bessern Kenntniss des Menschen* (Bonn, 1828); *Der Magnetismus im Verhältniss zur Natur und Religion* (Stuttg. 1842); *Der Geist des Menschen in der Natur* (Stuttg. 1849); *Was ist die Cholera* (2d edit., Stuttg. 1850); and *Anleitung zur Mesmer'schen Praxis* (Stuttg. 1852). He died in 1854.

ENNIS, a parliamentary and municipal borough, chief town of County Clare, Ireland, on the Fergus, 20 miles W.N.W. of Limerick, is a neat town, with some good houses. Pop. (1871) 6503, of whom 6102 were Roman Catholics, and 401 of all other denominations; (1881) 6307. It returns one member to parliament. It has the ruins of a monastery founded in 1240 by O'Brien, Prince of Thomond. Near the town is Ennis College, founded by Erasmus Smith. E. has a valuable limestone quarry, large flour-mills, and some trade in grain and cattle.

ENNISCO'RTHY, a market-town in the middle of Wexford county, Ireland, on a rising ground on the Slaney, 14 miles N.N.W. of Wexford. The Slaney is here tidal and navigable for barges, and flows through a fertile and beautiful valley. Pop. (1871) 5594; (1881) 5666, of whom about 5000 were Roman Catholics. E. has a large corn-trade. It arose in a Norman castle, still entire, founded by Raymond le Gros, one of the early Anglo-Norman invaders. Cromwell took E. in 1649; and the Irish rebels stormed and burned it in 1798.

ENNISKILLEN, a parliamentary and municipal borough, chief town of county Fermanagh, Ireland, about 75 miles W.S.W. of Belfast, is beautifully situated on the Erne; the greater portion on an isle in the river between the Upper and Lower Loughs Erne. It consists mainly of one undulating street running E. and W. Around, are richly cultivated eminences and many fine mansions. Its two forts command the only pass for 50 miles into Ulster across the Erne. The chief manufactures are cutlery and straw-plait. Pop. (1871) 5836, of whom 3272 were Roman Catholics, 2096 Episcopalians; (1881) 5836. It returns one member to parliament. E. is famous for the victory, in 1689, of the troops of William III., under Lord Hamilton, over a superior force of James II., under Lord Galmoy. The banners taken in the battle of the Boyne hang in the town-hall. The regiment of Enniskilleners, or 6th Dragoons, was first instituted from the brave defenders of the town.

E'NNIUS, one of the earliest Roman poets, the father of the Roman Epos, was born at Rudiae, in Calabria, about 240 years before the Christian era, and was probably of Greek extraction. He is said to have served in the wars, and to have risen to the rank of a centurion. In Sardinia, he became acquainted with Cato the Elder, and returned with him to Rome when about the age of 38. Here he gained for himself the friendship of the most eminent men, among others that of Scipio Africanus the Elder, and attained (what was then exceedingly rare in the case of an alien) to the rank of a Roman citizen. He supported himself in a decent but humble manner by instructing some young Romans of distinguished families in the Greek language and literature, his accurate knowledge of which explains the influence he had on the development of the Latin tongue. He died when he had attained the age of 70, or about 190 B.C. His remains were interred in the tomb of the Scipios, and his bust was placed among those of that great family. E. has tried his powers in almost every species of poetry, and although his language and versification are rough and unpolished, these defects are fully compensated by the energy of his expressions, and the fire of his poetry. His poems are highly esteemed by Cicero, Horace, and Virgil: the last, indeed, frequently introduces whole lines from the poetry of E. into his own compositions. His memory seems to have been lovingly cherished by his countrymen; *Noster Ennius*, 'Our Ennius,' they used to call him. Of his tragedies, comedies, satires, and particularly of his *Annales*, an epos in 18 books, only fragments are still extant. What adds to our regret is, that it is believed his whole works were extant as late as the 13th c. (A. G. Cramer, *Hauschronick*). The fragments have been collected and edited by various scholars, among others by Hessel (Amst. 1707). The fragments of the *Annales* have been edited by Spangenberg (Leip. 1825). Compare Hoel, *De Ennianorum Annalium Fragmentis* (Bonn. 1839). The few fragments of his dramas that have come down to us were collected by Ribbeck in his *Scenica Romanorum Poesis Fragmenta* (2 vols. 1871-73).

ENNS, a river of Austria, rises at the northern base of a branch of the Noric Alps in the crown-land of Salzburg, 12 miles south of Radstadt. It first flows north to Radstadt, then north-north-east to Hietlau, after which it proceeds in a general direction north-north-west, passes Steyer, and joins the Danube 11 miles below the town of Linz, after a course of about 120 miles. Its chief alluents are the Salza and the Steyer. For the last 15 miles of its course, the E. forms the boundary between Upper Austria (Ober der Enns) and Lower Austria (Unter der Enns). The scenery on the banks of the E. is in general bold and romantic, as it flows, for the most part, between parallel mountain-chains, which are lofty and precipitous. In its lower course, it becomes navigable, but it is chiefly important from the valuable water-power which it supplies.

ENOCH, the name of two different individuals in Scripture.—1. The eldest son of Cain, who built a city which was called after his name.—2. The son of Jared, and father of Methuselah. A peculiarly mysterious interest attaches to him on account of the supernatural manner in which his earthly career terminated. We are told by the writer of Genesis, that E. 'walked with God 300 years . . . and he was not; for God took him.' What the statement 'he was not' signified to the later Jews, is explained by the writer of the Epistle to the Hebrews: 'Enoch was translated that he should not see death.' E. and Elijah are the only human beings on record who did not require to discharge the debt which mortals owe to nature. It may naturally be supposed that E. was a character on whom the extravagant fancy of the later Jews would fasten with unusual pleasure. As they came more and more into contact with Grecian and other culture, they felt the necessity of linking on the arts and sciences of Gentile nations to their own history, if they would continue to preserve that feeling of supremacy which was so dear to their pride as the chosen people. Hence, E. appears as the inventor of writing, arithmetic, astronomy, &c., and is affirmed to have filled 300 books with the revelations which he received, the number 300 being obviously suggested by the number of years during which he is said to have walked with God.

ENOCH, BOOK OF. This book, from which curiously enough, St. Jude quotes as if it were history, shows how richly mythical the history of the mysterious antediluvian Enoch had become! It was probably written originally in Aramaic, by a native of Palestine, in the 2d c. B.C. The precise date is not known. At subsequent periods, it would seem to have been enlarged by additions and interpolations. It is divided into five parts; and the *first* discourses of such subjects as the fall of the angels, and the journey of E. through the earth and through Paradise in the company of an angel, by whom he is initiated into the secrets of nature, &c.; the *second* contains E.'s account of what was revealed to him concerning the heavenly or spiritual region; the *third* treats of astronomy and the phenomena of the seasons; the *fourth* represents E. beholding, in prophetic vision, the course of Divine Providence till the coming of the Messiah; and the *last* consists of exhortations based on what had preceded. The book was current in the primitive church, and was quoted by the Fathers, but was lost sight of by Christian writers about the close of the 8th century, so that until last century it was only known by extracts. Fortunately, however, the traveler Bruce discovered in Abyssinia three complete MSS. of the work, which he brought to England in 1773. These MSS. proved to be an Ethiopic version made from the Greek one, in use among the Fathers, as was evident from the coincidence of language. The Ethiopic version did not appear till 1838, when it was published by Archbishop Lawrence. An English translation, however, by the same writer, had appeared in 1821, which passed through three editions, and formed the basis of the German edition of Hoffmann (Jena. 1833—1838). In 1840, Gfrörer published a Latin translation of the work; but by far the best edition is that of Dr. A. Dillman, who, in 1851, published the Ethiopic text from five MSS.; and in 1853, a German translation, with an introduction and commentary. An English translation, with notes, was published in 1882 by Professor Schodde, of Ohio, U.S.

ENOS (anciently, *Ænos*), an ancient town and seaport of European Turkey, in the province of Adrianople, is situated on a rocky isthmus at the mouth of a gulf of the same name, about 35 miles west-north-west of Gallipoli. It is the port of Adrianople, and has some trade in wool, camels' hair, cotton, leather, silk, &c. Its harbor is commodious, but so shallow, from being choked up with sand, that it admits only small vessels. Pop. 6000, principally Greeks. The Gulf of Enos is about 2½ miles wide at the entrance, extends into the country for about 14 miles, and is on an average 5 miles broad.

The town of E. is very ancient. Virgil mentions it (*Æn.* iii. 18) as being one of the towns founded by Æneas after the sack of Troy; and Homer also attests its antiquity by alluding to it in his great poem (*Il.* iv. 519).

ENRIQUEZ, GOMEZ ANTONIO (properly, **ENRIQUEZ DE PAZ**), a Spanish poet, the son of a baptized Portuguese Jew, was born

at Segovia early in the 17th century. He entered the army in his 20th year, and rose to the rank of captain; but in 1636, had to flee the country, to escape the persecution of the Inquisition, which suspected him of a secret leaning to the creed of his father. E. settled at Amsterdam, and latterly professed the Jewish faith; in consequence of which he was burned in effigy by the pious Catholics of Seville, 14th April 1660. The date of his death is not known. During his residence in Spain, E. had considerable reputation as a dramatic poet. According to his own account, he wrote 22 comedies, which met with great success on the stage, in consequence of which several of them passed as Calderon's. *La prudente Abigail*, *Engañar para reinar*, *Celos no ofenden al sol*, and *A lo que obligan los celos*, were published under the name of Fernando de Zarate. E.'s comedies show him to have possessed much inventiveness, but in other respects they deserve little praise. Among his other writings are *Las Academias morales* (Rouen, 1642), containing some fine elegiac verse; *La Culpa del primer peregrino* (Rouen, 1644), a mystico-theologic poem; *El siglo Pitagórico* (Rouen, 1647), a series of satirical portraits partly in prose and partly in verse; and *El Samson Nazareno* (Rouen, 1656), an abortive epic. For a notice of E. and his writings, see Ticknor's *History of Spanish Literature*.

ENROLMENT, entry upon a register or record.

Enrolment of Deeds.—In order to prevent the secret transfer of lands which was effected in England by means of a Bargain and Sale (q. v.), it was provided by 27 Hen. VIII. c. 16, that the deed must be enrolled; but a mode was soon adopted by Lease and Release of evading that Act and attaining the same end. By the Fines and Recoveries Act (3 and 4 Will IV. c. 74), it is enacted that all transfers of land effected under the provisions of that statute, must be enrolled in the Court of Chancery within six months after the execution.

Enrolment of Decree in Chancery.—A decree in a suit in Chancery did not receive full effect until it had been enrolled. And it used to be a practice to enroll a decree, and so prevent any appeal except to the House of Lords. But enrolment after 1876 became useless; and it no longer prevents the usual appeal to the Court of Appeal in the first instance, and thence to the House of Lords. The general rule under the Judicature Acts is that every decree may be appealed from within a year if final; and within 21 days if interlocutory. All appeals are now by way of re-hearing, and no petition case or other formal proceeding than notice of motion is necessary.

ENSCHE'DÉ, a town in the Netherlands, province of Overysel, lies about four miles from the Hanoverian boundary, and 30 miles west-north-west of Zutphen. Besides fustians and dimities, cottons for export to Java are largely manufactured. Cotton-spinning, bleaching, dyeing, and calendering also employ many of the inhabitants. There are several benevolent institutions, a Reformed, a Roman Catholic, a Baptist Church, a Chamber of Trade, and grammar-school, in which French, English, and German are taught. Pop. (1880) 5500.

ENSEMBLE (Fr.), the general effect produced by the whole figures or objects in a picture, the persons and plot of a drama, or the various parts of a musical performance.

ENSIGN was, until 1871, the title of the lowest combatant rank of commissioned officers in the British army, and is derived from their being charged with the duty of carrying the regimental colors or ensign (Fr. *enseigne*, Lat. *insigne*). In the hand-to-hand mêlées of the middle ages, the preservation of the colors or standard, as the rallying-point of those fighting under the same leader, was a matter of vital importance, and was only intrusted to the bravest and most trustworthy. The colors were committed to him with imposing ceremony in presence of the assembled regiment, and he had to take an oath to defend them with life and limb, and if need were, to wrap himself in them as a shroud, and devote himself to death. The man who undertook this perilous post received sometimes as much as sixfold the usual pay. It was doubtless in this way that the point of honor arose respecting the colors. History records repeated instances where the oath was kept to the letter. In the modern system of warfare, the regimental colors are seldom exposed to such danger, and the office of ensign is of less account. In the infantry, there were two kinds of subalterns below the captain, viz., the lieutenant and the ensign. In the cavalry and artillery, the duties of ensign were taken by officers who had the titles of cornet or second-lieutenant. When a gentleman entered the army, he began as an ensign (if in the infantry), and from this rank he rose by purchase or seniority. The price of an ensign's commission is stated under COMMISSIONS. ARMY, as well as the extra price to be paid on rising to the rank of lieutenant. The pay was 5s. 3d. per day, and the half-pay 1s. 10d. to 3s.; although it was most unusual for an ensign to be on half-pay. An ensign in the Foot Guards ranked as a lieutenant in the army, and on transferring his services to an infantry or cavalry regiment, exchanged with an officer of that grade.

The rank of ensign having been abolished in the British army, the number of lieutenants has been proportionately increased; but for three years the officer only receives the same pay as the ensign formerly had. The officer enters in the probationary grade of sub-lieutenant, which is converted to lieutenant as soon as he proves himself qualified to command soldiers.

In the late East India Company's army, a cadet became an ensign, in rank and pay, directly he landed in India.

ENSIGN is also the name of one of the flags belonging to the British fleet; and, under that or some other name, to most other fleets. It is a large flag or banner hoisted on an ensign staff, a long pole erected over the poop, or at the gaff when the ship is under sail. Its chief purpose is to denote the nation to which the ship belongs. The English ensign has for a groundwork one of three colors—red, white, or blue—and bears the Union double cross of St. George and St. Andrew, or Union-Jack (q. v.), in the upper corner next the mast (dexter-chief). The white ensign is also divided into four quarters by a red cross of St. George, and is limited to ships-of-war. Merchant-vessels are only allowed to carry the blue ensign; but yachts, if of clubs acknowledged by the Admiralty, colonial armed vessels, ships connected with government departments, and merchant-vessels commanded by officers of the Naval Reserve, are permitted to use the red ensign. Formerly, the English admirals required ships of all other nations to dip their ensigns to the English flag: the refusal of the Dutch to comply with this custom, was the signal for one of Blake's bloodiest encounters with Van Tromp.

ENSILAGE (a French word, through the Spanish, from the Latin *sirus* or *syrus*, Greek *siros*, a pit, whence the Spanish verb *ensilar*, to store grain in a *silo* or pit) is the preservation of green forage in an air and water tight silo—the contents being tightly pressed down so as to get rid of and permanently exclude the oxygen of the air, and thereby prevent putrefactive fermentation. Desiccation being thus avoided, the ensilaging of the fodder prevents the loss of feeding qualities. Silos, or underground vaults for the storage of grain, are of very early date and widespread practice; distinctly traceable in Enripides, Theophrastus, and others, and in the records of various ancient nations. They are still in extensive use in Syria, Turkestan, and parts of Africa. The German *Sauerkraut* is salt ensilaged cabbage; green gooseberries preserved till Christmas in stoppered air-tight bottles are ensilaged fruit. In 1850, we meet with a minute account, by the Rev. John Wilson of the German and East Prussian method of ensilaging the green crop of grass, clover, or vetches. In 1874, M. Goffart, at Château Burtin, in the department of Loir-et-Cher, stored 250 tons of green maize, mixed with one-fifth of its weight of rye-straw chaff, in pits of twelve yards long by two yards deep; the walls being of stone and cement, and the bottom paved. This example was followed by a few French agriculturists. The experiment attracted attention in America; Mr. Mills of New Jersey has the credit of having been the first to put it to the proof in that country; and by a system 'within the reach of most farmers,' kept 120 cattle and twelve horses for seven months on the produce of thirteen acres.

In 1878, Professor Caldwell of Cornell University packed short-chopped and straw-covered green fodder in a triangular heap fifteen feet long and six feet high, rendered air-tight by a foot and a half of earth. In this way, green fodder was kept available for a year. Soon, bricks and mortar, stone and cement, took the place of earth. A work by M. Goffart on the subject having been translated into English in 1879, induced hundreds of Americans to give the system a trial. From September 22 to 30 of that year, a big silo on Winning Farm, Massachusetts, was filled with the fodder from off seven acres, and on the 3d December, when it was opened, the outcome was generally pronounced satisfactory, although the sourness of the fodder, in contrast with that in the French silos, was remarked. In 1882, a conference of ensilage experimenters was held in New York, at which it was concluded that ensilage yielded a markedly superior product at a markedly inferior outlay. In 1882, a party of Norfolk farmers and landowners, on a tour of inspection into Dutch farming, reported their utmost satisfaction with the results of their examination of an ensilage pit in Holland. In a Report issued 1882, by the Commissioners of Agriculture for the United States, 91 sets of replies to 26 practical questions all unanimously concurred in the most favorable testimony to the value of ensilage; 'a stock of cattle can by ensilage be kept at one-fourth the expense of any other method.' On October 9, 1882, there were opened on Albert Farm, Glasnevin Ireland, silos of a very rude description which had been stored with fresh fodder in July; and the results were favorable in full proportion to the deserts of the silos. In 1881, in spite of a very protracted drought, Mr. Wolcott of Boston, Massachusetts, was able to keep four times as many cows on the same acreage by ensilage as he had formerly been able to keep with green food in summer and hay in winter. On the produce of two crops from 34 acres, about 780 tons of green forage, put into his silo in 1882, he arranged to

feed 80 cows for twelve months. A correspondent of the U.S. Commissioner of Agriculture sold ensilage at from 24s. to 36s. per ton, which had cost him only 8s. to produce. In the silo of the Vicomte de Chezelles, at the Château Bouleau, Liancourt, St. Pierre—the largest, probably, then in Europe—72 yards long, 6½ yards wide, 4½ yards high from the ground level, 4 yards deep below the ground level—there were stored, in October 1882, the produce of 170 acres of trefoil, lucerne, tares, and grass, filling the whole pit except some 10 feet at the end occupied by the remainder of the previous year's ensilage—the whole dependence, in fact, for the winter of 20 horses, 36 bullocks, 120 milch cows, and 1200 sheep. Both the old and the new ensilage was eaten with evident relish by the cattle. Silos are built of very various forms and dimensions, the aim in all cases being simply to render them to the utmost air and water proof. The rectangular shape, with width about one-third the length, has hitherto been deemed most advisable; but recently, M. Goffart has constructed 'elliptical' silos, as obviating the angularity which so far resists settlement and density of packing.

In America, silos of 40 feet long, 16 feet broad, and from 16 to 24 feet deep, are deemed the cheapest. When a silo is very large, it is perhaps best to partition it off into sections for convenience of successive packing; with the advantage also, that when one section is opened, it may be kept open without damage till the whole is used. Yet, in the case of the enormous one at Château Bouleau, the ensilage is simply cut away when wanted, as a truss of hay from a stack. The walls are built of brick or concrete, with a facing of cement, about 14 inches or more of thickness, to resist pressure. The floor should be paved, and the soil on which it rests well drained. The structure may be above or below, or partly above, partly below, the level of the ground. The cost of the Duke de Chezelles' silo was reckoned at £2 to £3 per acre. Silos in England would seem to cost somewhat more, but the expense will vary much with local circumstances. Silos of galvanized iron or metal (to be sunk in the earth) have also been made and used. Rye, oats, clover, lucerne, vetches, millet, tares, grass, all kinds of crop except roots, may be stored in the silo. Corn, rye, &c. should be cut when the grain is in the 'milk.' Delay renders the fodder poor, and in the case of corn is apt to irritate the gums. A farmer can be filling his silo from June to October, as the successively sown crops successively reach the 'milk' point. The quality of fodder is not at all deteriorated by being cut, carried, and packed in wet weather. Maize, the heaviest forage crop, might, therefore, be safely sown for silos in the south of England. Some pack without shredding; but mostly the corn-stalks are shorn by the steam chaff-cutter into one-inch, half-inch, or quarter-inch lengths. When a silo is to be packed, a wall of planks 8 feet or 10 feet high is raised round the pit, and the whole is filled to the top. The mass soon sinks. Horses are walked over it to tread it down. It may next be covered with straw, then overlaid laterally with planks covered with earth, and weighed heavily down with stones or bricks or barrels of sand. There is no danger of over-compression. It is generally held that a pit should not be disturbed for three months after being filled. The silos should be under the same roof with the cowhouse. Ensilage on being opened is always of a high temperature in a slight fermentation, and of sub-acid or vinous taste. This, however, is deemed no deterioration to the original substance, as the preserved fodder is no less appetizing to the cattle; and the change is thought to correspond with the state brought about in fresh forage after it has passed into the first stomach of ruminant animals. It is singular how little difference is revealed by chemical analysis between green and ensilaged fodder; in the latter the albuminoids are slightly decreased and the soluble carbo-hydrates increased. In wet and late harvests, the custom of ensilage would be invaluable in Britain, where hay is frequently lost or spoiled by the bad weather. It would greatly increase the stock-raising capacity of the country, and so tend to the more perfect fertilization by natural manure of the grain-bearing lands. See Professor Thorold Rogers's *E. in America* (1883); works by Woods, Christy, and others; and numerous articles in the *Field*, 1882 and 1883.

ENTABLATURE, that part of a design in classic architecture which surmounts the Columns (q. v.), and rests upon the capitals. It is usually about two diameters of the column in height, and is divided in every style of classical architecture into

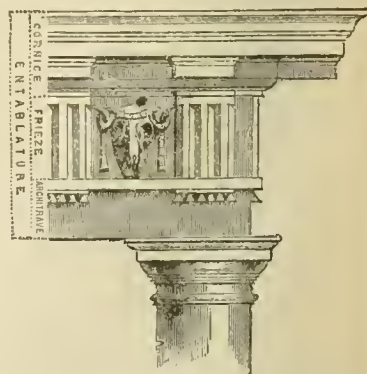


Fig. 1.—Example of Doric Entablature.

height, and is divided in every style of classical architecture into

three parts—architrave, frieze, and cornice. These parts vary in their relative proportions in different styles. In Doric architecture, for example, if the entablature be divided into eight equal parts, two of these form the height of the architrave, three that of the frieze, and three that of the cornice. In the other styles, the relative proportions are as three, three, and four.

The term entablature was not used till the 17th c., the members composing it being previously simply designated the cornice, frieze, and architrave.

1. *The Architrave* is the horizontal portion which rests immediately upon the abacus of the column. It is usually ornamented with horizontal mouldings, with flat spaces or *faciæ* between. The upper moulding always projects further than the others, so as to throw off the rain. This moulding varies in different styles. In Doric (fig. 1), it is a plain square projection, with small pendants or *guttae* under the triglyphs. In the other styles, it is generally an ogee or talon moulding. These mouldings are frequently enriched with leaf ornaments, and in very florid designs the *faciæ* are also enriched.

2. *The Frieze* is the middle portion of the entablature, between the top of the architrave and the bed of the cornice. In the Doric style, it is ornamented with triglyphs or slight projections, divided by angular grooves into three parts. The spaces between the triglyphs (called metopes) are square, and are either plain or enriched, either with figure-sculpture, as in the Parthenon, or with bulls' heads, pateræ, or other ornaments. In the other styles, the frieze is never cut into portions, but is either left quite plain or ornamented with figure-sculpture or scroll-work. The former is most usual in Greek art, the latter in Roman. In late Roman works, the frieze is sometimes *swelled* or made to project with a curve.

3. *The Cornice* forms the upper portion of the entablature. It is divided into several parts. The lower moulding or mouldings resting on the frieze are called the bed-mouldings—the upper projecting part is called the Corona (q. v.), and between the two there are frequently introduced modillions and dentil bands. The bed-moulding is generally of an oval or echinus form, and is frequently enriched with the egg and tongue or leaf ornaments.

The upper moulding of the corona is generally of a *cymarecta* form (see COLUMN, fig. 1), and is often ornamented with lions' heads. These represent the opening through which the rain was at first led off from the roof-gutters, which were cut in the top of this moulding, and were retained as ornaments after their original use was discontinued. The corona projects well over the frieze and architrave, and protects them from rain, while at the same time, by its broad shadow, it gives repose and variety of effect to the building. The *soffit*, or under side of the corona, is frequently panelled and ornamented with pateræ.

Origin.—The component parts of the entablature are said, with some appearance of truth, to owe their origin to the forms of the construction of the oldest temples. These were of wood, and were put together in the manner most natural for that material. The square beams laid across from post to post are represented by the architrave; the triglyphs of the frieze are copied from the ends of the cross-beams; the cornice is taken from the boarding which covered the rafters and ties of the roof—projected so as to throw off the rain; and the dentils and modillions show the ends of the rafters left uncovered.

Whatever the origin of the entablature may have been, it is a remarkable fact, as connected with Greek and Roman art, how

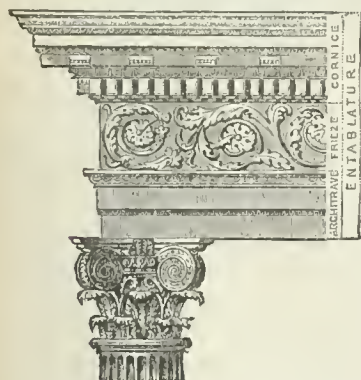


Fig. 2.—Example of Composite Entablature.

a manner still further removed from its original purpose (fig. 2). The strict proportions of the various parts were entirely lost sight of. The frieze was increased in height, so as to admit of small windows, to light the entresol or Mezzanine (q. v.), and in the French and English forms of the renaissance, the various members become still more attenuated and altered from the original design (see RENAISSANCE). But in no modification of classic

architecture, however debased, is the entablature wanting. The architrave, frieze, and cornice are essential portions of every classic design.

ENTADA, a genus of climbing shrubs of the natural order Leguminosæ, sub-order Mimoseæ, having pinnate or bipinnate leaves, and remarkable for their great pods, in which the seeds lie amidst a glutinous or gelatinous substance.

ENTAIL, or, as it is frequently called in Scotland, *tailzie*, from Fr. *tailler*, to cut, properly signifies any destination by which the legal course of succession is cut off, one or more of the heirs-at-law being excluded or postponed, and the settlement of land made upon a particular heir or series of heirs. The desire to preserve in our own family land which we have either inherited or acquired, appears to be inherent in the human mind. The first distinct trace of the existence of entails, is to be found in the Roman law. The Greeks, indeed, permitted persons to name successors to their estates, and to appoint a substitute who should take the estate on the failure of him first named. The substitute, as appointed, was permitted to succeed on the death of the institute (as he was called) without leaving issue or without alienating the estate. But this limited right fell far short of the power of entailing which has since prevailed in various countries. At Rome, under the later emperors, the practice of settling land upon a series of heirs, by means of *Fideicommissa* (q. v.), grew up, and was sanctioned by the state. These deeds, which were originally simply a trust reposed in the honor of a friend, to whom the property was conveyed, to carry out the will of the grantor, by degrees received the sanction of the law. In their early form, they contained merely a substitution of heirs. But by the later law, a much fuller form of settlement was admitted, whereby the estate was protected from every sort of alienation. It is impossible to doubt that the later Roman form must have been adopted by the Scottish lawyers in framing their deeds of entail. The limitation to a particular line of descent, the prohibition to alienate or burden with debt, and the still more peculiar feature of the declaration of forfeiture in case of non-compliance, are to be found in both forms. There are, however, two points in which the Roman law differed from that which prevailed for many years in Scotland—viz., that the former did not recognize the right of primogeniture, and that after the legislation of Justinian, the limitation of the deed was restricted to four generations. For the right of primogeniture, as recognized in deeds of entail, we are indebted to the feudal law. That system, which has united with the civil law to form a basis for the codes of modern Europe, did not, in its original form, recognize the right of a holder of land to alienate his feudal benefice, or even to alter the succession, because on the failure of heirs the feu returned to the superior. But the right of the eldest son to represent his father, both in the duties and privileges of the fief, if not an original principle of the system, was universally recognized in the days of its greatest power. We shall presently see how this principle was embodied in a Scottish deed of entail.

In England, the Saxons, it is said, prohibited the alienation of lands by those who had succeeded to them under condition that they should not alienate.—Wilkins's *Leges Saxonice*, p. 43 (note). Among the Saxons, the law of primogeniture was not recognized. But on the establishment of the feudal laws in England, a practice began to prevail whereby an estate was settled upon a particular series of heirs, as 'to a man and the heirs of his body.' This is the first germ of an entail in England. It was called a fee-simple conditional, because the judges refused to recognize an absolute limitation of the estate to a particular line of heirs, but held the destination to be conditional on the birth of an heir, and that that condition having been purified, the donee was free to alienate the estate. The common law thus refusing to recognize entails, a statute was passed which had the effect of introducing that practice into England. This was the famous statute *De Donis* (q. v.), whereby it was declared that the estate should be held *secundum formam doni*. In order to the creation of an entail under this statute, it was not enough that the estate was limited to 'a man and his heirs,' as those words were held to constitute an estate in fee; it was necessary that the estate should be given to 'a man and the heirs of his body,' or 'to a man and the heirs of his body by his wife Joan.' The former was called a general, the latter a special entail. Another form whereby lands might be entailed under the statute *De Donis*, was by settlement in Frankmarriage (q. v.). For nearly 200 years after the passing of this act, lands settled in the form which it prescribed continued to be held under the fetters of a strict entail. But the tendency of the law, which in Scotland, as we shall presently see, was to strengthen the power of entails, was, in England, in the opposite direction. For a long time, tenants in tail, taking advantage of legal technicalities, were able practically to defeat the limitation in tail by means of a Discontinuance. But it was not till the time of Edward IV. that an effectual means of evading the provisions of the act was brought into use; this was achieved by

means of a process called a common recovery. See FINES AND RECOVERIES. By this process, a tenant in tail could bar the entail, and convert the estate into a fee-simple. Another mode of barring an entail was by means of a Fine (q. v.). It had been declared by the statute *De Donis*, that levying a fine of lands should be no bar to the entail; but by 32 Hen. VIII. c. 36, it was enacted that a fine of lands, when duly levied, should be a complete bar to the tenant in tail, and those claiming under him. It is to be observed that the operation of a fine was confined to those claiming under the tenant in tail; those who had rights of reversion or remainder under the grantor of the entail were not excluded by this species of assurance; so that by means of a recovery only could an estate tail be converted into a fee-simple.

From the introduction of common recoveries till the passing of the Fines and Recoveries Act (3 and 4 Will. IV. c. 74), a period of more than 300 years, it was impossible that an estate could be held under the fetters of an entail, if the tenant in tail and the next heir chose to combine to defeat the entail. By the Fines and Recoveries Act, the technicalities formerly necessary in order to bar an entail were removed, and a tenant in tail may now, by a simple conveyance, alienate his estate at pleasure, at least where there is a possibility of issue. Under the modern settlement, where the estate tail is preceded by a life interest, the consent of the tenant for life is required to bar remainders and reversions. An estate tail is a freehold of a limited description. Tenant in tail may commit Waste (q. v.). Formerly, an estate tail was not liable to the debts of the tenant, but by 1 and 2 Vict. c. 110, this restriction has been removed. Copyhold lands have been held not to fall under the operation of the statute *De Donis*. A limitation, therefore, which in a freehold creates an estate tail, in copyhold lands creates a fee-simple conditional, according to the old common law, except where the custom of the manor is to the contrary. But by trust-conveyances, copyhold estates may be settled in the same way as freeholds. No land can be settled in England for more than the lives of existing persons, and twenty-one years thereafter; but, in point of fact, land is constantly re-settled by its aristocratic owners. Lord Cairns's Settled Land Act, 1882, has given to tenants for life absolute power of sale upon notice to the trustees of the settlement, and without petition to the court, the price being invested for the persons interested under the settlement. By a series of statutes in England, tenants for life have also received large powers of managing and improving their estates.

In Scotland, as in England, entails appear first to have taken their rise from the feudal usages. It has been observed by Lord Kames, that while the feudal system was in its vigor, every estate was in fact entailed, because no proprietor had any power to alter the order of the succession. But when the stricter feudal principles gave way, and the power of alienating land began to be recognized, the holders of estates sought to secure, by deed, in their own families the lands which they possessed. The form first adopted for this purpose was the simple destination, whereby the estate was simply limited to a particular series of heirs, without prohibition to alienate, or declaration of forfeiture for contravention of the will of the grantor. In this form, the deed must have resembled the early English entails. The feudal law of primogeniture having been received as a principle of common law, the estate would naturally descend from father to son in the line indicated by the deed. But, as it was held that those succeeding under this deed were not restrained from alienating, the practice of adding prohibitory clauses was introduced. Entails in this form were held to bind the heir from granting gratuitous alienations; but he was not restrained from selling the estate or burdening it with debt.

Early in the 17th c., a further addition was made to the form of the deed by the introduction of irritant and resolute clauses, i. e., clauses declaring the act of alienation to be null, and to infer the forfeiture of the estate. The form thus adopted, which resembles closely the form of the Roman deed already noticed, was fortified by a decision of the Court of Session on the Stormonth entail in 1662, holding that an estate so protected could not be attached by creditors. This decision created much difference of opinion amongst lawyers as to the power of the grantor thus to protect an estate from the onerous act of the heir, in consequence of which the famous Scotch Entail Act, 1685, c. 22, was passed, by which it was enacted that an estate conveyed by a deed fortified by prohibitory, irritant, and resolute clauses, and recorded in a particular register, should be effectually secured in the line of destination. This act has always been most strictly viewed by Scottish lawyers; and entails which have been found deficient in any of the prescribed requisites, have been regarded by the courts as utterly ineffectual. The operation of the old entail act was found, notwithstanding, to be of the most oppressive character. Statutes were in consequence passed from time to time, empowering heirs of entail to exercise larger powers of ownership than could be granted under the act 1685, and to make provisions for their families. Chief among these were the Montgomery, the

Aberdeen, and the Rosebery Acts. At length, by 11 and 12 Vict. c. 36 (known as the Rutherfurd Act), the power of fettering lands by a strict entail has been finally destroyed. By this act, heirs under an existing entail may disentail, with the consent of certain heirs next in succession; and in all entails made after 1st August 1848, and also in old entails where the heir in possession was born since 1st August 1848, the heir of entail in possession may, by means of a simple deed of disentail, free his estate, from the restrictions of the entail. A statute, in 1875, gave the heir in possession larger powers of permanent improvement and the right of buying out the interest of the next heirs at a compulsory valuation; and the Entail (Scotland) Act, 1882, gave further powers of disentailing in the case of entails made since 1848, and in all cases, a practically absolute power of sale to be exercised on petition to the court, the price being invested for behoof of the heirs of entail. From statistics returned to parliament in 1882, it appeared that disentailed land was rapidly re-entailed in Scotland.

In America, before the rebellion, the English law as to estates tail prevailed. But in the United States, the law of entails has been gradually abandoned by the several states; and property can now be fettered, to a limited extent only, by means of executory Devises (q. v.). In France, the power of creating entails has varied much at different periods, from the right to make a perpetual entail, which appears to have been the original principle, to a limitation to four, and at one time to two degrees. But by the Code Napoleon, ss. 896—897, entails are now absolutely prohibited.

In Spain, also, entails, till then permitted under certain restrictions, were entirely abolished by the Cortes in 1820. Thus it will be seen that the right of securing land in a particular family, which commends itself to the natural feelings, has been found so oppressive in operation, and so injurious to the public interest, that after an existence of more than 600 years, it has been practically discredited almost simultaneously by the general consent of modern nations.

See McCulloch's *Treatise on the Succession to Property vacant by Death*; William's *Principles of the Law of Real Property*; Sandford's *History and Law of Entail in Scotland*; Reports by H. M. Consuls on Systems of Land Tenure, 1870; and Cobden Club Essays, on same subject. See also Lavaleye, *De la Propriété primitive*, and Garsounet, *Histoire des Locations perpétuelles*.

ENTASIS (Gr.), the swelling outline given to the shaft of a Column (q. v.).

ENTELLUS MONKEY, or HONUMAN (*Semnopithecus Entellus*), an East Indian species of monkey, with yellowish fur, face



Entellus Monkey (*Semnopithecus Entellus*).

of violet tinge, surrounded with projecting hairs, long limbs, and very long muscular and powerful—though not prehensile—tail. It is held in superstitious reverence by the Hindus, and is often to be seen exhibiting much impudent familiarity in the precincts of temples; indeed, temples are often specially dedicated to it; hospitals are erected for its reception when sick or wounded. Hindu laws affix a far more severe punishment to the slaughter of one of these sacred monkeys than of a man; the peasant esteems it an honor when his garden is plundered or his house robbed by troops of them, and would consider it an act of the greatest sacrilege to drive them away. This is one of the very few species of monkeys found in the northern provinces of India, and in summer ascends the Himalaya to the pine-forests, and almost to the snow-line; it has even succeeded in crossing the mountains, and occurs in Bhotan.

ENTERITIS (Gr. *enteron*, the intestines), inflammation of the bowels, and especially of their muscular and serous coat, leading to Constipation (q. v.) and pain, with Colic (q. v.), and sometimes Ileus (q. v.). Enteritis is distinguished from these last affections, indeed, only by the presence of inflammatory symptoms—i. e., pain, tenderness, fever, &c., from a very early stage of the disease, and in so decided a form as to require special attention.

If enteritis does not depend upon mechanical obstruction, it may be combated by hot fomentations, with moderate leeching and counter-irritation, and the internal administration of opium. Injections of warm water, or of asafoetida and turpentine (see CLYSTER), should be at the same time given to clear the lower bowel; and all purgatives, except in some cases castor oil, should be avoided. The disease is, however, one of great danger, and should never be incautiously treated with domestic remedies. It is closely allied to Peritonitis (q. v.), and often depends upon internal mechanical causes, or on external injury.

In the Lower Animals.—Inflammation of the bowels, among the heavier breeds of horses, generally results from some error of diet, such as a long fast followed by a large, hastily devoured meal, indigestible or easily fermentable food, or large draughts of water at improper times. When thus produced, it is frequently preceded by stomach staggers or colic, affects chiefly the mucous coat of the large intestines, and often runs its course in from eight to twelve hours. With increasing fever and restlessness, the pulse soon rises to 70 or upwards, and, unlike what obtains in colic, continues throughout considerably above the natural standard of 40 beats per minute. The pain is great, but the animal instead of recklessly throwing himself about, as in colic, gets up and lies down cautiously. Respiration is quickened, the bowels torpid. Cold sweats, stupor, and occasionally delirium, precede death. When connected with, or occurring as a sequel to influenza, laminitis, and other complaints, the small intestines are as much affected as the large, and the peritoneal as well as the mucous coat of the bowels. This form is more common in the lighter breeds. When the patient is seen early, whilst the pulse is still clear and distinct, and not above 60, and the legs and ears warm, bloodletting is useful, as it relieves the overloaded vessels, and prevents that exudation of blood which speedily becomes poured out in the interior of the bowels. This disease should be treated as follows: In a pint of oil, or an infusion of two drachms of aloes in hot water, give a scruple of calomel and an ounce of laudanum, and repeat the calomel and laudanum every hour in gruel until the bowels are opened, or five or six doses are given. Encourage the action of the bowels by using every half hour soap and water clysters, to which add laudanum so long as pain and straining continue. If the animal is nauseated and stupid, with a cold skin, and a weak quick pulse, bleeding and reducing remedies are very injurious; and the only hope lies in following up one dose of the calomel and aloes with small doses of laudanum and sweet spirit of nitre, or other stimulants, repeated every forty minutes. In all stages, woollen cloths wrung out of hot water and applied to the belly encourage the action of the bowels and relieve the pain.

Enteritis in cattle is mostly produced by coarse wet pasture, acid or poisonous plants, bad water, and overdriving. The symptoms are fever and thirst, a quick but rather weak pulse, restless twitching up of the hind limbs, tenderness of the belly, and torpidity of the bowels. Calves generally die in three or four days, other cattle in a week or nine days. Bleed early, open the bowels with a pint of oil and a drachm of calomel, which may be repeated in eight or ten hours, if no effect is produced. Give every hour fifteen drops of Fleming's tincture of aconite in water, until six or seven doses are given. Allow only sloppy and laxative food, such as treacle, gruel, or a thin bran mash; employ clysters and hot cloths to the belly, and use two-ounce doses of laudanum if the pain is great. Enteritis in sheep mostly occurs in cold exposed localities, and where flocks are subjected to great privations or improper feeding. The symptoms and treatment resemble those of cattle.

ENTOMOLOG'Y (Gr. *entomon*, an insect, *logos*, a discourse), the science which has INSECTS (q. v.) for its subject. The mere collector of insects may be one of the humblest laborers in the great field of natural history, but his labors contribute materials for the more philosophic naturalist who studies the structures of these creatures, and compares them with one another according to the unity and the variety of design which they exhibit. And when we begin to take into account the vast number of different species of insects, their great diversities of structure and of habits, their great complexity of organization, the wonderful transformations which many of them undergo at different stages of their existence, and the equally wonderful but extremely various instincts which many of them display, we find entomology to be a science worthy to engage the noblest mind. But besides all these things, we must remember that insects serve most important purposes in the general economy of nature; and that some of them are directly useful to man, some directly injurious, at least when their numbers are at any time excessively multiplied.

Entomology, along with the other branches of natural history, was cultivated by Aristotle and other Greeks. Aristotle is the most ancient author of whose works anything relating to this science now remains. Pliny has little on this subject but what is copied from Aristotle; and it can scarcely be said to have been again studied as a science till the 16th c., when attention began

once more to be directed to it, although it was not till the 17th c. that much progress was made, or that any important works on entomology appeared. Insects then began to be described, not only those of Europe, but also some of the curious and splendid insects of tropical countries; bees and other insects of particular interest received attention; the metamorphoses of insects began to be studied, and their anatomy to be investigated.

The names of Goedart, Malpighi, Swammerdam, Lenuwenhoek, and Ray deserve to be particularly mentioned; but the infant state of the science may be illustrated by the fact, that about the end of the 17th c., Ray estimated the whole number of insects in the world at 10,000 species, a number smaller than is now known to exist in Britain alone. In the 18th c., the name of Linnaeus occupies as high a place in the history of entomology as in that of kindred branches of science. The progress of the science was much promoted by his arrangement and exhibition of the discoveries of previous and contemporary naturalists; and by his system of classification, founded on characters taken from the wings, or their absence, a system professedly artificial, yet so harmonizing with the most natural distribution into groups, that some of its orders were indicated by Aristotle, and that it has retained and seems likely to retain its place, modified, indeed, but not essentially changed. De Geer and Fabricius are perhaps, after Linnaeus, the most worthy to be named of the great entomologists of the 18th century. At the close of the 18th and beginning of the 19th c., the name of Latreille is pre-eminently conspicuous; and in the year 1815, a new impulse began to be given to the study of entomology in Britain by the publication of the admirable *Introduction to Entomology* of Messrs. Kirby and Spence, a work combining in a remarkable degree the merits of being at once popular and scientific. Since the beginning of the 19th c., the number of insects known and described has prodigiously increased; many entomologists have with great advantage devoted themselves particularly to the study of particular orders of insects; and many valuable monographs have appeared. Entomological literature has now become very extensive. The progress of the science has owed not a little to entomological societies, of which the Entomological Society of London may be particularly mentioned. We cannot attempt to enumerate the distinguished entomologists of the 19th c., but perhaps the names of Leach, Macleay, Curtis, Stephens, Westwood, Smith, Walker, Stainton, Swainson, Newport, Darwin, and Lubbock, deserve notice in Britain; Meigen, Jurine, Gyllenhal, Gravenhorst, Hubner, Dufour, Boisduval, Eriksen, Lacordaire, Burmeister, Strauss-Dürkheim, Gerstaecker, Blanchard, and Girard, on the Continent; and Say, Packard, and MacCook, in America. We have not yet any complete work on the insects of Britain; but the *Insecta Britannica*, of which some volumes have been published under the auspices of the Entomological Society, is intended to supply the want.

ENTOMO'STRACA (Gr. insect-shells), a term introduced by Müller, and adopted by Latreille, Cuvier, and other naturalists, to designate the second of their two great divisions of Crustaceans (q. v.). The number of species of E. is very great. They are all of small size, except the King-crabs (*Limulus*), which in many respects differ from all the rest, and have recently been formed by some naturalists into a sub-class of crustaceans by themselves. Many of them are minute, and exist in great numbers both in fresh and salt water, particularly in stagnant or nearly stagnant fresh water, affording to many kinds of fishes their principal food. They differ very much in general form; the number of organs of locomotion is also very various—in some very few, in some more than one hundred—usually adapted for swimming only, and attached to the abdominal as well as to the thoracic segments; but there never is a fin-like expansion of the tail, as in some of the malacostracous crustaceans.

The antennae of some are, however, used as organs of locomotion. Some of the E. have mouths fitted for mastication, and some for suction. Not a few are parasitic. The heart has the form of a long vessel. One or two nervous knots or globules supply the place of a brain. The organs of respiration are in certain species attached to some of the organs of locomotion, in the form of hairs, often grouped into beards, combs, or tufts, or blade-like expansions of the anterior legs are subservient to the purpose of respiration: in others, no special organs of respiration are known to exist. The eyes are sometimes confluent, so as to form a single mass—one eye—in the front of the head. The name E. has been given to these creatures in consequence of most of the species having shells of one or two pieces, rather horny than calcareous, and of very slender consistence, generally almost membranous and transparent. In very many, the shell consists of two valves, capable of being completely closed, but which, at the pleasure of the little animal, can also be opened so as to permit the antennae and feet to be stretched out.

The study of the smaller crustaceans has recently been prosecuted with great assiduity and success, by Milne-Edwards and others; and in consequence of the great differences existing among

them, new classifications have been proposed, and the name E. has by some been restricted to those which have a mouth formed for mastication, but no special organs of respiration, forming a section which is subdivided into two orders, *Ostrapoda* and *Copepoda*, the former having a bivalve shell or shield, the latter destitute of it.—But the name E. is still commonly employed in its former wider sense.

ENTOMOSTRACA, FOSSIL. E. attained their maximum size in the palæozoic waters, which they tenanted in vast shoals. The Silurian Trilobite (q. v.) was a phyllopod, and the Pteregotus of the old red sandstone was nearly allied to the modern limulus. Small bivalvular species are found in all strata, sometimes, as at Burdie-House, near Edinburgh, forming layers of considerable thickness, at others scattered in enormous numbers in the dried sediments of lakes, as in the fresh-water clays of the Wealden, or forming in some places a large proportion of chalk, with the multitudes of their thin calcareous coverings.

ENTOPHYTES (*Entophyta*; Gr. *enton*, within, and *phyton*, a plant), a term usually employed to denote those parasitic plants which grow on living animals. It is seldom extended to vegetable parasites which grow on living vegetables, whether on external or internal parts, nor is it restricted to those which are found in the internal cavities, or within the substance of animal bodies, but includes all which have their seat on living animal tissues. It does not, like the analogous term *Entozoa*, denote any particular class of organized beings; some of the E. are *Algæ*, and some *Fungi*, but to these two orders they are limited, and all of them belong to the lower sections of these orders; some of them to those lowest sections in which the distinguishing characters of the two orders cannot easily be traced, so that they are referred to the one or the other on very slender grounds; those in which a coloring matter is present being reckoned *algæ*, although it can be observed only in masses of aggregated cells, and not in the cells when viewed separately, and those which even in the mass appear entirely colorless, being considered *fungi*.

Many of the *algæ* and *fungi* parasitic on plants are nearly allied to those which occur on animals; thus, ergot and the kind of mildew which has proved so destructive to vines, are referred to the same genus (*Oidium*) to which is also referred the fungus found in the diseased mucous membrane in cases of *aphthæ* or *thrush*; and another genus (*Botrytis*, q. v.) contains the fungus called Muscardine, or Silkworm Rot, so destructive to silkworms, together with the fungus which accompanies or causes the potato disease, and many other species which infest plants. Common

mould is even supposed to occur on animal tissues tending to decay, during life, as well as on dead animal and vegetable substances.

Vegetable parasites occur both in man and in the lower animals; not a few of them are peculiar to fishes, and more are peculiar to insects than to any other class of animals. The fungi which grow on the bodies of insects sometimes attain an extraordinary development: *Sphaeria Sinensis*, which grows on a Chinese caterpillar, and to which medicinal virtues, probably imaginary, are ascribed in China, attains a length greater than that of the caterpillar itself. A similar species (*S. Robertsi*) is found on the caterpillar of a New Zealand moth.

The situations in which E. occur are very various. Some, like the thrush fungus already noticed, appear in diseased conditions of the mucous membrane; some find their place in the lungs, the ear, or other organs; some on the skin, in the hair follicles, and *in* as well as *on* the hair itself. The 'fur' which appears on the tongue when the stomach is disordered, abounds in the extremely slender unbranching threads of the alga called *Leptothrix buccalis*, which also vegetates luxuriantly in cavities and corners of the teeth not sufficiently visited by the tooth-brush. The lungs of birds, the gills of fishes, the intestines of insects, the wing-covers of beetles, the eggs of molluscs, all have their peculiar vegetable parasites by which they are sometimes infested.

It is often by no means easy to say whether the presence of E. is to be regarded as the consequence or as the cause of disease; sometimes it may be both. Sometimes it appears to be certainly a consequence, as when the *Sarcina* (or *Merismopædia*) *ventriculæ* occurs in the contents of the stomach and bowels; sometimes, as in the diseases called *Favus*, *Porrigo*, *Tinea*, *Herpes tonsurans*, *Plica Polonica*, *Mentagra*, *Pityriasis versicolor*, &c., it seems entitled to be regarded as the cause of the diseased state, and the cure of the disease seems to be accomplished by killing the parasite, often a thing of no little difficulty.

Whence the germs of E. are derived is often a question to which it would not be easy to find an answer. Their spores are extremely minute; but there are no plants which produce seeds or spores more abundantly than some of them do; the growth of the plants themselves is very rapid, and reproduction is 'very intense and rapid.'

It has sometimes been imagined that epidemic diseases may be caused by spores of E. conveyed through the air; no evidence has, however, been produced to render this opinion probable. An attempt was made to establish the existence of cholera fungi or algae, but it completely failed.

ENTOZOA.

ENTOZO' A. This term is applied to all the animal forms which live either in the natural cavities (as, for example, the intestinal canal), or in the solid tissues (as, for example, the liver) of other animals. The number of these parasites is so great (there being at least 20 distinct species of worms found in man, 14 in the dog, 15 in the horse, 11 in the common fowl, &c.), and their occurrence so frequent, especially in some of the lower animals, that we must regard their presence, at all events in many species, rather as the normal condition, than as a morbid state due to accidental causes.

It is worthy of notice, that many of the animals included amongst the E. only enjoy a parasitic existence during a part of their total life, which often, as in the well-known case of perfect insects, presents very varied and distinct phases. Thus, for example, the larvæ of the gadfly (*Estrus equi*) undergo their entire development in the stomach of the horse, attaching themselves by minute hooks to the gastric mucous membrane; they then detach themselves pass along the intestines, and in due time are discharged, and undergo their further changes externally; and many similar instances might be quoted. For this reason, and additionally because parasites are now known to belong to various classes of animals, we no longer attempt, like Linnaeus and Cuvier, to form a special group of E.; and a reference to the *Vermes intestinae* in the *Systema Naturæ*, or to the *Entozoaires* in the *Règne Animal*, at once shows that these illustrious naturalists grouped together animals with few or no true natural affinities.

Although most E. belong to the class of *Vermes* or *Worms*, this, as has been already observed, is by no means exclusively the case. Thus, even fishes may lead a parasitic existence; a fish of the genus *Fierasfer* being frequently found in the respiratory cavity of the *Holothuria tubulosa*, or *Sea-cucumber*, and small fishes having been frequently observed in the cavity of the *Asteria discoïdes*. Amongst the crustaceans, instances of parasitism are by no means rare; different species of *Lernæa* being abundant in the branchial (or gill) cavity, and on the surface of numerous fishes, while the *Lingatulæ* infest mammals, reptiles, and fishes, being found in the olfactory sinuses, the larynx, the lungs, the peritoneal cavity &c. The instances in which molluscs are found to live parasitically are few; certain gasteropods, however, inhabit the bodies of echinoderms, holothurians, and comatulas; and amongst the lamellibranchiata, species of *modiolaria* and *mytilus* live in the bodies of ascidians. There are several cases of polyps which have been observed to adopt a parasitic existence; and finally, various protozoa are not unfrequently met with in the animal fluids; for example, certain species of *Vibrio*, *Cercomonas*, and *Paramécium*, have been found in the intestinal evacuations in cholera and diarrhœa; *Monads* have been found in the urine in cholera, and certain infusoria and rhizopoda in the blood of the dog, the frog, and many other animals. See **HEMATOZOA**.

The more common kinds of E. appear to have attracted the notice of the earliest physicians and naturalists whose opinions or works have reached us. Hippocrates speaks of several worms,

especially the tæniæ and ascarides, infesting the human intestinal canal; and Pythagoras learned in India that the bark of the pomegranate acted almost as a specific in cases of tape-worm. Aristotle noticed both the tape-worm of the dog and of man, and the *Cysticercus cellulosæ* (see **CESTOID WORMS**) of the pig; but utterly unconscious that the cysticercus, under favorable conditions, became developed into a tape-worm (see **TAPE-WORM**), referred the origin of all intestinal worms to spontaneous generation—a doctrine that seems to have been generally adopted till the 17th c., when Redi published (in 1684) a work on Helminthology, in which he distinctly showed that the generation of various E. followed the same laws as in higher animals, and that in many instances there were distinct males and females. The great recent discovery, that the vesicular or bladder-like parasites, such as the different species of cysticercus and cœnurus, are cestoid worms in an early stage of development, is alluded to in **CESTOID WORMS**, and will be more fully noticed in the article **TAPE-WORM**.

Another point of general interest in connection with E. is the part of the body in which they are found. While most live in the intestinal canal and other open cavities (as the larynx bronchial tubes, &c.), others are found in the closed cavities and in the parenchymatous tissue of the liver and other solid organs. Thus (confining our remarks to the E. occurring in man), *Anchylostoma duodenale*, *Strongylus duodenalis*, two species of *Ascaris*, *Oxyuris vermicularis*, *Trichocephalus dispar*, *Distoma heterophyes*, at least four species of *Tænia*, and *Bothriocephalus latus*, have been found in different parts of the intestinal canal; while *Strongylus gigas* inhabits the kidney, another species of *Strongylus* the lungs, a species of *Spiroptera* the bladder, two species of *Filaria* and *Monostoma Lentis* the eye, *Trichina spiralis* the voluntary muscles, two species of *Echinococcus* and *Cysticercus cellulosæ*, various parenchymatous tissues, two species of *Distoma* the gall-bladder, another species the portal vein, and the *Filaria Medinensis*, or *guinea-worm*, the subcutaneous tissue.

Davaine, who may be regarded as one of the very highest authorities on this subject, gives the following synopsis of the E. occurring in man and the domestic animals (see his *Traité des Entozoaires*, Paris, 1860).

TYPE I. PROTOZOA, including the genera *Bacterium*, *Vibrio*, *Monas*, *Cercomonas*, *Trichomonas*, *Paramécium*.

TYPE II. CESTOIDEA, including the families of *Tæniadæ* and *Bothriocephalidæ*. The *Tæniadæ* occur (1) in their undeveloped, cystic, or vesicular form, constituting the genera *Cœnurus* and *Cysticercus*; and (2) in their perfect ribbon-like shape, constituting the genus *Tænia*, of which about 20 species have been described. The *Bothriocephalidæ* contain the single genus *Bothriocephalus*, which embraces various species. Their early or vesicular stage has not yet been described.

TYPE III. TREMATODA, including two well-marked secondary types: (1) The *Polystomidæ*, which live as epizoa on the skin or gills of aquatic animals, and which do not concern us here; and (2) the *Distomidæ*, including the genera *Monostoma*, *Distoma*, *Hol-*

ostoma, *Amphistoma*, with the doubtful genera of *Tetrastoma* and *Hecathrydium*.

TYPE IV. ACANTHOCEPHALA, with the single genus *Echinorhynchus*.

TYPE V. NEMATODEA. Passing over two cases in which these worms have been discovered, apparently in their larval or imperfectly developed state (once by Rainey in the human trachea, and once by Vulpian in the kidney of the dog), Davaine gives the following genera, *Oryuris*, *Ascaris*, *Spiroptera*, *Trichina*, *Trichosoma*, *Trichocephalus*, *Filaria*, *Dochmæus*, *Sclerostoma*, *Strongylus*, *Anchylostoma*, *Dactylius*.

TYPE VI. ACANTHOTHECA, including the genus *Pentastoma*.

Alarming as the above list may seem, comparatively few of the worms contained in it do in reality give rise to dangerous or severe symptoms. It seems to be a condition of parasitism, that the animal upon which the parasite lives must not be destroyed by it; and it has been suggested by one of our highest authorities on this subject, Van Beneden, that in many cases the parasite does not so much attack the organism in which it exists, as its superabundant products. Dujardin and other helminthologists have described cases in which worms were developed by thousands in persons apparently in good health. The symptoms occasioned by *Ascarides*, *Tæniæ*, &c., are described in the articles *ASCARIS*, *TAPE-WORM*, &c.

The multiplication of worms is most rapid in debilitated persons, especially children living in cold and damp situations; and impure water, unripe fruits, and raw and imperfectly cooked meat, have considerable influence on the development of these animals. For the description of the medicines used for their destruction, see the article *VERMIFUGES*; and for information regarding the structure and habits of the most important E. see the articles *ASCARIS*, *BOTHRIOCEPHALUS*, *CESTOID WORMS*, *GUINEA-WORM*, *MONOSTOMA*, *NEMATODEA*, *STRONGYLUS*, *TAPE-WORM*, *THREAD-WORMS*, *TREMATODA*, *TRICHINA SPIRALIS*, *TRICHOCEPHALUS*.

ENTRACT, in Music, is an instrumental piece, composed in the form of a little symphony or overture, to be performed between the acts of a play.

ENTRÉ DOU'RO E MI'NHO, or, as it is frequently called, MINHO, a province of Portugal, in the extreme north-west of the country, is bounded on the N. by Galicia, from which it is separated by the river Minho; on the E. by Galicia and Tras os Montes; on the S. by the province of Beira, from which it is separated by the river Douro; and on the W. by the Atlantic Ocean. It has an area of about 2810 square miles, and a pop. (1878) of 982,735. It has been called the Paradise of Portugal, and indeed it may be doubted whether any territory in Europe of equal extent exhibits so much beauty. It is traversed from north-east to south-west by three mountain-ranges, which, however, sink down as they approach the coast, leaving a considerable tract of undulating country along the sea-margin.

The chief rivers, besides those already mentioned as forming the northern and southern boundaries of the province, are the Lima—a portion of the vale of which is said to form the loveliest landscape in the world—the Cavado, and the Tamego. The climate is agreeable and healthy. The chief productions are wine, oil, flax, maize, wheat, barley, oats, and vegetables. Wine, which is shipped at Oporto, is largely exported. Along the coast are numerous fisheries, at which great numbers find employment. The province of Minho consists of three districts, Braga, Vianna, and Porto.

ENTRE RÍ'OS (the Spanish for *Between Rivers*) takes its name from its occupying the space between the Parana and the Uruguay. It is one of the states of the Argentine Confederation. The area is estimated at from 30,000 to 40,000 square miles, and the population in 1869, at 134,271 inhabitants. The country is almost entirely pastoral—its principal productions being hides, horns, tallow, and jerked beef. The soil is not well fitted for cultivation, for, besides being rather swampy throughout, it is subject, in the south, to annual floods. The capital is Concepción del Uruguay, with a pop. of 6500.

ENTREMETS, ENTRÉES, French terms now used in England to designate certain courses of dishes served at fashionable dinners. The chief dishes are *entrées*, and the lighter dishes are *entremets*.

ENTRESOL is a low story between two main stories of a building (generally between the ground floor and the first story), or between two portions of one story, when certain rooms are of greater height than the others upon the same floor. The rooms in the E. are called *Entresols* or *Mezzanines*.

ENTROP'PIUM, or ENTROP'PION (Gr. *en*, in, and *trepo*, I turn), inversion of the eyelashes, or even eyelid, consequent either on loss of substance, or on inflammatory swelling of the lid. If confined to one or two eyelashes, they should be plucked out by the roots, and the bulbs should be cauterized; but the radical cure

of severe entropium requires a careful adaptation of the surgeon's art to the circumstances of the particular case, and should not be attempted by unskilled hands.

ENTRY, RIGHT OF. A person is said, in English law, to have a right of entry who has been wrongfully dispossessed or ousted of land and tenements by Abatement, Intrusion, or Disseisin. See the several articles under these heads. A right of entry was formerly lost by suffering a descent cast, i. e., where the tenant tortiously in possession is permitted to continue unmolested till his death, and is succeeded by his heir. This result of suffering a descent cast is removed, 3 and 4 Will. IV. c. 27, and right of entry is now lost by not asserting it for twenty years.

ENTRY OF AN HEIR. In the feudal law of Scotland, this term, was applied to the recognition of the heir of a vassal by the superior or dominus. Strictly, the whole rights of the vassal in the property return to the superior on his death, and must be renewed to his heir. The renewal, however, is not optional, it is merely an occasion of exacting dues of entry from the heir, which tend, of course, to diminish the value of the property, and of putting fees into the pockets of conveyancing lawyers, who are the only real gainers by the arrangement. See *CONVEYANCING*.

ENVELOPES. Until the introduction of the penny-postage system, envelopes for written letters were very little adopted; it was far more customary to secure, by wafer or sealing-wax, the sheet of paper on which the letter was written. When the postage was rendered uniform for all distances, and prepayment enforced, or at least recommended, it was supposed that stamped envelopes would be convenient coverings for letters, sealing the letter and paying the postage at one operation. Such has indeed been the case; but the envelope-manufacture has since taken a new direction, and to an extent that no one could have contemplated. Several large firms in London and elsewhere can make envelopes more cheaply than the government, and can vary the size, shape, color, and quality to an indefinite degree; as a consequence, although envelopes bearing the government impressed stamp are still in demand, the unstamped varieties are used in very much larger quantities. They are made by two methods, involving different amounts of machine-power. The paper is first cut into quadrangular pieces rather longer than wide, by a cutting blade brought to bear upon a pile of sheets at once; and then cutting-dies reduce these pieces to the proper shape, generally lozenge or diamond form, but sometimes with curvilinear edges. For some kinds, it is found to economize both time and paper to stamp the pieces out at once from the rough sheets. The subsequent folding and gumming are performed generally by hand, sometimes by machine. In the hand-method, women and girls fold with almost incredible quickness, having very simple guide-pieces to aid them in giving the proper oblong quadrangular shape to the fold. The gum is applied with a small brush, either all along the overlapping edges, or in spots here and there, according to the quality of the envelope.

The envelope-machines, however, such as those of Messrs. De la Rue, are beautiful examples of automatic mechanism. In the kind invented and used by this celebrated firm, a cutting-machine severs the blanks or papers; and dies are employed to stamp the device on the spot where the seal would otherwise lie. The blanks are then fed into the folding-machine, where they pass through a curious series of processes. Each blank is carried down into a box, where a plunger makes four creases in it; two short levers fold down two of the flaps thus made; a gumming apparatus comes up, and applies a line of wet gum to each flap-edge; two small levers then fold down the other two flaps (but only fastening one of them); and finally, the envelope is shifted aside to a pile, and makes way for another. All these processes are gone through in *one second*, enabling the machine to make sixty envelopes per minute. Where twelve of these machines are working at once, it will be seen that a million envelopes are put out of hand in a very short time. Nearly a million and a half of enveloped letters pass through the post every day in the United Kingdom, most of the envelopes for which are of home manufacture; and besides this, a large export trade is maintained. The stamped envelopes all go to Somerset House, to have the stamp impressed upon them, which is done by a beautiful machine, chiefly invented by Mr. Edwin Hill, in which embossing and color-printing are ingeniously combined. These envelopes are sold by the Stamp-office, between which and the Post-office a monetary adjustment becomes necessary.

ENVOY, a diplomatic minister of the second order, i. e., inferior in rank to an ambassador. Envoys ordinary and extraordinary, ministers plenipotentiary, the internuncios of the pope, and all other inferior diplomatic ministers, differ from ambassadors in this, that although they receive their credentials, like ambassadors, immediately from their sovereign, they represent not his personal dignity, but only his affairs. They stand to him just as an ordinary agent does to his principal, and their acts or promises are his in a business, though not in a personal sense. It is said that this

class of diplomatists was first introduced by Louis XI. of France, towards the end of the 15th century. The envoy is superior in rank to the chargé d'affaires, whose credentials proceed from the ministers of the state from which he is sent, and are addressed to the ministers of the state to which he is sent; or are a mere delegation from an ambassador or envoy to conduct the affairs of the mission in his absence. Consuls (q. v.) are not generally reckoned among diplomatic ministers, though, where they have diplomatic duties to perform independently of an ambassador or envoy, they are accredited, and treated as ministers. According to the division of diplomatic agents into four classes, which was made by the great powers at the congress of Vienna in 1815—viz. 1. Ambassadors, legates, and nuncios; 2. Envoys, ministers, and other agents accredited to sovereigns; and 3. Chargés d'affaires, accredited by and to the departments of Foreign Affairs—an envoy would be of the second, and a chargé d'affaires of the third rank. But the practice of this country has interjected between the ambassador and the envoy a second class, called envoys extraordinary and ministers plenipotentiary, which, of course, throws the ordinary envoy into the third, and the chargé d'affaires into the fourth class. See CHARGÉ D'AFFAIRES, AMBASSADOR, EMBASSY, and CONSUL.

ENYED. See NAGY-ENYED.

E'OCENE (*eos*, dawn, and *kainos*, recent), a term introduced by Lyell to characterize the Lower Tertiary strata, from the idea that the fossil shells of that period contain an extremely small proportion (3½ per cent.) of living species. He accordingly looks upon these beds as indicating the dawn of the existing state of the testaceous fauna—no recent species having been detected in the older rocks. The gradual approximation of the living inhabitants of the globe to the present forms is the chief characteristic of the Eocene and newer deposits. The Eocene beds rest on the chalk. Like the other Tertiary strata, these deposits occupy small and detached areas when compared with the older measures. It is not difficult to determine the relative position of Primary or Secondary strata, because of the great extent of particular beds, being frequently continuous over extensive districts. But Tertiary deposits are more isolated, and occur in smaller and more detached patches; hence it is difficult to determine the contemporaneity of the sections of the various periods, occurring as they do in different isolated localities. Their relations must be determined from the petrological structure of the beds, which, however, is very inconstant, or from the more satisfactory evidence derived from their fossiliferous contents.

In the following table are given the generally received divisions of this period, with the maximum thickness (in English feet) of the English strata, and the French and Belgian equivalent beds:

UPPER EOCENE.	1. Hampstead series... 175	Calcaire lacustre supérieur, and Grès de Fontainebleau.—Rupélien.
	2. Bembridge series... 115	Gypseous series of Montmartre, Calcaire lacustre moyenne, and Calcaire siliceux.—Tongrien.
	3. Osborne series..... 70	Grès des Beauchamp.
	4. Heaton series..... 182	Sables moyennes, Calcaire grossier, and Lits coquilleux.—Laeckenien and Bruxellien.
MIDDLE EOCENE.	5. Bagshot series..... 1270	Wanting in France.—Ypresien.
	6. London clay series. 480	Argile plastique et lignite.—Landenien supérieur.
	7. Plastic clay series.. 160	Wanting in France.—Landenien inférieur.
	8. Thanet sands series 90	

Total thickness, 2542 feet.

EO'LIAN HARP. See EOLIAN HARP.

EON DE BEAUMONT, CHARLES GENEVIEVE LOUIS AUGUSTE ANDRÉ, TIMOTHEE D', known as the *Chevalier d'Eon*, was born at Tonnerre, in Burgundy, in 1728, studied law and became an advocate. He attracted the notice of the Prince of Conti by some political writings; and in 1755, was introduced by the latter to Louis XV., who employed him in diplomatic missions to Russia and Austria. After serving a short time in the army, not without distinction, he was sent to London in 1761 as secretary of embassy, and shortly after was made minister-plenipotentiary. Becoming the victim of a court cabal, however, which deprived him of his office, he took his revenge by publishing his secret correspondence with the French court, which contained, among other things, libels on various persons. For one of these, he was prosecuted in London; and to avoid judgment, fled to the continent. He, however, returned to England again; but, on the death of Louis XV., the French ministry deemed it prudent to recall

him, as they were afraid he might betray their secrets to the English government, which made him brilliant offers. The pretext laid hold of for this purpose, was the scandal excited in London by his having assumed the garb of a woman, which he had done at the request of Louis, the better, it may be presumed, to hide his designs as a 'secret agent.' On his return to France, however, Eon was very favorably received; and Louis XVI. even ordered him to make use of the feminine garb in future. In 1783, he again proceeded to London, not, however, in any visible official capacity; and, though dressed as a woman, gave lessons in fencing, of which art he was a complete master. On the outbreak of the French Revolution, he hastened home, and offered his services to the nation; but as nothing came of his offer, he finally returned to London, where he sank into the greatest misery, and died 21st May 1810. An examination of Eon's remains by Mr. J. Copeland, a surgeon, settled the question of his sex, and put an end to the curiosity of the English public. His writings appeared at Amsterdam 1775, under the title of *Loisirs du Chevalier d'Eon*. The *Mémoires* which bear his name are not genuine.

EOO'A, or MIDDLEBURG, one of the Friendly or Tonga Islands, is 30 miles in circuit, and contains 300 inhabitants. It is in lat. 18° 19' S., and long. 175° 37' W. The surface, which is rocky and barren, rises 600 feet above the sea. The group, as a whole, was discovered by Tasman in 1643.

EÖTVÖS, JOZSEF, a highly distinguished Hungarian author, was born 3d September 1813 at Buda, educated at home by a tutor of republican sentiments, and studied philosophy and jurisprudence at the university of Pesth during the years 1825—1831. He became an advocate in 1833, but soon resolved to devote himself exclusively to literature, in which field he had already won a great reputation by his comedies *Kritikusok* (The Critics) and *Házasságok* (The Weddings), and also by his tragedy *Boszu* (Revenge). After his return from a journey through Germany, France, England, Switzerland, and the Netherlands, he published a work on *Prison Reform* (1838). This was followed (1838—1841) by his novel entitled *The Carthusian*, which was pronounced one of the best productions of Hungarian literature. E. now began to distinguish himself in politics as a writer of incisive and influential articles on the liberal side represented by Kossuth. *The Village Notary* (A' Falu' Jegyzője, 1846; Eng. transl. 1850) is a work of the highest order of merit, marked by variety of incident, easy vigor of style, humor, liveliness, and freshness of descriptive power. It was founded in 1848 by a powerful novel describing Hungary in 1514. When the revolution of 1848 broke out, E. was appointed Minister of Public Instruction, but soon retired to Munich, where he employed himself exclusively in literary pursuits. The most important fruit of his residence here was a work (published in German and Hungarian, 1851—1854) on the influence of the ideas of the 19th c. on the state and on society. In 1851, E. returned to Hungary. In 1859, he published anonymously a notable book (in German) on the guarantees for the power and unity of Austria. In 1867, he was appointed Minister of Worship and Education, and in that capacity engaged actively in the work of reform. He died at Pesth on the 3d of February 1871.

EOZOON is the name given by Dr. Dawson of Montreal to an assumed organism whose remains constitute reefs of rock in the Laurentian System (q. v.) in Canada; apparently a large foraminifer, which must have grown in sheets on the sea-bottom. Occurring as it does in rocks not formerly supposed to be fossiliferous, it would be the oldest known organism, and deserves its name *Eozoon* (Dawn-animalcule) *Canadense*. Dr. W. B. Carpenter also strongly maintains the organic nature of these masses of microscopic tubes and cells; others deny this, and affirm the supposed cells and canals to be merely infiltration marks. The Laurentian System in Scotland seems to contain no fossil remains.

E'PACT, in Chronology, is the excess of the solar month above the lunar synodical month; or of the solar year above the lunar year of twelve synodical months; or of several solar months above as many synodical months; or of several solar years above as many periods, each consisting of 12 synodical months. The menstrual epact is the excess of the civil calendar month above the lunar month. For a month of 31 days, this epact is 1 day 11 hours 15 minutes 57 seconds, if we suppose new moon to occur on the first day of the month. The annual epact is the excess of the solar year above the lunar. As the Julian solar year is (nearly) 365 days, and the Julian lunar year is (nearly) 354 days, the annual epact is nearly 11 days. The epact for two Julian years is, therefore, nearly 22 days; for three years, 33 days; and so on. When, however, the epact passes 30 days, 30 falls to be deducted from it, as making an intercalary month. For three years, then, the epact is properly 3; and for 4 years, adding 11 days, it is 14 days; and so on. Following the cycle, starting from a new moon on the 1st of January, we find that the epact becomes 30 or 0 in the 19th year. The epact for the 20th year is again 1; and so on. The years in the cycle are marked by Roman numerals, I, II, III., &c., called the Golden numbers; and a table of the

Julian epacts exhibits each year in the cycle with its golden number and epact. As the Gregorian year (see CALENDAR) differs from, and is in advance of, the Julian by 11 days (the number lost on the Julian account before the Gregorian computation of time was introduced in England), and as 11 days is the difference between the solar and lunar years, it follows that the Gregorian epact for any year is the same with the Julian epact for the year preceding it.

EPACRIDACEÆ, a natural order of exogenous plants, consisting of shrubs and small trees, which, both in appearance and in botanical characters, much resemble the *Ericææ*, or Heath Family. The most important distinguishing structural character is indeed found in the simplicity of the anthers, which are one-celled, open longitudinally, and are destitute of appendages. The



Springelia Incarnata :
1, flower and calyx; 2, anther; 3, stamens and ovary.

Epacris Grandiflora.

flowers of the *E.* have generally a tubular corolla, dividing into five—rarely four—segments; which, however, sometimes become separate petals. The calyx is persistent, often colored, has the same number of segments with the corolla, and is surrounded with small bracts. The stamens are fewer than in the *Ericææ*, usually equal in number to the segments of the corolla, and alternate with them. The fruit is sometimes a capsule, sometimes a berry, sometimes a drupe. The leaves are simple, generally alternate, often crowded; the flowers in spikes, in terminal racemes, or axillary and solitary.—About 400 species of *E.* are known, all natives of the Indian Archipelago, the South Sea Islands, and Australia; in which regions they seem to occupy the place of the heaths of other parts of the world. Some, particularly of the genus *Epacris*, are well-known ornaments of our green-houses, and are flowering shrubs of great beauty. Some produce edible berries resembling the cranberry. See CRANBERRY.

EPAMINONDAS, the most eminent of Theban generals and statesmen, and one who for a long period elevated his country to the highest point of honor and prosperity, was born 414 B.C. He was descended from an ancient but impoverished family, and led a retired life till his 40th year, profiting by the instructions of Lysis the Pythagorean, who inspired him with enthusiasm for the elevated ideas which it was the object of his life to realize. *E.* first becomes prominent during the period when the Lacedæmonians garrisoned the citadel of Thebes, and kept the inhabitants in subjection. Though he took no part in the desperate but successful stratagem by which his fellow-citizens recovered the *Cadmeia* in 379 B.C., he stepped forward immediately after into the ranks of the patriots; and when sent to Sparta in 371 B.C. along with several others, in order to negotiate a peace between the two countries, *E.* displayed as much firmness and dignity as eloquence in the debate which ensued upon the question whether Thebes should ratify the treaty in the name of all Boeotia, the result of which ratification would have been equivalent to a recognition of her claim to supremacy over the Boeotian towns. To this the Lacedæmonians demurred, and the war was again resumed; *E.* was appointed commander-in-chief; and, in conjunction with his friend Pelopidas, with an army of 6000 men, defeated double that number of the enemy at Leuctra (371 B.C.). Two years later, he and Pelopidas marched into the Peloponnesus, incited several of the allied tribes to fall away from Sparta, and then turned his arms against that city, which, however, was bravely defended by Agesilaus. On his return to Thebes, *E.* was accused of having violated the laws of his country, by retaining the supreme power in his hands beyond the time appointed by

law; but was acquitted in consequence of his open and animated defence. In the spring of 368 B.C., the war was renewed with increased fury between Thebes and Sparta, and *E.* once more marched into the Peloponnesus, but did not accomplish much; and on his return home, received a check from Chabrias at Corinth. To atone for this unsuccessful undertaking, he advanced with 33,000 men into Arendia, and joined battle with the main body of the enemy near Mantinea, in the year 362 B.C. *E.*, at the head of his troops, succeeded in breaking the Spartan phalanx, but was mortally wounded in the breast by a javelin. Being told by the physicians that he would die as soon as the weapon was extracted, and on receiving intelligence that the Boeotians had gained the victory, he is said to have torn out the javelin with his own hand, exclaiming: 'I have lived long enough.' His moral purity, justice, and clemency are extolled by the ancients as much as his military talents; and it is expressly recorded of him, that he never told a lie, even in jest. Compare Baneh, *Epaminondas und Thebens Kampf um die Hegemonie* (Breslau, 1834); Pomtow, *Das Leben des E.* (1870).

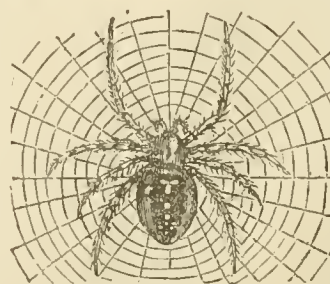
EPAU'LEMENT (from the French *épaule*, shoulder), in siege-works, is a portion of a battery or earthwork. The siege-batteries are generally shielded, at one end at least, by epaulements, forming an obtuse angle with the main line of the battery. The object is to protect the guns and gunners from a flanking fire. The name is often given erroneously to the parapet of the battery itself, but it applies properly to the flanking return only. Sometimes the whole of a small or secondary earthwork, including the battery and its flanks, is called an epaulement; and sometimes the same name is given to an isolated breast-work intended to shield the cavalry employed in defending a body of besiegers.

An *épaule* is the shoulder of a bastion, where one of the faces and one of the flanks meet; and this points to the proper meaning of epaulement, as a shoulder or flanking work.

E'PAULETTE, from the same French source as epaulement, is a shoulder-knot worn by commissioned officers in the naval profession, both as an ornament and a distinction. In the British navy, the officers of and above the rank of lieutenant wear epaulettes of gold lace, one on each shoulder, sub-lieutenants wearing one only. Ranks and degrees are marked in a very systematic way by means of crowns, anchors, and stars worked in silver on the epaulette, and also by the size of the cords of the epaulette itself. This decoration was formerly universal in the British army, officers wearing those of gold, men of worsted; but they were abolished during the Russian war, in consequence of the danger to which officers thus easily marked out were exposed. It is retained by the French army alone of the armies of the great powers. Militia officers wore epaulettes of silver cords.

EPÉE, CHARLES MICHEL, ABBÉ DE L', one of the founders of the system of instruction for the deaf and dumb, was born at Versailles, 25th November 1712. He studied for the church, and entering into holy orders, became a preacher and canon at Troyes, but eventually, on account of his Jansenist opinions, was deprived of this appointment. He now lived in retirement in Paris. In the year 1755, he first began to occupy himself with the education of two deaf and dumb sisters; and, as he asserts, without any previous knowledge of Pereira's efforts in the cause, invented a language of signs, by which persons thus afflicted might be enabled to hold intercourse with their fellow-creatures. His first attempts being crowned with success, he determined to devote his life to the subject. At his own expense, he founded an institution for the deaf and dumb, and labored with unwearied zeal for its prosperity. His favorite wish, however, the foundation of such an institution at the public cost, was not fulfilled till after his death, which took place 23d December 1789. He wrote a work, entitled *Institution des Sourds et Muets* (2 vols., Paris, 1774), which afterwards appeared in an improved form under the title, *La Véritable Manière d'Instruire les Sourds et Muets* (Paris, 1784).

EPEI'RA, a genus of spiders, the type of a family called *Epeiridæ*. They are of those spiders which have only a pair of



Epeira Diadema.

pulmonary sacs and spiracles; construct webs with regular meshes, formed by concentric circles and straight radii; and are furnished with a pair of almost contiguous eyes on each side, other four eyes forming a quadrangle in the center. Many of them are remarkable for the beauty of their colors and of their forms. Several species abound in our gardens, particularly in autumn. *E. diadema* is one of the largest British spiders. It is found in moors, the borders of woods,

&c.; but it is in tropical countries that the *Epeiridæ* exist in greatest

numbers, and attain the greatest size and beauty, extending from branch to branch their lace-work, remarkable for gracefulness of design. The net, when loaded with wings, wing-covers, and limbs of insects that have been preyed upon, is often loosened, and falls down upon the central nest or den of the spider; and successive nets thus falling down, form at last a ball sometimes as large as a man's head. Some of the spider cords, carried horizontally from tree to tree at a considerable height from the ground, 'are so strong as to cause a painful check across the face when moving quickly against them; and more than once,' Sir J. E. Tennent says, 'in riding I have had my hat lifted off my head by a single thread.'—Tennent's *Ceylon*.

EPERÏES (Lat. *Fragopolis* or *Eperesinium*; Hung. *Eperjes*; Slovak, *Pressora*), an old town of Hungary, in the county of Saros, of which it is the capital, is agreeably situated on the left bank of the Tareza, about 150 miles north-east of Pesth. It is surrounded with walls, is the seat of a bishop, and contains some houses of the 15th and 16th centuries, built in the style of those in Naples, with which E. was much connected in the middle ages. Its principal buildings are the Church of St. Nicholas, the communal college, with 500 students and a library consisting of 14,000 volumes, and the county hall. It has manufactures of earthen-ware and of linens and woollens, and has some trade in linen goods, corn, and Tokay wine. In the vicinity are the Sovar saltworks, which produce 5000 tons of salt annually. Pop. (1880) 10,139, mostly Slavs, with a few Germans.

EPERNAY, a town of France, in the department of Marne, is the head-quarters of the *Vins de Champagne*, and is situated in the midst of a rich vine-growing district, on the left bank of the Marne, 19 miles west-north-west of Chalons. It is well built, clean, and well paved. Its environs consist of the most part of elegant villas, with vaults attached, belonging to the Champagne wine-merchants. E. manufactures large quantities of earthen-ware from a clay obtained in the neighborhood, and called *Terre de Champagne*; also hosiery, refined sugar, and leather. It has a brisk trade in bottles, corks, wire, champagne wines, &c. Pop. (1876) 15,414.

E'PHAH, a measure of capacity for dry goods in use among the Hebrews. It contained three English pecks and three pints.

EPHE'MERA (Gr. lasting for a day), a Linnaean genus of neuropterous insects, now forming the family or tribe *Ephemeridae*. They are allied to the *Libellulidae*, or Dragon-flies, but differ from them in many very important respects. They have received their name, to which corresponds the English **DAY-FLY**, sometimes also applied to them, from the brief duration of their existence in the perfect state, in which, very unlike the dragon-flies, they are believed to take no food, merely propagating their species, and dying. From the season of the year in which they begin to be seen, some of them are also called **MAY-FLY**; and by this name are well known to anglers, who use them, and artificially imitate them as excellent lures for trout. The eggs of the ephemerae are also a favorite food of fishes; they cohere together in a gelatinous mass. The larvæ and pupæ are aquatic, and in these states the ephemerae have a much longer life than in their perfect state, extending even to years. The larvæ and pupæ are sufficiently voracious. The abdomen of the larva is furnished on each side with a set of leaflets, which serve instead of gills for respiration, and are also used in locomotion, although there are six feet attached to the thoracic segments. The pupæ differ little from the larvæ except in having rudimentary wings enclosed under scales. Both larvæ and pupæ have the abdomen terminated by two or three jointed filaments, which the perfect insect also has, sometimes very long. The body of the perfect insect is soft and slender; the wings resemble in form those of dragon-flies, but are soft and filmy; in repose, they are elevated vertically above the body: the second pair of wings are much smaller than the first, and in some species are altogether wanting; the organs of the mouth are so soft and small as not easily to be discerned, and to be apparently unfit for any kind of use. Ephemeræ, in their larva and pupa states, live chiefly under stones in water, or in burrows which they make in the banks of streams. When ready for their final change, they creep out of the water to undergo it on some plant or other object by the water-side, generally towards sunset on some fine day of summer or autumn. After having attained their winged state, however, they cast off a complete slough or envelope, so perfect, that it exhibits even the limbs, abdominal filaments, and antennæ; and these 'ghost-like exuviae' are sometimes so abundant in the neighborhood of streams, as to cover in 'a pearly layer' the hat and basket of the angler. The multitudes of ephemerae are often very great, filling the air as a cloud; nay, so abundant are they at times, that their bodies have been known to cover the ground in certain districts of France, and have been gathered from particular spots in cart-loads to be used as manure.

EPHE'MERA, or **FEBRIS DIARIA** in Latin (from Gr. *epi* and *hemera*, on a day), a fever which lasts only a single day, or part of a day, and is generally dependent on some slight local irritation.

It hardly requires any other treatment than the removal of the cause, if known.

EPHE'MERIS (Gr., 'for the day') is a name applied to almanacs from their containing notices for each day. It is mostly confined to astronomical tables giving the daily places of the sun, moon, and planets, and other phenomena of the heavens. Such tables have become common since the days of Kepler. The first were published by Purbach for the years 1450—1461. Those of Regiomontanus, for 1474, were much more accurate, and his Ephemerides met with universal acceptance. Similar publications were afterwards made by Leovitius, Origanus, Kepler, and others. The most important works of the kind at present are the *French Connaissance des Temps*, the *English Nautical Almanac*, the *Berlin Astronomisches Jahrbuch*, and the *American Ephemeris and Nautical Almanac*.

EPHE'SIANS, EPISTLE TO THE, is a letter addressed by St. Paul, during his first imprisonment at Rome, to the church which assembled in Ephesus (q. v.). This church had been planted by the apostle himself, and as we infer from various circumstances, mentioned in the Acts of the Apostles, was an object of his special affection. The epistle was written almost at the same time as that to the Colossians, and consequently breathes the same spirit of exalted piety and fervid faith, besides containing many similar thoughts and exhortations. It may be divided into two grand parts, the first of which is for the most part *doctrinal*, and the second practical. The proofs of its *genuineness* and *authenticity* have generally been considered unquestionable; but some years ago De Wette, in his *Introduction to a Commentary on the Ephesians* (2d. edit. 1847), tried to show that this epistle is simply an expansion of the grander epistle to the Colossians, though he admits that it has the appearance of having been compiled in the apostolic age.

E'PHESUS, one of the twelve Ionic cities of Asia Minor, was situated in Lydia, near the mouth of the river Caystrus, in the midst of an alluvial plain. It does not appear to have been as old as the Trojan war, but its primitive history has been confused by myths. It bore a great variety of names at different times, the principal of which, besides E., were Ortygia and Ptelea. According to Strabo, it was founded by Androclus, son of Codrus, and this is the most probable of the accounts which have come down to us, though others held to the tradition of its Amazonian origin. It was long before E. acquired any political importance, in spite of being a sacred city from an early period. Subdued first by the Lydian, and next by the Persian kings, it was included, after the death of Alexander the Great, in the territories of Lysimachus (281 B.C.), by whom it was greatly strengthened. Ultimately, it came into the possession of the Romans; and in the time of Augustus, when Strabo wrote, it was 'the greatest place of trade of all the cities of Asia west of the Taurus.' This was also its condition when visited by St. Paul, who resided here three years; but the destruction of its great temple by the Goths, in 260 A.D., gave it a blow from which it never recovered.

In 341 A. D., it was the scene of the *third* general council of the Christian Church. Its general history, while a city of the Byzantine empire, was unimportant, and before the days of Tamerlane it had almost completely perished.—The ruins of E. comprise a stadium 687 feet long, fragments of a great theater (alluded to in the account of St. Paul's preaching in the city), of an odeum or music-hall, and of various walls and towers, belonging to the Greek, Roman, and Byzantine eras. Near the western extremity of the town are also some massive structures, which have since 1868 been carefully excavated, sometimes from beneath 18 feet of soil. It is now certain that these stand on the site of the famous *Temple of Diana*. This marvelous building, one of the seven wonders of the world, was originally built by Chersiphron; but after its destruction by Herostratus on the night (as is said) when Alexander the Great was born (356 B. C.), it was rebuilt by the inhabitants in a style of greater splendor than before, the very women contributing their ornaments to secure the necessary funds; yet, notwithstanding this enthusiasm, more than two hundred years elapsed before the new edifice was completely finished. It was the largest Greek temple ever constructed. Its length was 425 feet, its width 220, the number of its columns 128, of which 36 were carved, and their height 60 feet. It had an area more than four times that of the Parthenon at Athens, and even the Olympium was only about two-thirds as great. But even more wonderful than the temple itself were the numberless statues and pictures which it contained, executed by the best masters of Greece. The altar of the goddess was principally adorned with the works of Praxiteles. Plundered of its treasures by Nero, and burned (as has been mentioned) by the Goths, it was most likely finally destroyed by the iconoclasts, in the reign of Theodosius I., who issued his celebrated edict against the ceremonies of the pagan religion 381 A. D. The site of E. is now occupied by some wretched villages, the principal of which is Ayasuluk.—Certain cabalistic words or sayings are said to have been inscribed on the figure of Diana, which being copied and

carried about as charms, became known as *Ephesa litorea* (Mason's *Anatomie of Sorcerie*, 1612).

EPHOD, a vestment worn by the Jewish high-priest over the *Meil* or second (purple) tunic. It consisted of two shoulder-pieces, one covering the back, the other the breast and upper part of the body, not unlike the Greek *epomis*. Two onyx stones set in gold fastened it on the shoulders, and on each of the stones were engraved the names of six tribes, according to their order. The material of which the ephod was wrought was extremely costly and magnificent: 'gold, blue, purple, crimson, and fine twined linen.' A girdle or band, of one piece with the ephod, fastened it round the body. Just above this girdle, in the middle of the ephod, and joined to it by little gold chains, rings, and strings, rested the square oracular breast-plate with the mysterious *Urim* and *Thummim*. See also **HIGH-PRIEST** and **URIM AND THUMMIM**.

Originally intended to be worn by the high-priest exclusively, ephods of an inferior material seem to have been in common use in later times by the ordinary priests. Even David, when bringing the ark back to Jerusalem, appeared in one. There is also mention made of an ephod in several passages of the book of Judges and Samuel, where the word must needs stand either for the whole priestly apparatus of an illegal service, or simply for a statue or an idol. The Talmud understands this ephod to have been a colossal shoulder vestment of gold, to which divine honors were rendered.

E'PHORI (Gr. 'overseers'), an order of magistrates in ancient times which appears to have originated at Sparta, and to have been peculiar to the Doric governments. When or by whom the ephori were at first instituted, is a point of great uncertainty. Herodotus attributes their creation to Lyscurgus, and Aristotle to Theopompus (770—720 B.C.). Their duty was to superintend the internal administration of the state, especially affairs of justice, for which a particular building was assigned them, called the Ephorion. One of their most important functions was the oversight, at least in part, of the education of youth, for we are told by Athenæus that they inspected the clothing and bedding of the young men. The ephori were five in number; they were elected by and from the people—on which Aristotle observes, that through them the *demoi* enjoyed a participation in the highest magistracy of the state—and held their office only for one year. Their influence gradually increased, for their powers were so ill defined that it was difficult to say what was *not* under their cognizance and authority. Cicero draws a comparison between the ephorality of Sparta and the tribunate of Rome, which is not altogether unwarranted by the facts of the case. Ultimately, the kings themselves became subject to the supervision of the ephori. Cleomenes, for example, was brought before them for bribery; Agesilaus was fined, and Pausanias imprisoned; and in extreme cases they could prefer charges against them, and have them tried before the supreme criminal court. They also transacted the negotiations with foreign powers, subscribed treaties, raised troops, 'intrusted the army to the king or some other general,' and, in fact, acted as the executive of the state. Muller regards the ephorality as 'the principle of change in the Spartan constitution, and, in the end, the cause of its dissolution.' In the hands of the ephori, the constitution of Sparta certainly ceased to be a genuine aristocracy, and became a sort of oligarchy; but this point is involved in much obscurity and perplexity. Their authority, however, was at last destroyed by Agis and Cleomenes, who murdered the ephori for the time being, and restored the old Spartan constitution (225 B.C.).

E'PHRAEM SY'RUS, one of the most celebrated and prolific ecclesiastical writers of the Syrian Church. Several accounts of his life have been handed down to us, but they all bear more or less such a legendary character, that the real facts to be gathered from them are but scanty. It appears, then, that Ephraem (Heb. *Ephraim*) was born in the early part of the reign of Constantine the Great, 'somewhere between the Euphrates and Tigris,' most probably at Nisibis. His parents were, according to some, heathens; and E., repudiating their idolatry at an early age, had to leave their roof. Jacob, Bishop of Nisibis, took care of the boy, and undertook his education. His progress in learning was so satisfactory that the bishop was soon able to make him teacher at his own school; and when in 325 A.D. Jacob went to the council of Nicea, E. accompanied him thither. In 363, Nisibis was ceded by Jovian to the Persians, and E. first retired into Roman territory, then went to Anid, his mother's birthplace, and finally settled in Edessa (Orfa), where he remained until his death. He is said to have been so poor when he first arrived at Edessa, that he was obliged to take service at a public bath, but he soon became acquainted with hermits of the neighborhood, and adopted their habits: he retired into a cave near the town, and led the life of a recluse. But so great were his piety and asceticism, as well as his readiness to help the poor and tend the sick, that he was looked upon as a saint, and his day is still celebrated, at different dates, in various churches. Among his usual

denominations, more especially referring to his teachings and writings, are 'Prophet of the Syrians, Column of the Church, Harp of the Holy Spirit,' &c.; and his name is never mentioned without 'Mor' or 'Mari' (Lord, My Master) being prefixed. But for all that, he had no lack of enemies. His burning zeal for preaching and converting led him to attack most fiercely almost every one beyond the pale of his peculiar creed. He spoke and wrote unceasingly against idolaters, 'Chaldees,' Jews, and heretics of all kinds, especially Arians, Sabellians, Manicheans, Novatians, &c. Towards the end of his life, he paid a visit to Basil the Great, in Cappadocian Caesarea, who could not prevail upon him to accept of any higher office in the church than a deanery, though he spared no effort to make him bishop. Returned to Edessa, he found plague and famine raging there, and to his over-exertions for the relief of the sufferers his death is attributed by some. He expired in the same year with Basil, in 378, not before having given the strictest injunctions that his burial should be of the very simplest description. With respect to the Testament which he is reported to have dictated in his dying hour—much as it has been used for biographical purposes—we can take no notice whatever of it, as it is entirely spurious.

The visit to Basil, unimportant as it seems, has been of very great moment. The legend which surrounds this, as all other incidents of his life, with a halo of miracle, records that the two men, although previously ignorant of each other's language, began to speak them fluently at this interview—Basilus Syriac, and E. Greek. This wonderful circumstance first induced the learned to enter upon the question, whether E., half of whose voluminous works are in Greek, did really understand that language; and further, whether he understood any language but his own, Syriac. If he did not, what view was to be taken of his Commentaries on the Bible, of which the Hebrew and Greek texts, as well as the Septuagint and the Greek Fathers, must have been a sealed book to him. There were, and are still, great differences of opinion on these points, but it is generally taken for granted now, that he did not understand any language but his own; that he made use of the common Syriac version, the Peshito; that his grammatical and linguistic notes are taken from different Syriac Commentaries, and that the Greek portion of his works consists partly of translations made from his Syriac after his death, or even during his lifetime, and partly of interpolations. Both the praise and the blame which have been indiscriminately bestowed upon him as a writer are exaggerated. His chief merit lies in the glowing fervor and the deep piety which he infused into all he wrote, more particularly into his elegiac hymns. Diction and form are poetical throughout, and when not soaring into the infinite, of no mean beauty. The effect is heightened by the matchless simplicity and awing grandeur of the Syriac idiom.

We will now enumerate his principal works and their editions. Those (under his name) in Greek, consist of Sermons or Homilies, and Treatises of an exegetic, dogmatic, and ascetic nature. Photius records that he wrote more than a thousand such sermons; Sozomenos speaks of '300 myriads,' but, as we said before, of those that have come down to us, some are spurious, and others at least suspicious. Gerhard Vossius translated 171 treatises from Greek MSS. found in Italian libraries, into Latin, and published them at Rome, 1589—1598, in 3 vols. (There is but one piece in them translated from the Syriac.) They were reprinted in Cologne in 1603, 1619 (1675), and also in Antwerp, in 1619. The first Greek edition appeared in Oxford in 1709, edited from 28 Oxford MSS., by E. Thwaites. The most important of his Syriac works are, besides an infinite variety of homilies, sermons, poems, &c., his commentaries, or rather scholia, on parts of the Old Testament. Their value to us, however, is limited to their aiding us in explaining and fixing some readings of the Peshito (see **PESHITO**), and in enriching our critical apparatus. That he also commented on the Gospels is certain, but no MS. has been found as yet, not even in a Greek or Arabic translation. As to the songs and prayers in the Syrian Liturgy ascribed to E., they are simply composed in his manner, and betray their comparatively recent origin at the first glance. The principal edition of his works in Syriac and Greek was published in 6 vols. in Rome, under the papal authority (1732—1746).

The principal writers on E. are: Sozomenos, *Hist. Eccl.* iii. 16; Assemani, *Proleg. and Biblioth. Orient.*; Credner, *De Proph. Min. Vers. Syr.* (1827); Lengerke, *Comm. de Ephr. Syr. S. S. Interprete* (Halle, 1828); and *De Ephr. Syr. Arte Hermen.*, &c. (1831). Some tasteful German translations of hymns, by Zingerle, are to be found in the *Zeitschr. d. Deutschen Morgenl. Gesellsch. passim*.

E'PHRAÏM, the younger son of Joseph by his wife Asenath, and the founder of one of the twelve tribes of Israel. It is possible that he may have received his name, which signifies 'double fruitfulness,' from having been born during the seven years of plenty. His grandfather, Jacob, shortly before his death, prophesied the greatness of his posterity when giving him his blessing: 'His seed shall become a multitude of nations,' (Gen. xlviii. 19). After the

Israelites had left Egypt, the tribe of Ephraim numbered 40,500 (Numbers, i. 32, 33); but from causes not specified, and not discoverable, it had sunk, forty years later, on the eve of the conquest of Canaan, to 32,500 (Numbers, xxvi. 37). Yet it was under the leadership of an Ephraimite, Joshua, the son of Nun, that the Canaanites were subjugated, and the land possessed. This seems to have given the tribe a much higher influence than might have been expected from its numerical strength. We find Judah and Ephraim classed together as taking their inheritance first (Josh. xv. xvi., &c.). The precise boundaries of Ephraim, as of the other tribes, it is impossible to determine. It occupied the center of Palestine, was bounded on the south by Dan and Benjamin, and stretched from the Jordan on the east to the Mediterranean on the west. From scattered notices of the Ephraimites in the earlier annals of the Hebrews, we infer that they were, on the whole, jealous of their brethren. This feeling of dissatisfaction at length broke out into rebellion in the reign of Rehoboam, and the new kingdom of Israel, ruled over by Jeroboam, was for the most part merely the kingdom of Ephraim, for the land which lay to the north of it could hardly be said to be actually in the possession of the tribes whose names it bore, the original inhabitants keeping stubborn hold of their cities and strongholds. See the article **JEWS**.

EPI, or **GIROUETTE** (Fr.), a species of ornamental ironwork with which the cones of pavilions or pointed roofs are sometimes surmounted in the renaissance style of architecture. One of the finest examples is that which surmounts the Tourelle aux Pastors at the Hôtel de Bourgheroulde in Rouen.

EPIC POETRY (Gr. *epos*, a word, a discourse or narrative). The two chief kinds of poetry, are Epic poetry and Lyric poetry. Epic poetry has outward objects for its subject, of which it gives an imaginative narrative. The events themselves may be partly real and partly fictitious, or they may be altogether fictitious. Lyric poetry, on the other hand, sets forth the inward occurrences of the writer or speaker's own mind—his feelings and reflections. No composition, perhaps, answers, in all its parts, to the one of these descriptions, or to the other; but a piece or poem is classed as epic or lyric according to the element that predominates.

Under each of these grand divisions, or genera, there are subdivisions, or species. The longer poems of the epic genus embrace an extensive series of events, and the actions of numerous personages. The term *heroic epic* or *heroic poem*, is properly applied to such works as the *Iliad* and *Odyssey* of Homer, Virgil's *Æneid*, Tasso's *Jerusalem Delivered*, Ariosto's *Orlando Furioso*, and others, which describe the achievements of the gods and heroes of antiquity, or of the little less mythic knights of medieval chivalry. Poems, again, like Milton's *Paradise Lost* and Dante's *Divina Commedia* are *sacred epics*. Byron's *Childe Harold*, with the length and narrative structure of an epic, abounds in reflection, sentiment, and satire, and thus is, in substance, as much lyric as epic. Productions like those now named form the class of grand epics, or epic poems, by way of eminence. But there are several species of minor poems which from their nature, must also be ranked as epics. One of these is the *Idyl*, a term applied to what is called *pastoral poetry*, or to descriptions in general of natural scenery, and of the actions and manners of men in calm, ordinary life. Burns's *Cotter's Saturday Night*, Goldsmith's *Deserted Village*, and most of Crabbe's poems, are *idyls*; so are poetical epistles. The *ballad* (q. v.) is another species of minor epic.

Attempts at epic poetry are now rare, the spirit of the age being against that form of composition. Instead of epic poems, we have *novels*, which, so far as subject is concerned, may be considered as the epics of modern civil and domestic life.

EPICHA'RMIUS, a famous Greek poet, was born in the island of Cos, in the 5th c., B.C. At first, he studied philosophy under Pythagoras; but a residence at Megara, the native soil of comedy, gave him a taste for that branch of the drama. After the destruction of Megara, in 484 B.C., he removed to Syracuse, where, at the court of Hiero, he spent the remainder of his life. From this circumstance, he is often mentioned by the ancients as a Sicilian. Almost nothing else is known of his personal history except that he died at the age of 90, or, as some say, of 97. The date of his death, as of his birth is unknown. E. is called by Theocritus the father of comedy, and Plato assigns to him a place among comic writers as high as that of Homer among epic poets. He certainly did a good service in excluding, to a large extent, from his dramas the vulgar buffoonery which disgraced all previous comedies, and in introducing a regular plot in which the *comus* or band of revelers sustained the dialogue. None of E.'s works survive entire; but we possess several fragments and the titles of thirty-five. They embrace a wide variety of topics, mythological, social, and political. From one of them, Plautus borrowed the plot of his *Menecmi*, which shows a great amount of constructive skill. The fragments of E. have been collected and edited by H. P.

Krusemann (Haarlem, 1834). Compare Lorenz, *Leben u. Schriften des E.* (1861); and Guigniant, *Histoire de la Comédie Antique* (1863).

EPICTE'TUS, a celebrated disciple of the Stoa, was born at Hierapolis, in Phrygia, about fifty years after the birth of Christ. He was at first the slave of Epaphroditus, a freedman of Nero, at Rome, whose abusive treatment he is said to have endured with the composure characteristic of the sect to which he belonged. He was afterwards manumitted, and devoted himself to the Stoic philosophy. Domitian hated him on account of his principles, and banished him, along with several other philosophers, from Rome. E. settled at Nikopolis, in Epirus. Under the pressure of the times in which he lived, his serious moral views received a character rather of self-denial than of energy; to renounce, to endure, and not to set the mind upon anything beyond the power of the individual to attain, being the points chiefly insisted on. His pupil, Arrianns, collected the maxims of E. in the work entitled *Encheiridion* ('Handbook') and in eight books of Commentaries, four of which are lost. The peculiar excellence of the writings of E. consists in their simple and noble earnestness. That real heartfelt love of good and hatred of evil which we are in the habit of supposing an exclusively Christian feeling, does manifest itself very finely and beautifully in these, yet, as Professor Brandis says, 'there is not a trace in the *Epicteten* to show that he was acquainted with Christianity, and still less that he had adopted Christianity, either in part or entirely.' Some of his opinions, moreover, are essentially Christian in their nature, though, of course, they are unconnected with the facts of revelation. E. believes in our 'resemblance' to God, in our 'relationship' to him, and in our 'union' with him through the coincidence of the 'will' and the 'soul'; he recognizes the contest between good and evil, the life-struggle in the heart, the divine life against which the law in the members wars; and he affirms the necessity of 'invoking God's assistance in the strife,' that the inner life may become pure as God is pure. There are several good editions of the works of E., the most complete of which is that of Schweighäuser (Leip. 1800).

EPICURUS, AND EPICUREANISM. Epicurus, an illustrious Greek philosopher, was born in the island of Samos, 341 B.C., seven years after the death of Plato. His father, Neocles, is said to have been a schoolmaster, and his mother, Chærestrate, to have practised arts of magic. At the age of 18, he repaired to Athens, where it has been supposed that he may have had for his teacher Xenocrates or Theophrastus, or perhaps both, but he himself used to declare that he was self-taught. Of the older philosophers he was most attached to Anaxagoras and Democritus, his system of physics being evidently built upon the atomic speculations of the latter. E.'s stay at Athens on this occasion was short. At Mytilene, in his thirty-second year, he first opened a school; and there and at Lampsacæ he taught for five years.

In 306 B.C., he returned to Athens, and established a school of philosophy in a garden which he purchased and laid out for the purpose. From this circumstance, his followers were called the 'philosophers of the garden.' Although E. laid down the doctrine, that *pleasure* is the chief good, the life that he and his friends led was one of the greatest temperance and simplicity. They were content, we are told, with a small cup of light wine, and all the rest of their drink was water; and an inscription over the gate promised to those who might wish to enter no better fare than barley-cakes and water. The chastity of E. was so incontestable, that Chrysippus, one of his principal opponents, in order to deprive him of all merit on the score of it, ascribed it to his being without passions. The calumnies which the Stoics circulated concerning him are undeserving of notice, and were at no time generally believed. E.'s success as a teacher was signal; great numbers flocked to his school from all parts of Greece, and from Asia Minor, most of whom became warmly attached to their master, as well as to his doctrines, for E. seems to have been characterized not less by amiability and benevolence than by force of intellect. He died 270 B.C., in the seventy-second year of his age.

E. was a most voluminous writer. According to Diogenes Laertius, he left 300 volumes. Among others, he had 37 books on Natural Philosophy, a treatise on Atoms and the Vacuum; one on Love; one on Choice and Avoidance; another on the Chief Good; four essays on Lives; one on Sight; one on Touch; another on Images; another on Justice and the other Virtues, &c. Almost all of these works are lost; the only writings of E. that have come down to us are three letters, and a number of detached sentences or sayings, preserved by Diogenes Laertius, in his life of the philosopher. The principal sources of our knowledge of the doctrines of E., besides the above letters, &c., are Cicero, Seneca, and, above all, Lucretius, whose great poem, *De Rerum Natura*, contains substantially the Epicurean philosophy.

Although the majority of E.'s writings referred to *natural philosophy*, yet he was not a *physicist*, properly speaking. He studied nature with a *moral* rather than with a *scientific* design. According to him, the great evil that afflicted men—the incubus

on human happiness—was FEAR; fear of the gods and fear of death. To get rid of these two fears, was the ultimate aim of all his speculations on nature.

The following is a brief account of his views. E. regarded the universe (*Tô Pan*) as corporeal, and as infinite in extent, and eternal in duration. He recognized two kinds of existence—that of bodies, and that of *vacuum*, or space, or the intangible nature. Of his bodies, some are compounds, and some atoms or indivisible elements, out of which the compounds are formed. The world, as we now see it, is produced by the collision and whirling together of these atoms. He also held the doctrine of perception by *images* (Gr. *eilola*), which are incessantly streaming off from the surface of all bodies, and which are necessary to bring us into *rapprochement* with the world without. In like manner, he believed that sounding bodies threw off emanations, by which we are brought into sympathy with them; and that perception by smell took place in the same way. In psychology, E. was a decided materialist, holding, for various reasons, that the soul is a bodily substance, composed of subtle particles, disseminated through the whole frame, and having a great resemblance to spirit or breath with a mixture of heat.

In seeking to understand the phenomena of the heavens, E. has no scientific end in view; his sole object is to enable the mind to account for them to itself, without the necessity of imagining any supernatural agency at work. 'The phenomena of the heavens,' says E., admit of various causes being assigned for their production, equally conformable to the facts learned from the senses. If, then, in thinking of any appearance, we suppose it brought about by the same cause that produces another appearance which gives no alarm or uneasiness, we are as much delivered from uneasiness as if we *saw* that such is the cause of it.' E. did not deny that there are gods, but he strenuously maintained, that as 'happy and imperishable beings,' they could have nothing to do with the affairs of the universe or of men. 'Beware,' he says, 'of attributing the revolutions of the heaven, and eclipses, and the rising and setting of stars, either to the original contrivance or continued regulation of such a being. For business, and cares, and anger, and benevolence, are not accordant with happiness, but arise from weakness, and fear, and dependence on others.'

E. next proceeds to deal with the fear of death. Having proved in his psychology that the dissolution of the body involves that of the soul, he argues that the most terrible of all evils, death, is nothing to us, 'since *when we are, death is not; and when death is, we are not*. It is nothing, then, to the dead or the living; for to the one class it is not near, and the other class are no longer in existence.' Whether E. actually succeeded in removing the terrors of death by his syllogism, may be doubted.

The *positive* part of E.'s system may be noticed in a few words. He held that *pleasure* was the chief good, and it is from a misapprehension of the meaning of this word as used by E. that the term Epicurean came to signify one who indulged his sensual appetites without stint or measure. At the same time, it is easy to see that the use of the word 'pleasure' was calculated to produce the mischievous results with which the later Epicureanism was charged. According to E., the sources and tests of all ethical truth are the feelings (*pathê*), and these are two, pleasure and pain. We delight in the one, and avoid the other instinctively. 'When we say that pleasure is the end of life, we do not mean the pleasures of the debauchee or the sensualist, as some from ignorance or from malignity represent, but freedom of the body from pain, and of the soul from anxiety. For it is not continuous drinkings and revelings, nor the society of women, nor rare viands, and other luxuries of the table, that constitute a pleasant life, but sober contemplation that searches out the grounds of choice and avoidance, and banishes those chimeras that harass the mind.' But, on the other hand, E. says: 'If the means to which sensualists owe their pleasures dispelled the anxieties of the mind . . . and enabled them to set limits to their desires, we should have no grounds to blame them for taking their fill of pleasure, wherever they could find it, provided it were attended with no pain or grief from any quarter, for that is the only evil.'

The whole question of ethics, then, comes to a calculation and balancing of pleasures and pains; in other words, the cardinal virtue is *prudence*. E. rests *justice* on the same prudential basis as temperance. Denying any abstract and eternal right and wrong, he affirms that injustice is an evil, because it exposes the individual to disquietude from other men; justice is a virtue, because it secures him from this disquietude. 'Injustice is not an evil in itself, but becomes so from the fear that haunts the injurer of not being able to escape the appointed avengers of such acts.' The duties of friendship and good-fellowship are inculcated on the same grounds of security to the individual.

Among the Romans, the system of E. was adopted by many distinguished men. Horace, Atticus, and Pliny, the Younger, were Epicureans; and the splendid poem of Lucretius must have recommended the system to many. In modern times, Epicureanism

was resuscitated in France by Pierre Gassendi, who published an account of E.'s life and a defence of his character in 1647. Many eminent Frenchmen have professed his principles; among others Molière, Saint Evremond, Count de Grammont, the Duke of Rochefoucauld, Rousseau, Fontenelle, and Voltaire.

EPICYCLE. The earlier astronomers assumed that all the motions of heavenly bodies took place in circles, the circle being held to be the most *perfect* of all curves; and a necessary consequence of this assumption was, that the motions must have a uniform velocity. Another part of the hypothesis was, that all the heavenly bodies moved round the earth, which remained at rest in the center. The observed phenomena of the heavens, however, were soon seen to stand in glaring inconsistency with these assumptions; and to remedy this, it was necessary to have recourse to additional assumptions. For the sun and moon, which manifestly do not always move with the same velocity, the *Eccentric Circle* (q. v.) was imagined. The case of the planets, whose motions were seen to be sometimes direct, sometimes retrograde, and sometimes altogether arrested, offered still greater difficulties; to get over which, the idea of *epicycles* was hit upon. According to this hypothesis, while a planet was moving in a small circle, the center of that small circle was describing a larger circle about the earth. This larger circle was called the *deferent*, and the smaller, which was borne upon it, was called the *epicycle* (Gr. *epi*, upon). In this way the motions of the planets about the earth were conceived to be something like what the motion of the moon about the sun actually is. By assuming proper proportions between the radii of the deferent circle and the epicycle, and between the velocities of the two motions, it was found possible to account pretty satisfactorily for the above-mentioned appearances and irregularities in the motions of the planets. But it is only the irregularities arising from the revolution of the earth about the sun that can be at all explained in this way and not those arising from the elliptic motions of the planets about the sun, nor yet the inequalities of the moon's motions. The successors of the Greek astronomers, down to Tycho Brahé, continued therefore, to increase the number of epicycles, setting one circle upon another, until the hypothesis, in itself complicated, became still more so, and made the simplicity of the Copernican system at once striking.

EPICYCLOID is the name of a peculiar curve. When a circle moves upon a straight line, any point in its circumference describes a Cycloid (q. v.); but if the circle moves on the convex circumference of another circle, every point in the plane of the first circle describes an epicycloid; and if on the concave circumference, a hypocycloid. The circle that moves is the generating circle; the other, the base. The describing point is not necessarily in the circumference of the generating circle, but may be anywhere in a radius or its prolongation. This curve was first investigated by the Danish astronomer Römer. It has many remarkable properties, and is even useful in the practical arts. The teeth of wheels in machinery must have an epicycloidal form, in order to secure uniformity of movement.

EPIDAMNUS. See DURAZZO.

EPIDAUROS, a town of ancient Greece, on the eastern shore of the Peloponnesus, in the district of Argolis, was situated on a small promontory 15 stadia in circumference, in the Saronic Gulf, in lat. 37° 38' N., long. 23° 10' E. During the most prosperous period of Grecian history, E. was an independent state. It was colonized first, it is supposed, by Carians (hence the older name of *Epicarus*, according to Aristotle), and afterwards by Ionians, but was subsequently invaded by a Dorian army, under Deiphontes, the son-in-law of Temenus the Heracleide. This force dethroned Pityreus, the Ionian king of E., compelled him and his citizens to retire to Athens, and inaugurated the Dorian rule, which preserved the ascendancy at E. during the whole of the historical period. The form of government was originally monarchical, but after many vicissitudes, it eventually became and remained oligarchical. At an early period, E. became one of the chief commercial cities of the Peloponnesus. It colonized the islands of Cos, Calyndus, and Nisyros, as well as the town of Ægina, which, during the 6th c., attracted all its commerce from the then declining mother-city. E. was chiefly famous for its temple of Æsculapius, to which patients resorted from all parts of the Hellenic world, seeking cures for their diseases. The site of this temple was a plain surrounded by mountains, about 5 miles west of the town, and which is still called Hieron, the sanctuary. E. had also numerous temples, among which were those of Artemis, Dionysus, Aphrodite, and Hera, and a magnificent theater, at present in a more perfect state of preservation than any in the Peloponnesus, and with sufficient accommodation for 12,000 spectators.

E. (modern Greek, *Epidauro*) is now a small village, with scarcely 100 inhabitants, employed for the most part in raising vegetables for the Athenian market. The plain surrounding the village is productive and highly cultivated. Here, in January 1822,

a congress from all parts of Greece assembled, and promulgated the constitution known as the constitution of Epidaurus.

EPIDEMIC (Gr. *epi*, upon, and *dem*, the people), a disease which attacks numbers of persons in one place simultaneously or in succession, and which in addition is observed to travel from place to place, often in the direction of the most frequented lines of communication. Many epidemic diseases are also contagious, and all of them suggest the necessity of careful inquiry into the ventilation, drainage, food, drink, and habits of the persons liable to be affected. In presence of an epidemic, it is proper to take unusual precautions to preserve the public health (see article **HEALTH**), and not unfrequently the organization of a regular house-to-house visitation of the locality is calculated to do much good, by directing the minds of the poor and ignorant to their duties in respect to themselves and to each other. See **ENDEMIC** for further observations on this subject; also **CONTAGION**, **INFECT**, **FEVER**, **CHOLERA**, &c.

EPIDEMIC CEREBRAL MENINGITIS is a disease which has been noticed and described by many American physicians since the year 1811, when Dr. North specially drew the attention of the profession to it. In 1838—1840, it appeared in France, and committed great ravages in Versailles, where the mortality was 28 per cent.; in Strasburg, where the mortality was 42 per cent.; in Lyon, Nancy, and other garrison towns. The patients, in these cases, were almost entirely young conscripts; and the disease was regarded as non-infectious. In the spring of 1846, it appeared in the Dublin and Belfast workhouses, boys under 12 years of age being the only victims. In 1863, it was very fatal in the United States. In 1865, it ravaged West Prussia; of 2000 cases recorded, half died; and of 347 cases, 330 were under 14 years of age. In the United States, two forms of the disease are recognized—one marked by shock, weak pulse, purpled limbs, and coma, death happening within the first day; the other presenting signs of cerebro-spinal mischief, such as tetanoid spasms, and death here occurring in three days. Purple spots were present in 27 out of 44 cases.

We now pass to the so-called *Black Death*, which in 1866 and 1867 caused such intense alarm in Ireland. A healthy medical student, aged 19, residing in Dublin, fell ill with chilliness and *malaise* about noon on March 18, 1866. When he was visited in the evening, it was found that he had vomited frequently and was very prostrate; purple blotches appeared on his skin during the night; and about noon next day, he suddenly fell into stupor, and was dead at two, or about 26 hours from the apparent commencement of the symptoms. A girl, aged 18, presented similar symptoms on April 2, but recovered. Fatal cases were recorded on May 12, 13, and 17. According to Dr. Mapother, 63 fatal cases had been registered (up to July) in the Dublin district, exclusive of eight deaths amongst soldiers.

The symptoms include two types of very different severity. In the graver, life is rapidly extinguished as if by a blood-poison; in the milder, the symptoms are those of inflammation of the cerebro-spinal axis, or its membranes. Dr. Stokes, however, regards these latter phenomena as secondary to the essential disease, and believes that they will always appear, if the patient lives long enough for their development. The earliest symptoms are chilliness and a sense of impending danger, and vomiting of a persistent character soon follows. There is constipation till shortly before death, when the evacuations are involuntarily discharged. The tongue is dry; the pulse abnormally compressible, and usually over 100. The dark purple blotches, caused by the escape of dissolved hæmatin (coloring matter of the blood) from the smaller vessels, are situated in and under the true skin of the legs, hands, face, back, and neck. These patches vary in size from that of a pin's head to that of a walnut, and are often sufficiently raised to be detected by the touch. The skin is dusky and moist, sometimes even bathed in sweat. In some cases, stupor, and in others, delirium and intense restlessness, are the forerunners of death. The rapidity with which this disease runs its course is appalling. A healthy boy, aged 10½ years, sank in less than five hours from the time of his seizure; and of 41 investigated fatal cases, 14 terminated within 24 hours. Of these cases, 21 were females, and 20 males. Youth predisposes very strongly to the disease. No position in life affords exemption; one young nobleman, three medical students, two undergraduates, and several inhabitants of the lowest hovels—the seats of typhus and cholera—were amongst the victims.

With regard to treatment, almost every kind has been tried, and each has been found equally unavailing. The external application of cold to the spine and head as advocated in various forms of disease by Dr. Chapman, deserves a trial. Dr. Mapother suggests that the disease is due, like scurvy, to the want of fresh vegetables as an article of food; and if this view is correct, it is satisfactory to feel that if this terrible malady is incurable, it is at all events preventible. A few cases of this disease have been recorded

as occurring quite recently in various parts of England. They would probably have passed unnoticed but for the Dublin epidemic.

EPIDEMIC MENTAL DISEASES. When we consider how ordinary and normal thoughts and emotions spread from one man to many, and sway multitudes to the same views and actions, it is no longer a mystery that morbid conditions of the mind should become at times no less epidemic than physical diseases. Such, at least, is the fact. A mental disorder may spread from man to man, and may involve whole nations. It depends for its propagation, like an epidemic disease, first upon external circumstances, and secondly, upon the peculiar condition or constitution of the individuals affected. Like the bodily affection, the causes which provoke the insanity and the tendency to be affected may have been in process of development for years. Both attack the weak rather than the strong; both exist for a season, and disappear. In the case of the mental malady, the external influences—those which constitute the moral atmosphere—are ignorance or imperfect knowledge, the power of one mind over another, the influence of language, the diffusion of particular opinions, the tendency to imitate. It is probable, however, that physical causes exercise an important influence in the production of such general mental conditions. In 1842 and 1844, there occurred in Germany and France, among the military, epidemics of meningitis with delirium, or inflammation of the membranes of the brain, when no moral factors were at work, but when diet, temperature, &c., were. But even where the origin cannot be so distinctly traced, the co-operation of external as well as psychical agents may be legitimately predicated. It would accordingly be illogical to limit the production of the Dancing Mania (q. v.), which occasionally, during several centuries, swept over Europe, to the reaction succeeding the dread of the end of the world, which had previously prevailed epidemically. An examination of about a hundred manifestations such as that alluded to, collected from various sources, demonstrates that not merely the intoxication of joy, but the most absurd forms of belief—that dreams, delusions, superstitions, corruptions of language, all instincts and passions, even movements and cries, may assume the form, and, to a certain extent, may follow the laws of epidemic diseases. In far-distant ages, there are records of a histrionic plague, when, after a summer of intense heat, all conceived themselves players, and traversed the streets, and sunk and died, repeating verses, and exhibiting extravagant gesticulations; of whole communities being stricken with nightmare, which was so general as to be supposed and called contagious. There have been epidemics of homicidal and suicidal mania. In one age, hundreds are found possessed by Satan; in another, larger numbers converted into wolves; and in recent times, the leaping ague of Forfarshire, and outbursts of pyromania in various places, remind us that there may be still in the constitution of the human mind, and in the education and the habits of life prevailing, elements capable of realizing the catastrophe suggested by Bishop Butler's question: What is to prevent a whole nation becoming mad? The instances of epidemic mental disease recorded in the following table, have been selected from a vast number of others, with a view of showing not the frequency or extent of such affection, but the range of the phenomenon through the powers and propensities of our nature.

Popular Name.	Form of Disease	Year.	Number Affected.	Authority
St. Vitus's—St. John's Dance.....	Choremania	1374	Hundreds	Hecker
Wolf-madness.....	Lycanthropia	1523	"	Calniel
Possession.....	Demonomania	1642 &c.,	"	"
Convulsionaries of St. Medard.....	Thcomania	1731	"	"
Incendiarism.....	Pyromania	1800	Many	Marc
Witchcraft.....	Demonopathia	Various	Thousands	Various
Suicide.....	Melancholia	"	"	Esquirol
Visions.....	Delusions	"	Many	Briere de Boismont
Timoria, Panic.....	Panphobia	1845	Many	Edin. Review 1-49

There appears to be no guarantee that the present and future generations shall be exempted from similar visitations, except in the universal diffusion of knowledge and sound thinking, for it is invariably in the darkness of ignorance or in the twilight of imperfect knowledge that the moral plague comes.—Hecker's *Epidemics of the Middle Ages*; Calniel, *De la Folie considérée sous le Point de Vue Pathologique, Philosophique, Historique et Judiciaire, depuis la Renaissance des Sciences en Europe jusqu'au dix-neuvième, Siècle*, &c.; and *Psychological Journal*, *passim*.

EPIDERMIS (Gr. *epi*, upon, and *derma*, the skin), a semi-transparent membrane, containing neither vessels nor nerves, and everywhere forming an external covering to the corium or true skin. See **SKIN**. The epidermis is called in ordinary lan-

guage the *scarf-skin*. It consists



Perpendicular Section of the Skin of the Leg of a Negro: Magnified 250 diameters.

a, a, papillæ of the cutis; b, deepest intensely colored layer of perpendicularly elongated cells of the mucous layer; c, upper stratum of the same layer; d, horny layer.

tended with fluid, and likewise containing minute granules, which diminish in number the more external cells.

The *horny layer* forms the external semi-transparent part of the epidermis, which in the white races is colorless, and is composed almost wholly of uniform cells, metamorphosed into plates or scales. The deepest plates in some degree resemble the uppermost cells of the mucous layer; but in the second or third layer we find the flattening commence; till at length, after a gradual series of modifications, we have the hard, horny scales which occur on the surface, where they are regularly cast off with more or less rapidity, and replaced by those beneath them.*

The color of the epidermis differs in different persons and in different parts of the body. It is deepest around the nipple, especially in women during pregnancy and after they have borne children. A more or less dark pigment is often deposited, in persons who are exposed to the sun, in the face, neck, back of the hands, &c. These tints are not produced by special pigment-cells, but are seated in the common cells of the mucous layer, round whose nuclei granular pigment is deposited. In the Negro and the other colored races, it is also only the epidermis which is colored, while the *corium* completely resembles that of Europeans. The perpendicular cells (see *b* in the figure) are the darkest, and form a sharply marked fringe at the edge of the clear corium. To these succeed brown cells, which accumulate in the depressions between the papillæ, and as we approach the horny layer, we have yellowish cells. The horny layer of the Negro also inclines to a yellow or brownish tint.

Morbid coloration of the epidermis (freckles, mother's marks, &c.) is produced in the same way as the color of the Negro's skin. Numerous instances of partially or entirely white Negroes and of black Europeans, not as a consequence of change of climate but as an abnormal condition of the skin, are on record.

The thickness of the epidermis varies extremely. While upon the cheeks, brow, and eyelids, it varies from $\frac{1}{16}$ th to $\frac{1}{8}$ th of a line, on the palm of the hand it ranges from $\frac{1}{8}$ d to $\frac{1}{2}$ a line, and on the sole of the foot sometimes even exceeds a line. In some parts of the body the horny layer is thicker than the mucous; in other, the mucous is the thicker of the two. As the chief use of the epidermis is that of affording protection to the soft and tender subjacent parts, it attains its greatest thickness on those portions of the body (the palm of the hand and the sole of the foot) which are most exposed to pressure and friction.

In *plants*, as in animals, the epidermis is formed of flattened cells, of which also new layers are continually produced from the bark below, whilst the outer ones dry up, lose their vitality, and peel off, crack and split off, or otherwise become separated from the living organism. The cells of the epidermis are often enlarged outwards so as to form projections, sometimes very slight, sometimes elongated into Hairs (q. v.). Glands (q. v.) are also connected with the epidermis, sometimes by the intervention of hairs, sometimes without, and in this way it contributes to the secretion of substances formed in plants by the wonderful chemistry of nature, and on which their value to man often greatly depends. The cells of the epidermis are usually filled with a colorless fluid, but resinous and waxy substances are sometimes found in them, and sometimes silica (as in grasses and Equisetaceæ), sometimes carbonate of lime (as in the *Charus*). The epidermis is

of two layers, chemically and morphologically distinct—viz., the *mucous layer*, which lies immediately upon the corium, and the *horny layer*, which forms the outermost surface of the body.

The *mucous layer* (known formerly as the *rete mucosum* s. *Malpighianum*) is of a whitish or slightly brown tint (in the Negro, dark gray or black), and is composed of small soft cells. The innermost of these cells, resting on the surface of the corium, are elongated and arranged perpendicularly; upon these follow elongated or roundish cells in many layers, which, in proportion to their distance from the corium, acquire, from their mutual pressure, a polygonal form, which may even be recognized in individual cells.

All the cells in the mucous layer are nucleated vesicles dis-

pierced by *Stomata* (q. v.). When the epidermis of plants is subjected to prolonged maceration, it can often be made to separate into two parts; one, which is more strictly called the epidermis, being the inner, lower, and thicker membrane; the other, which is called the *Pellicle* or *Cuticle*, being very thin, and extending continuously over every part of the plant except where it is pierced by the stomata. Thus, this superficial pellicle invests even the finest hairs. In some of the *Algae*, it seems to constitute the whole integument. In the greater number of plants, the epidermis is thin and soft, but sometimes it is thick, and sometimes hard.

E'PIDOTE, a mineral allied to garnet, composed of silica and alumina, with a considerable proportion of lime, or of peroxide of iron, or of peroxide of manganese. These diversities of composition constitute three very distinct varieties; and of these there are sub-varieties, differing in color and other particulars (*Pistacite*, *Bucklandite*, *Withamite*, *Zoisite* &c.). E. is sometimes found massive, foliated, columnar, granular, or incrusting; often crystallized. Its crystals are prisms, variously modified. Its prevalent colors are green, yellow, and gray, but some of the varieties are red and black. It is found in gneiss, syenite, trap, and other rocks in a number of localities in Scotland, and in many parts of the world.

EPIGA'STRIUM (Gr. *epi*, over, and *gaster*, the stomach), the part of the Abdomen (q. v.) which chiefly corresponds to the situation of the stomach, extending from the sternum towards the navel or Umbilicus (q. v.), and bounded on each side by the Hypochonders (q. v.). It is called in popular language the pit of the stomach.

EPIGE'NESIS, (Gr. *epi*, upon, and *genesis*, a formation) a formation upon, or in addition to, previously existing parts. The word is applied in physiology to that theory of new formations in organized beings which supposes them to spring from superadded centers of vital activity, as opposed to the theory which presumes that the new is formed by a development or modification of the old structure. See REPRODUCTION.

EPIGLO'TTIS. See LARYNX.

E'PIGRAM, a word derived from the Greek, and literally signifying an 'inscription.' In point of fact, the epigrams of the Greeks were simply inscriptions on tombs, statues, and monuments, written in verse, and marked by great simplicity of style, but having nothing in common with what now passes under the name. It was among the Romans that the epigrams first assumed a satirical character. Catullus and Martial are reckoned the best Latin epigrammatists. In modern times, an epigram is understood to be a very short poem, generally from two to eight lines, containing a witty or ingenious thought expressed in pointed phraseology, and in general reserving the essence of the wit to the close, as the serpent is fabled to keep its sting in its tail. The French excel all other nations in this kind of poetry. Their earliest epigrammatist of any note was Clement Marot (1495—1544); their best are Boileau, Voltaire, and Piron. The epigrams of German writers are for the most part happily expressed moral proverbs, but the *Xenien* of Schiller and Goethe contain not a few sharp and biting verses of a satirical character. In Britain, Pope, Burns, Byron, Moore, and other writers have shown a remarkable power of epigrammatic satire.

E'PIGRAPH (Gr. *epi*, upon, and *grapho*, I write), a terse inscription placed upon architectural or other monuments, for the purpose of denoting their use or appropriation, and very frequently worked in and forming part of their ornamental details.

E'PILEPSY (Gr. *epi*, upon, and *lambano*, future, *lepso*, I seize), a form of disease characterized by sudden insensibility, with convulsive movements of the voluntary muscles, and occasionally arrest of the breathing, owing to spasm of the muscles of respiration, and temporary closure of the Glottis (q. v.). Epilepsy was called by the ancient Greeks the 'sacred disease.' Owing to the mysterious and extraordinary character of the convulsion of epilepsy, it was always, in ancient times, supposed to be due in a very special manner to the influence of the gods, or of evil spirits; Hippocrates, however, combats this idea in a special treatise, in which he maintains that epilepsy is no more and no less divine than all other diseases. The same idea of the specially supernatural character of epilepsy is shown forth in the deeply rooted oriental notion of demoniac possession. See DEMONIACS. Epilepsy is often called, in modern language, the 'falling sickness,' and this name is not only descriptive of one of its most striking phenomena, but also points distinctly to the most obvious danger of the fit. The patient is seized, without reference to his condition or occupation, at the moment, with insensibility, often so complete and sudden as to lead to serious accidents and bodily injuries; in the most aggravated cases, he has no premonitory sensations whatever, but falls down without any attempt to save himself, and usually with a wild inarticulate cry of some kind, immediately after which the

*In reptiles and amphibians, this layer is periodically cast off in a more or less entire state, a new one being previously formed beneath it; and in man, desquamation in large patches often occurs after certain diseases, especially scarlatina.

face is violently distorted, the head drawn towards one or other shoulder, and the whole body convulsed.

These convulsions follow in rapid succession for a few minutes, and are attended by foaming at the mouth, and by great lividity, or, in some cases, livid pallor, which, with the irregular spasmodic movements of the lips, nostrils, and eyes, give a frightfully ghastly expression to the countenance, and almost invariably lead the bystanders to an exaggerated idea of the immediate danger of the fit. The immediate danger is, in reality, not great, excepting that the sudden attack may lead to an injurious or fatal fall; the tongue, however, may be bitten if protruded during the convulsion, or the patient may be so placed as to injure himself seriously by the repeated and unconscious movements of his body, or he may suffocate himself by accidentally falling with his face in water, or otherwise closing up the mouth and nostrils, or by dragging upon a tightened neck cloth. Care should be always taken to avoid these accidents by keeping the epileptic as much as possible within view of persons acquainted with his condition, and able to give such assistance as may be required; as well as by warning the patient himself to avoid all places in which a fall would be especially dangerous. But when an unskilled person happens to witness a fit of epilepsy, he will do well to remember that beyond the simplest and most obvious precautions against the dangers mentioned above, there is literally nothing to be done; and any attempt to rouse the patient by violent stimuli, as ammonia applied to the nostrils, or by dashing water in the face, or, still more, by administering medicines hastily recommended by the ignorant and thoughtless, is almost certain to do more harm than good. The tongue should be looked to, a piece of cork or other gag being, if necessary, inserted between the teeth; the patient should be then placed on a mattress or other soft place near the ground; his neck-cloth should be removed, and the dress loosened round the chest; the head should be, if possible, a little raised, and a free circulation of air maintained (this last precaution being very apt to be neglected in case of a crowd); with these things done, it may be safely affirmed that in the vast majority of epileptic cases nothing has been left undone which will conduce to recovery. The ordinary course of the fit (which usually lasts from five to twenty minutes altogether) is as follows: the convulsions gradually diminish in intensity, and the patient passes into a state of deep but motionless stupor, with dilated pupils, and sometimes, but not always, with snoring or noisy breathing; the foaming at the mouth ceases, the color gradually returns, and this state leads to recovery through a more or less protracted, but apparently natural sleep, the patient, on awaking, being often quite unconscious that he has been the subject of any anxiety, or, indeed, in any unusual condition whatever. Although in all cases of true epilepsy there is a stage of complete Coma (q. v.), or unconsciousness, yet the fit is often very transient, and but little attended by convulsion, being also less sudden than above described, and not necessarily causing a fall to the ground; in some cases, also, fits of greater intensity are preceded by certain premonitory symptoms or peculiar sensations, which act as warnings to the patient himself, and lead him to place himself in a position of safety on the approach of the paroxysm.

Having in view these distinctions (which are certainly of considerable practical importance), the French language, both popular and scientific, has adopted the terms of *grand mal* and *petit mal* (i. e., great and little evil), as characterizing the more and less dangerous forms of epilepsy respectively. The sensations which precede the fit in some epileptics have been termed in Latin the *aura* (i. e., breath) *epileptica*, from their supposed resemblance to a current of cold air passing over the body, and proceeding from the extremities towards the head. This description does not, however, hold good in all cases; and not unfrequently, as mentioned above, there is no *aura*, or unusual sensation of any kind, preceding the fit. It must be mentioned, however, as bearing on treatment, and as being quite within the bounds of popular medicine, that some of the most ancient authorities assert strongly the power of a tight bandage, placed suddenly upon the limb in which the *aura* begins, to cut short, or even to prevent altogether, the fit of epilepsy. Although this alleged fact has often been regarded as doubtful, it has never been altogether discredited, and has of late years been brought into renewed notice by good observers. It is even maintained that such a bandage, placed experimentally upon one or other of the limbs, and tightened on the approach of a fit, has been found effective in some cases in which there was no distinctly local sensation; and epileptics have been repeatedly convinced of the propriety of habitually wearing a bandage loosely applied upon the arm, which they have been able, by carefully watching their own sensations, and by being watched in turn by others, to get tightened at the proper time. There is no doubt room for fallacy in these observations, but they may safely be commended to notice, as involving no possible risk of mischief, and as far more worthy of extended trial than the great majority of popular remedies in epilepsy.

But the fit and its treatment form only a part of the anxieties

which arise out of a case of epilepsy. The ultimate danger of the disease has little relation to the severity of the individual fits, except in the modified sense explained above; the frequency of the attacks being apparently much more apt to influence the duration of life than their character. Indeed, although epileptics may survive several severe paroxysms at distant intervals, and recover in the end with an apparently unbroken constitution, it rarely happens that very frequently repeated attacks, even of the *petit mal*, are unattended by some permanent depreciation of the powers of mind or of body. The most frequent, perhaps, of all the more serious consequences of confirmed epilepsy is Insanity (q. v.), sometimes assuming the form of acute mania or monomania following the attacks, but quite as frequently tending to gradual imbecility without any acute seizure. Sometimes the development of the epileptic insanity, or dementia, is attended by palsy, and other indications of structural disorder of the brain; in other instances, no such consequences occur, and the brain after death may be found to have very little tangible disease, or only such disease as is found in numerous other cases of functional derangement.

Very often, even when the mind remains tolerably entire, there is loss of memory, and a certain want of acuteness and depression of spirits, which unfit the individual for the regular business of life. Disorders of the digestion are also not uncommon; and there is frequently a want of tone and vigor in all the bodily functions, which communicates a habitual expression of languor and reserve to the epileptic. Added to this, it can hardly be matter of surprise that the knowledge of his infirmity should deeply influence the mind of the epileptic, and produce a distaste for active occupations, especially for such as expose him to more than ordinary observation.

The causes and the radical cure of epilepsy are almost equally involved in mystery. It has been supposed by some to be dependent on an increased afflux of blood to the brain; while by other observers and pathological authorities it has been attributed, with about equal force of reasoning to precisely the opposite condition. Certain cases undoubtedly depend upon organic disease, as tumors or injuries to the brain and its membranes, more especially near the surface. Local sources of irritation in other parts of the body have also been supposed to be exciting causes of epilepsy; and cases are recorded in which the disease has been cured by the amputation of a finger or the division of a nerve. The attention of recent observers has been especially directed to the medulla oblongata and Spinal Cord (q. v.), as being the most probable physiological seats of a disease so decidedly marked by convulsive movements. But as yet little more than the most vague theoretical inferences can be drawn from their researches as to the cause either of the morbid tendency in epilepsy or of the paroxysm. One of the most curious and suggestive of these recent facts is the experiment of Brown-Sequard, showing that epilepsy, or a state closely resembling it, may be induced in certain animals by division of certain portions of the spinal cord, the artificial disease continuing long after the primary effects of the injury have ceased. A still more curious and inexplicable phenomenon has resulted from the multiplication of such experiments; for Brown-Sequard has shown that in guinea-pigs this artificial epilepsy is sometimes propagated to the offspring, becoming, like the natural disease, a hereditary and congenital morbid tendency. On these strange facts it would be premature to indulge in speculation in this place, but their great importance can hardly be overlooked.

The condition of the epileptic seems to be favorably affected by everything which conduces to a quiet and hopeful state of the mind, and to a vigorous condition of the body. The treatment of the disease should therefore, in general terms, be of the kind termed *Tonic* (q. v.), and should be adapted with care, and after very minute and careful inquiry, to the removal of all the special bad habits, and occasional causes of depression, which tend to bring the system into a condition *below par*, in the individual case. The influence of a happy and quiet domestic life, without unhealthy excitement, and with proper occupations, varied by amusement and exercise in the open air, can hardly be overestimated.

The marriage of epileptics is, however, not too readily to be sanctioned, as it has been known to be followed, not only by an increase of the disease, but by its transmission to a considerable portion of the family. On the other hand, a too absolute rule on this subject is not without its dangers, and perhaps the practical difficulties of the question are not to be met by any defined or dogmatic expression of opinion, founded on the general pathology of the disease. If the tendency exist, even slightly developed, upon both sides in such a connection, it needs hardly be stated that the danger of transmission to the descendants is increased in a very great degree. Hence, inter-marriages *within epileptic families* must be regarded as always in the highest degree imprudent. Parents and guardians are undoubtedly justified in making this disease an object of special solicitude, and reserve or concealment on this subject on either side, in the case of a proposed mar-

riage, should be regarded as equally dishonorable with any other form of deception in a matter so important to the welfare of society and of the parties concerned.

According to one of the oldest and most respected of American physicians (Dr. Jackson of Boston), the epileptic tendency may often be successfully treated by the systematic use of an exclusively vegetable diet, or by a very considerable reduction of the proportion of animal food. Among the innumerable remedies recommended by authorities, the salts of iron and zinc have perhaps the largest amount of experience in their favor; and Counter-irritants (q. v.) applied to the nape of the neck, or between the shoulders, either by blistering, the use of the seton, or even actual cautery, has been often followed by prolongation of the intervals, or decrease in the severity of the fits. Almost all the accredited remedies, however, have been observed to produce a temporary relief of this kind, even when without any permanent influence on the course of the disease.

Some of the *Lower Animals* are subject to epileptic fits. The disease is common in dogs and highly bred pigs. The creatures writhe with involuntary spasms, and are for the time without sight or hearing. Sometimes the muscles of the throat are so involved that fatal suffocation occurs. The attack is generally preceded by dulness, and lasts from ten to thirty minutes. It is generally traceable to torpidity or irregularity of the bowels, worms, debility, or plethora. In dogs, it is a frequent sequel of distemper. In cattle, it usually occurs in connection with the engorgement of the first or third stomachs; they throw themselves violently about, bellowing loudly, but seldom die. It is rare in horses, and differs from megrims, for which it is often mistaken, but in which there are no spasms. The treatment consists in freely opening the bowels, removing worms, if any are present, enjoining bleeding and spare diet, if the patient's condition is high, and generous feeding and tonics where it is low. The best preventives are carefully regulated diet, an occasional laxative, with a course of tonics, and especially of arsenic.

EPILOBIUM, a genus of plants of the natural order *Onagraceæ*, having four deciduous calycine segments; four petals; a much elongated, 4-sided, 4-celled, 4-valved, many-seeded capsule; and seeds tufted with hairs at one end. The species are herbaceous perennials, natives of temperate and cold countries, and very widely diffused both in the northern and in the southern hemisphere. Some of them are very ornamental, from the beauty of their flowers. Most of the British species have small flowers, and some of them are very common in moist places. *E. angustifolium*, which differs from all the other British species in having the petals dissimilar in shape and size, is frequently planted in gardens and shrubberies, on account of its numerous and beautiful rose-colored flowers; but its creeping roots are apt to overrun a flower-garden. It is sometimes called **FRENCH WILLOW**, from the resemblance of its stems and leaves to some kinds of willow, and the name **WILLOW-HERB** is often extended to the whole genus. It is found in very northern regions, and its leaves and young shoots are sometimes a grateful addition to the meals of the arctic traveler, although not likely to be relished in almost any other circumstances. The pith, when dried, yields a quantity of sugar to boiling water, and is used in Kamchatka for making a kind of ale, from which also vinegar is made.



Epilobium angustifolium:
1, a flower; 2, a longitudinal section of a flower, showing the arrangement of the ovules in the germen; 3, a seed.

water, and is used in Kamchatka for making a kind of ale, from which also vinegar is made.

EPILOGUE (Gr. *epi*, upon or after, and *logos*, a speech) means, in oratory, the summing up or conclusion of a discourse; but, in connection with the drama, it denotes the short speech in prose or verse which frequently, in former times, was subjoined to plays, especially to comedies. The epilogue was always merry and familiar in its tone, and was intended to establish a kindly understanding between the actor and the audience, as well as to conciliate the latter for the faults of the play, if there were any, and to send them away in good-humor. One of the neatest and prettiest epilogues ever written, and one which completely realizes what an epilogue should be, is that spoken by Rosalind at the conclusion of Shakspeare's *As You Like It*.

EPIME'NIDES, a Greek poet and priest, born probably at Phæstus in Crete, in the 6th or 7th c. B.C., and lived at Cnossus. His history has only reached us in a mythical form. He is said to have fallen asleep in a cave when a boy, and not to have wak-

ened for 57 years. Like Rip Van Winkle, he was naturally much astonished and perplexed on his return to broad daylight. His period of slumber, however, had not passed away unprofitably. His soul, disengaging itself from its fleshly prison, betook itself in the interval to the study of medicine and natural philosophy; and when it had shuffled on again its mortal coil, E. found himself a man of great knowledge and wisdom. Goethe has written a poem on the subject, *Des Epimenides Erwachen*. E. went to Athens about 596 B.C., where, by the performance of various mystical rites and sacrifices, he stayed a plague with which the inhabitants were afflicted. When he died is not known, but we may be certain that he did not live (as is fabled) for 299 years. That he wrote the epic poems attributed to him, the longest of which was on the Argonautic expedition, is considered highly improbable. Compare Heinrich, *E. aus Kreta* (1801).

EPINAL, a town of France, in the department of Vosges, is situated in a delightful district at the western base of the Vosges mountains, on both banks of the Moselle, about 200 miles east-south-east of Paris. Lat. 48° 10' N., long. 6° 26' E. It is a well-built, handsome town, with clean, regular, though badly paved streets, and is surmounted by the ruins of an old castle, the gardens attached to which are much admired. Among its chief buildings are the parish church, an antique Gothic structure; the hospital, formerly a Capuchin convent; a museum of pictures, antiquities, and natural history; the barracks; and the residence of the prefect of the department. E. manufactures chemical products, lace, block-tin, wrought-iron, pottery, cutlery, paper, and leather, and has some trade in grain, wine, timber, &c. Pop. (1876) 13,827.

ÉPINAY, LOUISE FLORENCE PETRONILLE DE LA LIVE D', a French writer, born about the year 1725. At the age of 19, she married her cousin, M. d'Épinay, but the union did not prove a happy one. While her husband was abandoning himself to dissolute courses, she sought the intercourse of philosophers and men of genius. In 1745 she formed a close intimacy with Rousseau, and presented him with a small house (the now famous Hermitage) which stood on one of her husband's estates in the woods of Montmorency. An unfortunate jealousy, however, which Rousseau conceived for Grimm, another friend of Madame d'E., was followed by an open rupture with his benefactress, and in his *Confessions* he scrupled not to malign her by way of vengeance. She spent the remaining twenty-five years of her life in comparative solitude, seeing only a small and select circle of philosophers and littérateurs. When Grimm was obliged to leave Paris, she continued, under the direction of Diderot, his literary correspondence with northern sovereigns. She died in 1783. From the pen of Madame d'E. we have *Conversations d'Émilie* (Paris, 1774), a work on education pronounced by the French Academy to be the most useful that had been published for a number of years; *Mémoires et Correspondance de Madame d'Épinay, renfermant un Grand Nombre de Lettres inédites de Grimm, de Diderot, et de J. J. Rousseau, &c.* (Paris, 1818); *Les Confessions du Comte de ****; &c.

EPIPHA'NIUS, ST., a Christian bishop, and writer of the 4th c., was born of Jewish parents in Palestine. He was baptized in his 16th year, and was educated among the Egyptian monks, who inspired him with an aversion to all liberal science. He rose gradually to the rank of Bishop of Constantia (formerly Salamis) in Cyprus, and continued in that office from 367 till his death in 403. His polemical zeal was conspicuously manifested against Origen. He had proclaimed him a heretic in his writings, and in 394 he went to Palestine, the focus of Origen's adherents, and called upon John, Bishop of Jerusalem, and the two monks, Rufinus and Jerome to condemn him. A more legitimate object of his violent opposition was the increasing worship of images. Jerome relates how he indignantly tore down an image in the precincts of a church in Palestine, as being contrary to the divine law. Among his writings, collected by Petavius (2 vols., Paris, 1622), the most important is his *Panarion*, or catalogue of all heresies (80 in number) a work which strikingly shows his unfitness for being a historian. His credulity and want of honesty are excessive.

EPIPHANY (Gr. *Epiphaneia*, appearance), denoted, among the heathen Greeks, a festival held in commemoration of the appearance of a god in any particular place. The word subsequently passed into the usage of the Christian Church, and was used to designate the manifestation or appearance of Christ upon the earth to the Gentiles, with especial reference to the day on which he was seen and worshiped by the wise men who came from the East. This occasion is commemorated in the church on the 6th of January, the twelfth day after Christmas, and hence the Epiphany is also called Twelfth Day. The Epiphany, which is said not to have been observed as a separate festival, but to have been included in the feast of the Nativity till 813, is observed as a 'scarlet day' at Oxford and Cambridge.

EPIPHYTES (Gr. *epi*, upon, *phyton*, a plant), often and popularly, but less correctly, called **AIR-PLANTS**, are plants which are not rooted in the ground, but are attached to trees, from the decaying portions of the bark of which, or of mosses and lichens which grow upon it, they derive their nutriment, probably, also, depending upon the air for it to a larger extent than other plants do. Mosses and lichens themselves, growing upon trees, may be called E., but the term is generally used of phanerogamous plants. E. are not connected with the trees on which they grow in the peculiar manner of the mistletoe, *Balanophora*, and other true parasites—not sending roots like them into the wood to suck the juice of the tree. It is chiefly in warm climates that phanerogamous E. are found, and in those which are also moist. Most of them prefer shady situations. Within the tropics, they often form an interesting and remarkable feature of the vegetation. Some of the *Bromeliaceæ* (as *Tillandsia*), *Cactaceæ*, *Araceæ*, *Gesneraceæ*, and other natural orders are E.; but the order to which they belong more than to any other is *Orchidaceæ*.

Many of the epiphytous orchids, as well as other E., are remarkable for their beauty; and the attention which has recently been given to their cultivation in hothouses has been rewarded by the most perfect success. See **ORCHIDS**. Plants which usually occur as E. are usually found growing on rocks. Although seldom found except in moist climates, E. are generally capable of enduring a considerable amount of drought, parting slowly with the moisture which they have once imbibed.

EPI'RUS, the ancient name of a part of Greece, bounded on the E. by the chain of Pindus, on the S. by the Ambracian Gulf, on the W. by the Ionian Sea, and on the N. by Illyria and Macedonia. It formed the southern part of modern Albania, or the pashalic of Janina, a wild and mountainous region, the haunt of robbers and semi-civilized tribes in all ages. The chief town was Dodona (q. v.); the chief rivers, the Acheron, Coeytus, Arachthus, and Charadrus. Anciently, it was celebrated for its cattle and its breed of Molossian dogs. Its earliest inhabitants were probably Pelasgians. In the historic period, Theopompus speaks of fourteen tribes, most of whom were believed by the Greeks themselves to be not of Hellenic origin. The principal were the Chaones, Threspoti, and Molossi, the last of whom finally obtained the entire sovereignty of the country. Of the Molossian kings of E., the most distinguished was Pyrrhus, who long waged successful war against the Romans. But after this race of kings became extinct (239—229 B.C.) by the death of Ptolemy, grandson of Pyrrhus, a republican constitution was adopted, whereupon parties sprang up among them, and the neighboring Macedonians got the upper hand. On the conquest of Macedonia by the Romans (168 B.C.), the Epirots were accused of having assisted Perseus, the Macedonian king, and the most revengeful measures were put in force against them. Æmilius Paulus, the Roman general, plundered and razed to the ground the 70 towns of E., and sold into slavery 150,000 of the inhabitants. From this period E. shared the vicissitudes of the Roman and Byzantine empires, until 1204, when one of the Comneni made himself independent. His dynasty ruled the country until 1466, when it was finally conquered by the Turks (see **SCANDERBEG**). E., peopled largely since the 14th century by Albanians (see **ALBANIA**), formed latterly a part of the Turkish vilayet of Janina. Through the mediation of the Six Western Powers, the district east of the river Arta was ceded to Greece in 1881.

EPI'SCOPACY (Gr. *episcopos*, bishop or overseer) is that form of church government in which one order of the clergy is superior to another—namely, bishops or prelates to priests or presbyters, the ordinary ministers of parishes or congregations. It is sometimes called *diocesan episcopacy*, to distinguish it from that *episcopacy* which Presbyterians and Independents also assert—the oversight of flocks by their pastors. See **BISHOP**. It is not essential to episcopacy that there should be *archbishops*, exalted in rank and authority above other bishops, although of the same order; and in some Episcopalian churches there are none.

Episcopacy has actually subsisted under very various modifications; the power of bishops being more or less absolute, or more or less controlled by synods of presbyters, or even—in the Protestant Episcopal Church of the United States—by a diocesan convention, composed both of presbyters and lay delegates. The power of the bishop is also variously affected by the relations subsisting between church and state; and great differences exist in this respect between the Church of England, the Church of Sweden, and the Church of Denmark, all Episcopalian, and all connected with the state as *established churches*.

The Church of Rome, the Greek Church, and other branches of the Eastern Church, are Episcopalian. Of Episcopalian Protestant churches not established, the most important are that in the United States, that in Ireland, that in Scotland, and the Moravian Church. See **ANGLO-CATHOLIC CHURCH**; and **ENGLAND, CHURCH OF**.

EPISCO'PIUS, **SIMON** (whose Dutch name was Bisschop), the head of the Arminian party after the death of Arminius, was born at Amsterdam in 1583, studied at Leyden, took his degree in 1606, and was ordained pastor of the village of Bleyswyck near Rotterdam in 1610. In the following year, the States-general, with the intention of putting an end to the agitations created by the controversies between the Gomarists or Calvinistic party and the Arminians or Remonstrants, ordered a conference to be held in their presence at the Hague between six ministers of each party. E. was one of the six charged with the advocacy of Arminianism, and highly distinguished himself by his good temper, ability, and learning. In 1612, the curators of the university of Leyden appointed him professor of theology in the room of Gomar, who had gone to Seeland. This enraged the leaders of the orthodox party, who unscrupulously accused him of Socinianism, and of having entered into an alliance with the Roman Catholics for the destruction of Protestantism. By this means the fanaticism of the populace was roused against him; he was insulted and abused in the street, and on one occasion narrowly escaped being stoned to death. The house of his brother in Amsterdam was also sacked, under the pretext that it was a rendezvous of the Remonstrants. In 1618, occurred the famous Synod of Dort (q. v.). E. was present, along with several other Arminians. The Calvinists, who happened to be in an overwhelming majority, would not allow him to speak; they told him that the synod was met not to discuss, but to judge; and, in fact, the whole proceedings exhibited as revolting a specimen of high-handed tyranny as any on record, even among ecclesiastical tribunals. Expelled from the church, and banished from the country, E. betook himself first to Antwerp, and afterwards to Rouen and Paris; but in 1626 returned to Rotterdam, where the *odium theologicum* against his party had become less virulent. Here he married in 1630, and four years after was made primarius professor of divinity in the newly established college of Remonstrants. He died in 1643. E. held enlightened principles in regard to religious toleration.

Not placing a high value on merely doctrinal views, but rather believing in the efficacy of the Christian spirit to elevate and purify the character, and seeing, moreover, the presence of this spirit in men holding the most conflicting opinions (when not enflamed with controversial hates), he would have wished a broader and more catholic bond of unity among Christians than the opinionative creeds of his day permitted. His chief works are his *Confessio Remonstrantium* (1621), *Apologia pro Confessione* (1629), and *Institutiones Theologicae*, incomplete. A complete edition of his works appeared at Amsterdam in 2 vols., 1650.

EPISTLE. The lesson in the church service called the Epistle, derives its name from being most frequently taken from the Apostolic Epistles, although it is sometimes also taken from other parts of Scripture. This part of the service is believed to be as old as the 6th century.

EPISTLE SIDE OF THE ALTAR, the left side of the altar or communion table, looking from it, at which in the church service the epistle of the day is read. It is of lesser distinction than the right or gospel side, and is occupied by the clergyman of lower ecclesiastical rank. The reader of the epistle was in former times called the Epistler.

EPISTOLÆ OBSCURORUM VIRORUM (Lat. Letters of Obscure Men) is the title of a collection of satirical letters which appeared at the commencement of the 16th c., and professed to be the composition of certain ecclesiastics and professors in Cologne and other places in Rhenish Germany. They were directed against the scholastics and monks, and lashed with merciless severity their doctrines, writings, morals, modes of speech, manner of life, follies and extravagances, and thus helped in no small degree to bring about the Reformation. The controversy of Reuchlin with the baptized Jew, Pfefferkorn, concerning Hebrew punctuation, gave the first occasion to the *Epistolæ*, and it is probable that their title itself was suggested by the *Epistolæ Clarorum Virorum ad Reuchlinum Phorcensum* (1514). They were addressed to Octavius Gravius in Deventer, who was by no means so complete an ignoramus as might be supposed from this circumstance, but who had made himself odious to the liberal minds of the time by his arrogant pretension and his determined hostility to the spirit of his age. On the first appearance of the work, it was fathered on Reuchlin; afterwards, it was ascribed to Reuchlin, Erasmus, and Hutten. More recent investigators have inclined to the belief, that the first part, which appeared at Hagenau in 1515 (but professedly at Venice), was the production of Wolfgang Angst, a learned and witty book-printer of that town; but, latterly, doubt has also been expressed whether even he had anything to do with the *Epistolæ*. In the composition of the second part (published in 1519), after Ulrich von Hutten, Erotus Rubemanns had the most considerable share. The circumstance of the *Epistolæ* being placed in the catalogue of forbidden books by a papal bull, helped to spread it not a little. Among the numerous editions of the work

(1643, 1703, 1827, &c.), the best is that by Böcking (1858; 2d ed. 1864). See D. F. Strauss's *Utrich von Hatten*.

EPITAPH (Gr. *epi*, upon, and *taphos*, a hillock, mound or other monument placed upon a grave). From originally signifying a monument, this word is now used exclusively to designate the inscription commemorative of the deceased which is placed upon the monument. This perversion may in some measure have arisen from the remembrance of the funeral orations which the ancients were in the habit of pronouncing at funerals. But the epitaph, in its stricter sense, was well known to the classical nations of antiquity; and, indeed, by every people a brief commemoration of the heroic actions or personal virtues of their illustrious dead has been regarded as one of the worthiest occupations of the faculties of the living. As epitaphs were not only engraved on the most enduring substances, but from their brevity were easily preserved in the memory and orally transmitted, wherever we find the literature of a people at all we are pretty sure to discover specimens of their epitaphs. Pettigrew has translated several from Egyptian sarcophagi (Bohn's edition, p. 5), but they are of no great interest. Herodotus (vii. 228) has preserved to us those which the Amphictyons caused to be inscribed on the columns which they raised in honor of the heroes of Thermopylæ, and that which Simonides, from personal friendship, placed on the tomb of the prophet Megistias. The general inscription for the whole of them was to this effect: 'Four thousand from Peloponnesus once fought on this spot with three hundred myriads;' and that which was special to the Spartans was still more memorable: 'Stranger, go tell the Lacedæmonians that we lie here obedient to their commands.' The *Anthologia Græca*, edited by Brunk, and subsequently by Jacobs, contains the largest collection of Greek epitaphs: of these many were translated and published by Bohn in 1854, under the editorial care of Mr. George Burges. Of Roman epitaphs every antiquarian museum even in this country presents numerous examples; for the form in which they were conceived was adopted by our own Romanized forefathers, and many a stone bearing the well-known *D. M. (Dis Manibus)*, or *Siste Victor*, probably cover the remains of those whose veins never contained a drop of Roman blood. A very interesting collection of early Christian epitaphs will be found in Dr. Charles Maitland's *Church in the Catacombs*, published in 1846. The naturally epigrammatic turn of the French mind peculiarly adapts it for this species of composition, and in French collections, such as the *Recueil d'Épithaphes*, very felicitous examples are to be found both in Latin and in French. Of the former may be mentioned the 'Tandem felix!' which the Count de Tenia, who had enjoyed every form of temporal prosperity, caused to be engraved on his tomb, and of the latter, the touching epitaph to a mother, 'La première au rendez-vous.' A large portion of the earlier monuments, and consequently of the epitaphs of this country, were destroyed at the Reformation, and subsequently by the iconoclastic rage of the Puritans and Presbyterians. But when we come down to a later date, the literature of no people, either ancient or modern, can vie with our own in this peculiar branch, for whilst English epitaphs possess the point and terseness without which no epitaph can be successful, they exhibit a feature almost unknown in those of other nations—that, viz., of wit, or more properly speaking, perhaps, of humor.

It seems as if the wittiest people in the world, as the English unquestionably are, had found it impossible to confine their railery to the living, and accordingly we find that the harmless peculiarities of the dead have often been hit off on a tombstone, with a felicity which has rendered immortal what otherwise the next generation must have forgotten. Of this class of epitaphs our collections present an almost infinite variety. There are many excellent old collections of epitaphs, such as the *Thesaurus Epitaphiorum* of Philip Labbe, Paris, 1666. Of modern ones, the best is that of Pettigrew, published by Bohn, which is so arranged as to mark the diversity of taste prevailing at different periods of our history. See also the works of Gruter, Græsius, Reinesius, Muratori, Mazochius; the *Monumenta Anglicana*, London, 1719; Weever's *Ancient Funeral Monuments*, &c.

EPITHALAMIUM was a species of poem which it was the custom among the Greeks and Romans to sing in chorus near the bridal-chamber (*thalamus*) of a newly married couple. Anacreon, Stesichorus, and Pindar composed poems of this kind, but only scanty fragments have been preserved. The epithalamium of Pelens and Thetis by Catullus is one of the finest specimens of Latin poetry extant; but probably the most gorgeous epithalamium in all literature, is that of the English poet Spenser. A collection of Greek and Latin epithalamia is to be found in Wernsdorf's *Poeta Latini Minores* (4th vol., part 2).

EPITHELIUM is the term applied in anatomy to the cell-tissue which, in layers of various thickness, invests not only the outer surface of the body, and the mucous membranes connected with it—as, for example, those of the nose, lungs, intestinal canal, &c.—but also the closed cavities of the body, such as the

great serous membranes, the ventricles of the brain, the synovial membranes of joints, the interior of the heart and of the blood-vessels proceeding to and from it, the ducts of glands, &c.

The thickness of this tissue varies extremely with the position in which it occurs. In some parts it consists of numerous strata of cells, collectively forming a layer of more than a line in thickness; in other parts, it is composed of only a few strata, or often of only a single stratum of cells, and can only be detected by the microscope.

The cells of which the epithelium is composed are usually soft nucleated cells; they may be rounded, polygonal, fusiform, cylindrical, or conical in shape, and sometimes they possess vibratile cilia, the appearance and uses of which will presently be explained.

In his *Manual of Human Histology*, Kölliker adopts the following arrangement. He considers (a) epithelium in a single stratum, and (b) epithelium in many layers.

(a) *Epithelium in a single stratum* may be composed of:

1. *Rounded, polygonal cells*, constituting the variety known as:



Fig. 1.

Epidermis (still soft like the epithelium of internal parts) of a two months' human embryo. Mag. 350 diam.



Fig. 2.

Epithelial cells of the vessels; the longer one from the arteries, the shorter ones from the veins.

pavement or tessellated epithelium, and occurring as an investment of the serous membranes, of most synovial membranes, of the lining membrane of the heart and of the veins, of the canals of glands, &c.

2. *Fusiform, superficially united cells* (fusiform epithelium), as the epithelium of the arteries and of many veins.

3. *Cylindrical cells* (cylinder epithelium), as in the intestine from the stomach to the termination of the alimentary canal, in



Fig. 3.

Epithelium of the intestinal villi of the rabbit. Mag. 300 diam.



Fig. 4.

Ciliated cells from the finer bronchial tubes. Mag. 350 diam.

the excretory ducts of all the glands opening into the intestine, &c. Various illustrations of this cylinder epithelium are given in the article DIGESTION, ORGANS AND PROCESS OF.

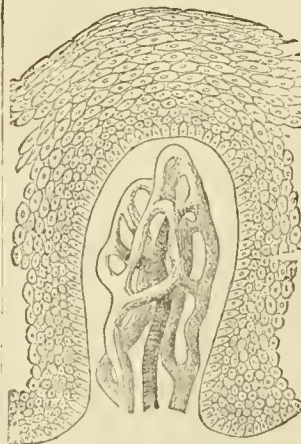


Fig. 5.

Laminated pavement epithelium investing a simple papilla (with blood-vessels in the interior) from the gums of a child. Mag. 250 diam.

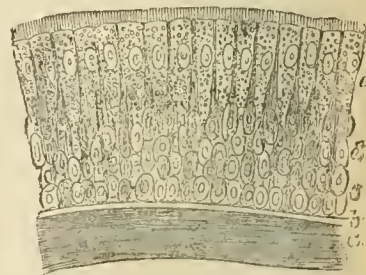


Fig. 6.

Ciliated epithelium from the trachea of a man. Mag. 350 diam. a, outermost part of the elastic longitudinal fibres; b, homogeneous outermost layer of the mucous membrane; c, deepest round cells; d, media round cells; e, outermost conical ciliated cells.

4. *Cylindrical or conical ciliated cells*, as the epithelium, of the more minute bronchial tubes, of the nasal cavities, and of the uterus.

5. *Rounded ciliated cells*, as the ciliated pavement epithelium of the ventricles of the brain in the fetus.

(b) *Epithelium in many layers* may be composed of:

1. *Cylindrical or rounded cells below, and more or less flattened cells above*. This is termed laminated pavement epithelium, and occurs in the mouth, lower part of pharynx, cesophagus, bladder, &c.

2. *Rounded cells below, more elongated ones in the middle, and ciliated conical ones above*. This is termed laminated ciliary epithelium, and occurs in the larynx, trachea, and larger bronchial tubes, in the greater part of the nasal cavity, &c.

In all the varieties of epithelium, the layer of external cells is being constantly disintegrated and replaced by the layer immediately beneath.

The uses of the chief varieties of epithelium, especially of ciliated epithelium require some notice.

The polygonal or pavement epithelium mainly acts like the epidermis, as a protecting medium to the soft parts beneath.

The cylindrical epithelium additionally takes an active part in the process of secretion. Illustrations of the function of the cells forming this variety of epithelium are given in the articles CELLS, ANIMAL; DIGESTION, ORGANS AND PROCESS OF; and the subject will be further noticed under the head SECRETION.

In connection with ciliated epithelium, we must notice *ciliary motion* generally, in so far as it occurs in the animal kingdom. Certain surfaces which are lubricated by a fluid, are covered with a multitude of hair-like processes of extreme delicacy and minuteness (their length varying from $\frac{1}{1000}$ to $\frac{1}{2500}$ of an inch), which from their shape are termed *cilia*, from *cilium*, an eyelash. During life, and for a certain period after death, these filaments exhibit a remarkable movement, each cilium bending rapidly in one direction, and rapidly returning to its original position (according to Krause, these movements range from 190 to 230 in a minute). On examining a ciliated surface with a high magnifying power, the motion presents an appearance somewhat resembling that of a cornfield agitated by a steady breeze. Any minute objects coming in contact with the free extremities of the cilia are urged onward in the direction of the predominant movement; and the best method of observing the course of the ciliary current is to sprinkle the surface with a little powdered charcoal, grains of which may speedily be seen to move onwards in a definite direction.

An easy way to observe this phenomenon is to detach with a knife, a small piece of epithelium from the back of the throat of a living frog. The scales, moistened with water or serum, will continue to exhibit the movement of their adherent cilia for a very considerable time, provided the piece be kept duly moistened. On one occasion, a piece prepared in this way by Mr. Bowman and Dr. Todd exhibited motion for seventeen hours; and it would probably have continued doing so for a longer time, had not the moisture around it evaporated; and if the epithelium is not removed from the body of an animal that has been killed, the motion continues much longer. In a turtle, after death by decapitation, it lasted in the mouth nine days; in the trachea and lungs, thirteen days; and in the cesophagus sixteen days. In man and mammals, it seldom lasts two days, and usually ceases much sooner.

The necessary condition for their movement appears to be the integrity of the cells to which they are attached; for as soon as these shrink up for want of moisture, or undergo any physical change, the cilia cease their characteristic action. We know nothing with certainty regarding the mechanism or source of ciliary motion, except that (as it continues on detached epithelium) it is independent of both the vascular and nervous system.

This phenomenon exists very widely throughout the animal kingdom. Dr. Sharpey, in his article CILIA* (published upwards of forty years ago), notices its occurrence in the Infusoria, in Polypts and their ova, in Acalephæ, Actinæ, Echinodermata, Annelida, Mollusca, and the Molluscoids (e. g., Ascidians), in Reptiles, Birds, and Mammals. Since the date of that article it has been discovered in Sponges, and in one or two exceptional cases in Fishes; but it has never been found in any part of the body of Articulata (Crustaceans, Insects, or Arachnidans). The parts on which it occurs are (1), the skin or surface of the body, (2) the respiratory, (3) the alimentary, and (4) the genito-urinary systems; and it has been observed in the ova of numerous classes of animals, from Reptiles downwards to Infusoria. In most of the parts in which we observe it, its use appears to be of a mechanical nature—viz., to convey the fluids or other matters along the surfaces on which the cilia exist, or, as in the Infusoria, to carry the entire animal through the water.

1. Cilia have been found on the external surface in Batrachian larvæ, in Mollusca, Annelida, Echinodermata, Actinæ, Medusæ, Polypts, and Infusoria. In most cases their function is respiratory, but in many instances it is also locomotive or prehensile.

2. Ciliary motion has been observed on the lining membrane of the air-passages of Mammals, Birds, and Reptiles, where, what-

ever may be its other uses, it serves to convey the secretions along the membranes, together with any foreign matters that may be present. It exists also on the external gills of Batrachian larvæ, and on the respiratory organs of Mollusca and Annelida. The cilia which exist externally on still lower animals without separate respiratory organs, assist in the respiratory process, by renewing the water on the surface.

3. It occurs in the mouth, throat, and gullet of various reptiles, and in the alimentary canal of the Mollusca, Echinodermata, many Annelida, and Acalephæ. It is not easy, as Dr. Sharpey observes, to see the purpose of the motion in all these cases. In some, it may merely convey secreted matters along the surface of the lining membrane; and in others it seems to serve in place of ordinary deglutition, to carry food into the stomach.

4. It is observed on the surface of the reproductive organs of Mammals, Birds, and Reptiles. From the direction of the current being from without inwards, the office of the cilia may be to hurry down the ovum, in addition to removing the mucous secretion of the membrane.

In Reptiles and Fishes, ciliary motion exists at the neck of each uriniferous tube. The movement is directed towards the tube, and favors the flow of the watery portion of the secretion towards it.

There are some situations, both in man and the lower animals, in which it is difficult to determine what functions the ciliary motion can perform, as, for example, in man, in the ventricles of the brain; and in the frog, in the closed cavities of the pericardium and peritoneum.

EPIZOA. This term is applied to those parasitic creatures which live on the bodies of other animals, and derive their nourishment from the skin. Our space will only allow of our noticing those that infest man. They may be divided into two groups: (1) Those which live upon the surface of the skin, and (2) those which live in the skin. Fleas, lice, bugs, ticks, &c., belong to the first group; the Itch-insect or *Sarcoptes*, the Pimple-mite or *Demodex folliculorum*, and possibly some other species of the *Acaridæ*, to the second.

In a zoological point of view, all the E. that infest the human subject are Insects or Arachnidans. The parasitic insects are: 1. *Pulicida*, or *Fleas*, including—1. The Common Flea, or *Pulex irritans*; 2. The Sand-flea, or *Pulex penetrans*, known also as the Chigo, Chigger, &c. II. *Acanthida*, or *Soft Bugs*, including the common Bed Bug or *Acanthia* (s. *Cimex*) *lectularia*. III. *Pediculida*, or *Lice*, including—1. The Common Louse, or *Pediculus capitis*; 2. The Body Louse, or *Pediculus vestimenti*; 3. The Crab Louse, or *Pediculus* (s. *Phthirus*) *pubis*; 4. The Louse occurring in Phthiriasis, or *Pediculus tabescentium*.

The parasitic Arachnidans belong to the order of *Acarida*, or Mites; indeed, most of the animals forming the different families of this order lead a parasitic existence. We have—1. *Demodicida*, including the Pimple-mite or *Demodex* (s. *Acarus*) *folliculorum* (the dog and the sheep possess each a special demodex). II. *Sarcoptida*, including the Itch-mite or *Sarcoptes* (s. *Acarus*) *Scabiei*. (Most of our domestic animals seem to be infested by a special sarcoptes, the species of which are numerous.) III. *Ixodida* or Ticks, including—1. The American Tick or *Ixodes hominis* (common in Brazil); 2. The Common Wood-tick (Dogs' Tick), or *Ixodes ricinus*. There are probably many species of Ixodes which are occasionally found on man. IV. *Gamasida*, or Beetle Lice, including—1. The Bird-mite, or *Dermanyssus avium* (occasionally found on sickly persons); 2. The Mian Bug, or *Argas persicus* (common in some parts of Persia, and especially at Miana); 3. The Chincha Bug, or *Argas chinche* (occurring in Columbia). V. *Orobatiida*, or Grass-lice, including the Harvest-Bug, or *Leptus autumnalis*. See the articles BUG, FLEA, ITCH MITE, LOUSE, TICKS.

EPIZOOTICS (Gr. *epi*, upon, and *zōon*, an animal) are diseases of animals which manifest a common character, and prevail at the same time over considerable tracts of country. Like epidemics, they appear to depend upon some peculiar and not well ascertained atmospheric causes; where the cases are neglected or overcrowded, they also frequently become contagious; they are apt to take on a low type of fever, and are better treated by supporting than by reducing remedies. Influenza in horses, and pleuropneumonia and vesicular epizootic in cattle, are examples.

EPOCH, in Chronology. See CHRONOLOGY.

EPOCH, in Astronomy, is an abbreviation for 'longitude at the epoch'; it means the mean heliocentric longitude of a planet in its orbit at any given time—the beginning of a century, for instance. The epoch of a planet for a particular year is its mean longitude at mean noon, on January 1, when it is leap year, and on December 31 of the preceding year, when it is a common year. The epoch is one of the elements of a planet's orbit.

EPODE is the last part of the chorus of the ancient Greeks, which they sung after the strophe and antistrophe, when the singers had returned to their original place. The epode had its

* In the *Cyclopædia of Anatomy and Physiology*.

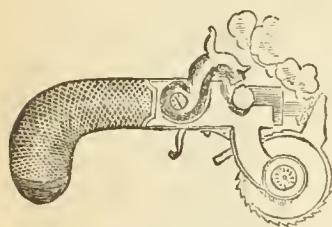
peculiar measure of syllables and number of verses. See CHORUS.

EPPING, a town in the west of Essex county, England, in a pleasant healthy situation, at the north end of Epping Forest, 16 miles north-north-east of London. It has a very irregular appearance. Pop. about 3000. It is noted for its cream, butter, sausages, and pork. It sends large quantities of butter to London. Epping Royal Forest, formerly under the name of Waltham Forest, where our ancient kings enjoyed much sport, covered all Essex, and extended almost to London. It is now limited to 60,000 acres in the south-west part of the county. Of this tract, only 12,000 acres are in waste and woods, the rest being now enclosed as private property. At the cost of about half a million of money, 5600 acres of Epping Forest were secured by the corporation of London, and declared free to the public by the Queen in May 1882. These ten square miles of almost unbroken woodland form one of the most extensive and beautiful pleasure-grounds in Europe. In the forest is Queen Elizabeth's hunting-lodge. Separated by a stream from Epping Forest is Hainault Forest, lately disforested.

EPROUVETTE is a machine for proving or testing the strength of gunpowder. It was invented or suggested in the last century by Robins, but was greatly improved by Dr. Hutton.

The *gun eprouvette* determines the strength of gunpowder by the amount of recoil produced. A small gun, usually a 'half-pounder,' is fixed to the lower end of an iron rod; its base being adjusted to an arm projecting from the rod; or else it is suspended from an iron frame. A horizontal steel axis is fixed to the rod or frame about which the gun may vibrate. A pointed iron rod or style projects downwards from the lower side of the gun, and touches a groove filled with soft wax; the groove is so shaped that, when the gun recoils, the point cuts a path for itself along this wax; and the length of this path determines the amount of recoil. Sometimes a brass graduated arc with an index is used instead of the pointed style and the waxed groove; but the principle of action is just the same. On the arc the recoil should vary from 26° for new fine-grain powder to 20° 5' for old powder of coarse grain. This system of proof is resorted to annually at minor and foreign stations for the proof of all powder in store, to ascertain the amount of deterioration; five rounds constitute the minimum proof. Before the eprouvette is resorted to, the powder must pass the test of specific gravity, by weighing not less than 55 lbs. to the cubic foot.

The *mortar eprouvette* determines the strength of gunpowder by the distance to which a ball is projected, instead of the distance to which the piece recoils. It is generally a mortar of 8-inches bore, in which 2 to 4 ounces of powder is employed to propel an accurately turned iron shot to a distance of about 120 yards. Other things being equal, the strongest gunpowder sends the shot to the greatest distance; and this is the usual mode adopted in testing gunpowder supplied to the government by various contractors.



Eprouvette.

The ordinary eprouvette is an instrument shaped like a small pistol without a barrel, and having its breach chamber closed by a flat plate connected with a strong spring. On the explosion of the powder against the plate, it is driven back to a distance indexed according to the strength of the powder, and is retained at its extreme state of propulsion by a ratchet wheel.

EPSOM (said to have originally been Ebbasham) is a small market-town on the margin of the Binstead Downs in Surrey, 15 miles south-south-west of London by road, and 14 miles by the London and South-Western Railway. The famed sulphate of magnesias springs of E. gave their name to the Epsom Salts formerly manufactured from them. This manufacture has been abandoned from the ease with which these salts can be made artificially. The Royal Medical College, erected on the Downs, and established in 1851, provides education for about 170 boys, the sons of medical men, and affords a home to decayed members of the profession and their widows. Pop. (1871) 6276. On the Downs, 1½ mile south of the town, the famous E. horse-races are held yearly. They are said to have been instituted by Charles I., but have become of greater importance since the institution of the Derby Stakes in 1780 (see **DERBY DAY**). The races last four days, and as many as 100,000 persons often assemble to witness the most important of them.

EPSOM SALT, or **SULPHATE OF MAGNESIA** ($MgO + SO_4HO$), occurs not only in the water of mineral springs, as at Epsom, Seidlitz, and many other places; but also as an efflorescence on the surface of various rocks, sometimes along with alum, as at Hurlet, in Renfrewshire; and on the ground, as in

some parts of Spain and of the Russian steppes. It sometimes occurs snow-white and very pure, sometimes discolored by impurities; and is either in the form of fine thread-like crystals, or in crusts, flakes, granules, &c. Its crystals are prisms, almost rectangular. For purposes of commerce, it is obtained by the action of dilute sulphuric acid upon magnesian limestone. See **MAGNESIUM**.

Epsom salt is a well-known purgative remedy much in use in household medicine. It may be given in doses from two drachms to one ounce, according to the effect required, in a tumbler of water. The disagreeable bitter taste is much relieved by acidulating with nearly a teaspoonful of dilute sulphuric acid to each ounce of salt.

E'PWORTH, a town in the north-west of Lincolnshire, England, 30 miles north-north-west of Lincoln. It chiefly consists of one street, above two miles long. The chief employments are hemp and flax dressing, rope-making and malting. Pop. (1871) 2295. John Wesley, founder of Methodism, as well as Kilham, founder of the seceding Wesleyans, was born here.

E'QUABLE MOTION is that by which equal spaces are passed over in equal times.

EQUA'LITY. See **LIBERTY, EQUALITY, FRATERNITY**.

EQUA'TION, ANNUAL, one of the most conspicuous of the subordinate fluctuations in the moon's motion, due to the action of the sun, which increases with its proximity to the earth and her satellite. It consists in an alternate increase and decrease in her longitude, corresponding with the earth's situation in its annual orbit, i. e., to its angular distance from the perihelion, and therefore having a year instead of a month, or aliquot part of a month, for its period. For an explanation of the mode of its production, the reader is referred to Herschel's *Outlines of Astronomy*, art. 738, *et seq.* The subject is too abstruse for explanation in this work.

EQUATION, DIFFERENTIAL, is an equation involving differential coefficients (see **CALCULUS**); such is $\frac{d^2y}{dx^2} + a \frac{dy}{dx} = x$; from which it is required to find the relation between y and x . The theory of the solution of such equations is an extension of the integral calculus, and is a branch of study of the highest importance.

EQUATION, FUNCTIONAL. See **FUNCTIONS**.

EQUATION, LUNAR. See **LUNAR THEORY**.

EQUATION OF EQUINOXES is the difference between the true position of the equinoxes, and the position calculated on the supposition that their motion is uniform. See **PRECESSION**.

EQUATION OF LIGHT. In astronomical observations, the visual ray by which we see any body is not that which it emits at the moment we look at it, but that which it *did* emit some time before, viz., the time occupied by light in traversing the interval which separates it from us. If, then, the body be in motion, its aberration, as due to the earth's velocity, must be applied as a correction, not to the line joining the earth's place at the moment of observation with that occupied by the body, (as seen) at the same moment, but at that antecedent moment when the ray quitted it. Hence is derived a rule applied by astronomers for the rectification of observations made on a moving body, viz., from the known laws of its motion and the earth's, calculate its regular angular motion in the time taken by light to pass from it to the earth. This motion is the total amount of its apparent displacement. Its effect is to displace the body in a direction contrary to its apparent motion, an effect one part of which is due to aberration, properly so called (see **ABERRATION**), resulting from the composition of the motions of the earth and of light, and another part to the fact of the passage of light occupying time. The *equation of light* is the allowance to be made for the time occupied by the light in traversing a variable space.

EQUATION OF PAYMENTS. The problem considered under this head in books of arithmetic is to find a time when, if a sum of money be paid by a debtor, which is equal to the sum of several debts payable by him at different times, no loss will be sustained by either the debtor or creditor. The rule generally given is as follows: Multiply each sum due by the time at which it is payable, and then divide the sum of the products by the sum of the debts: the quotient is the equated time. For example, if £10 be due at one month, and £20 at two months, find as an equivalent when the whole £30 may be paid at once. Ans. $\frac{10 \times 1 + 20 \times 2}{30} = 1\frac{2}{3}$ months. This rule is,

however, incorrect where the debts are unequal, because it takes no account of the balance of interest and discount. A correct rule for the case of two debts and simple interest is subjoined. Let d and

D denote the debts, t and T the times of payment, and r one year's interest on D. Then if $A = T + t + \frac{D+d}{dr}$, and $B = Tt$

+ $\frac{DT + dt}{dr}$, the equated time will = $\frac{1}{2} A - \frac{1}{2} \sqrt{A^2 - 4B}$.

When three or more debts are concerned, the plan is to find by this formula the equated time for the first two, and then for their sum payable at their equated time, and the third, and so on. The common rule is, however, sufficiently correct for ordinary use.

EQUATION OF THE CENTER. If the earth moved uniformly round the sun in a circle, it would be easy to calculate its longitude or distance from the line of equinoxes at any time. One year would be to the time since the vernal equinox as 360° to the arc of longitude passed over. But the orbit of the earth is not circular, nor is its motion uniform; the orbit is slightly elliptical, and the motion is quicker at perihelion than at aphelion. The true rule, then, for ascertaining the earth's longitude is contained in the following proportion: one year is to the time elapsed as the whole area of the earth's orbit is to the area swept over by the radius vector in the time. This is a deduction from Kepler's law (see **CENTRAL FORCES**), that, in planetary motion, equal areas (not angles) are swept over in equal times. The area swept over being ascertained from the laws of the earth's motion, and the elements of its orbit, it is a question of geometry to ascertain the angle corresponding to the area, or the true longitude. In astronomy, the longitude, as calculated on the supposition that the earth moves uniformly in a circle, is called the *mean longitude* of the earth; and it happens, from the orbit being, as we said, but slightly different from a circle, that the mean and true longitude differ but slightly. The quantity by which the true and mean longitudes differ is called the *equation of the center*; and this is sometimes to be added to, and sometimes to be subtracted from the mean longitude, to obtain the true; and sometimes it is zero.

EQUATION OF TIME. It will be seen from the article **EQUATION OF THE CENTER** (q. v.) that the earth's motion in the ecliptic—or what is the same thing, the sun's apparent motion in longitude—is not uniform. This want of uniformity would of itself obviously cause an irregularity in the time of the sun's coming to the meridian on successive days; but besides this want of uniformity in the sun's apparent motion in the ecliptic, there is another cause of inequality in the time of its coming on the meridian—viz., the obliquity of the ecliptic to the equinoctial. Even if the sun moved in the equinoctial, there would be an inequality in this respect, owing to its want of uniform motion; and even if it moved uniformly in the ecliptic, there would be such an inequality, owing to the obliquity of its orbit to the equinoctial. These two independent causes conjointly produce the inequality in the time of its appearance on the meridian, the correction for which is the equation of time.

When the sun's center comes to the meridian, it is apparent noon, and if it moved uniformly on the equinoctial, this would always coincide with *mean noon*, or 12 o'clock on a good solar clock. But from the causes above explained, mean and apparent noon differ, the latter taking place sometimes as much as $16\frac{1}{2}$ minutes before the former, and at others as much as $14\frac{1}{2}$ minutes after. The difference for any day, called, as we have said, the equation of time, is to be found inserted in ephemerides for every day of the year. It is nothing or zero at four different times in the year, at which the whole mean and unequal motions exactly agree—viz., about the 15th of April, the 15th of June, the 31st August, and the 24th December. At all other times, the sun is either too fast or too slow for clock-time. In the ephemerides above referred to, the sign + or — is prefixed to the equation of time, according as it is to be added to or subtracted from the apparent time to give the mean time. See **NAUTICAL ALMANAC**.

EQUATIONS. An equation may be defined to be an algebraical sentence stating the equality of two algebraical expressions, or of an algebraical expression to zero. From another point of view, it is the algebraical expression of the conditions which connect known and unknown quantities. Thus (1), $xy = 24$, and (2), $x^2 + y^2 = 52$, are two equations expressing the relations between the unknown quantities x and y and known quantities. Generally, equations are formed from observations from which an object of inquiry may be inferred, but which do not directly touch the object. Thus, suppose we wish to ascertain the lengths of the sides of a rectangular board which we have no means of measuring, and that all the information we can get respecting it is, that it covers (say) 24 square feet, and that the square on its diagonal is (say) 52 square feet. From these facts, we can form equations from which we may determine the lengths of the sides. In the first place, we know that its area is equal to the product of its sides, and if we call these x and y , we have $xy = 24$, the first of the equations above given. Again, we know that the sum of the

squares on the sides is equal to the square on the diagonal; hence, we have the second equation, $x^2 + y^2 = 52$. From these two equations, we should be able to determine the values of x and y . The determination of these values is called the *solution* of the equations.

Equations are of several kinds. Simple equations are of those which contain the unknown quantity in the first degree, thus, $x + 3 = 4$, is a simple equation. Quadratic equations are those which contain the unknown quantity in the second degree: $x^2 + 5x - 36 = 0$, is a quadratic equation. Cubic and biquadratic equations involve the unknown in the third and fourth powers respectively. For the higher equations, there are no special names; they are said to be equations of the degree indicated by the highest power of the unknown which they contain. Simultaneous equations are those which involve two or more unknown quantities, and there must always be as many of them, in order to their determinate solution, as there are unknown quantities. The equations first mentioned—viz., $xy = 24 - x^2 + y^2 = 52$, are simultaneous equations. It may be mentioned, that in the course of solving such equations the principal difficulties encountered are always ultimately the same as in the solution of equations containing only one unknown quantity. For instance, in the equations just given, if we substitute in the second the value of y as given by the first, or $y = \frac{24}{x}$, we have $x^2 + \frac{(24)^2}{x^2} = 52$, which may

be solved as a quadratic equation. The general theory of equations, then, is principally concerned with the solution of equations involving one unknown quantity only, for to this sort all others reduce themselves. Indeterminate equations are such as do not set forth sufficient relations between the unknown quantities for their absolute determination, and which accordingly admit of various solutions. Thus, $xy = 24$ is an indeterminate equation, which is satisfied by the values $x = 3, y = 8$; or $x = 6, y = 4$; or $x = 2, y = 12$. We require some other relation, such as $x^2 + y^2 = 52$, to enable us to fix on one of the sets of values, x and y , as those of x . For other kinds of equations, see **EXPONENT AND EXPONENTIAL, FUNCTIONS, AND DIFFERENCE**.

The object of all computation is the determination of numerical values for unknown quantities, by means of the relations which they bear to other quantities already known. The solution of equations, accordingly, or in other words, the evolution of the unknown quantities involved in them, is the chief business of algebra. But so difficult is this business, that, except in the simple cases where the unknown quantity rises to no higher than the second degree, all the resources of algebra are as yet inadequate to effect the solution of equations in general and definite terms. For equations of the second degree, or quadratic equations, as they are called, there is a rigorous method of solution by a general formula; but as yet no such formula has been discovered for equations even of the third degree. It is true, that for equations of the third and fourth degrees general methods exist, which furnish formulas which express under a finite form the values of the roots. See **CARDAN, and CUBIC EQUATIONS**. But all such formulas are found to involve *imaginary* expressions, which, except in particular cases, make the actual computations impracticable till the formulas are developed in infinite series, and the imaginary terms disappear by mutually destroying one another.

What is called Cardan's formula, for instance (and all others are reducible to it), is in this predicament whenever the values of the unknown quantity are all real; and accordingly, in nearly all such cases, the values are not obtainable from the formulæ directly, but from the infinite series of which they are the compact expression. But though such formulæ as Cardan's are useless for the purpose of numerical computation, the search for them has led to most of the truths which constitute the general theory of equations, and through which their *numerical solution* may be said to have been at last rendered effective and general. This method of numerical solution is a purely arithmetical process, performed upon the *numerical coefficients* of equations, and it is universally applicable, whatever the degree of the equation may be. With this method are connected the names of Budan, Fourier, Horner, and Sturm. We cannot here enter into an account of it; the reader should consult on the subject Young's *Theory and Solution of Algebraical Equations of the Higher Orders*; Peacock's *Treatise on Algebra*; and La Grange's works on *Numerical Solutions*.

The rules for the solution of the simpler forms of equations are to be found in all elementary text-books of algebra. It must suffice to notice here a few of the leading general properties of equations. By the roots of an equation are meant those values real or imaginary of the unknown which satisfy the equality; and it is a property of every equation to have as many roots and no more as there are units in its degree. Thus, a quadratic equation has two roots; a cubic equation, three; and a biquadratic, four. The quadratic equation $x^2 + 5x - 36 = 0$ has two roots, + 9 and - 4, which will be found to satisfy it. Further, the expression $x^2 + 5x$

-- $36 = (x - 9)(x + 4) = 0$; and generally if the roots of an equation

$$F(x) = x^n \pm A_{n-1}x^{n-1} \pm A_{n-2}x^{n-2} \pm \dots \pm A_1x \pm A_0 = 0$$

(to which general form every equation of the n th degree can be reduced), are

$$\pm a_1 \pm a_2 \pm a_3 \dots \pm a_n \dots$$

then

$$(x \mp a_1)(x \mp a_2)(x \mp a_3) \dots$$

$$(x \mp a_n) = F(x) = 0.$$

Hence, and from observing the way in which, in the multiplication of these factors, the coefficients

$$A_{n-1}, A_{n-2}, \dots, A_1, A_0$$

are formed, we arrive at the following important results:

A_{n-1} = the sum of the roots, with their signs changed.

A_{n-2} = the sum of the products of every two roots, with their signs changed.

A_{n-3} = the sum of the products of every three roots, with their signs changed.

A_0 = the product of the roots, with their signs changed.

The factors, it will be observed, are formed thus: If $+a_1$ be a root, then $x = a_1$, and $x - a_1 = 0$ is the factor. If the root were $-a_1$, then $x = -a_1$; and the factor would be $x + a_1 = 0$.

Observing now the way in which, in multiplying a series of such factors, the coefficients of the resulting polynomial are formed, we arrive at this: that a complete equation cannot have a greater number of positive roots than these changes of sign from $+$ to $-$ and from $-$ to $+$ in a series of terms forming its first member; and that it cannot have a greater number of negative roots than there are *permanencies* or repetitions of the same sign in proceeding from term to term. From the same source, many other general properties of equations, of value in their arithmetical solution, may be inferred. The subject is, however, too vast to be more than glanced at here.

EQUATOR, CELESTIAL, is the great circle in the sky corresponding to the extension of the equator of the earth.

EQUATOR, TERRESTRIAL, the great circle on the earth's surface dividing the earth into the northern and southern hemispheres, and half way between the poles.

EQUATORIAL, an important astronomical instrument, by which a celestial body may be observed at any point of its diurnal course. It consists of a telescope attached to a graduated circle, called the declination circle, whose axis penetrates at right angles that of another graduated circle called the hour circle, and is wholly supported by it. The pierced axis, which is called the principal axis of the instrument, turns on fixed supports; it is pointed to the pole of the heavens, and the hour circle is of course parallel to the equinoctial. In this position, it is easy to see that a great circle of the heavens corresponding to the declination circle, passes through the pole, and is an hour circle of the heavens. The telescope is capable of being moved in the plane of the declination circle. If, now, the instrument be so adjusted that the index of the declination circle must point to zero when an equatorial star is in the center of the field of view of the telescope, and the index of the hour circle must point to zero when the telescope is in the meridian of the place, it is clear that when the telescope is directed to any star, the index of the declination circle will mark the declination of the star; and that on the other circle its right ascension. If the telescope be clamped when directed on a star, it is clear that, could the instrument be made to rotate on its principal axis with entire uniformity with the diurnal motion of the heavens, the star would always appear in the field of view. This motion of rotation is communicated to the instrument by clock-work.

EQUESTRIAN ORDER, or **EQUITES**. This body originally formed the cavalry of the Roman army, and is said to have been instituted by Romulus, who selected from the three principal Roman tribes 300 equites. This number was afterward gradually increased to 3600, who were partly of patrician and partly of plebeian rank, and required to possess a certain amount of property.

Each of these equites received a horse from the state; but about 403 B.C., a new body of equites began to make their appearance, who were obliged to furnish a horse at their own expense. These were probably wealthy *novi homines*, men of equestrian fortune, but not descended from the old equites (for it should be observed that the equestrian dignity was hereditary). Until 123 B.C., the equites were exclusively a military body; but in that year Caius Gracchus carried a measure, by which all the *judices* had to be selected from them. Now, for the first time, they became a distinct order or class in the state, and were called *Ordo Equestris*. In 70 B.C., Sulla deprived them of this privilege; but their power did not then decrease, as the forming of the public revenues appears to have fallen into their hands. After the conspiracy of

Catiline, the equestrian order, which on that memorable occasion had vigorously supported the Consul Cicero, began to be looked upon as a third estate in the Republic; and to the title of *Senatus Populusque Romanus* was added *et Equestris Ordo*. But, even in the beginning of the empire, the honor, like many others, was so indiscriminately and profusely conferred, that it fell into contempt, and the body gradually became extinct. As early as the later wars of the Republic, the equites had ceased to constitute the common soldiers of the Roman cavalry, and figure only as officers.

EQUESTRIAN STATUE, the representation of a man on horseback. Equestrian statues were awarded as a high honor to military commanders and persons of distinction in Rome, and latterly were, for the most part, restricted to the emperors, the most famous in existence being that of the Emperor Marcus Aurelius, which now stands in the Piazza of the Capitol at Rome. It is the only ancient equestrian statue in bronze that has been preserved; an exemption which it probably owed to the fact, that for centuries it was supposed to be a statue of Constantine. The action of the horse is so fine, and the air of motion so successfully given to it, that Michael Angelo is said to have called out to it 'Cammina!'—(Go on, then!). It was originally gilt, and traces of the gilding are still visible on the horse's head. So highly is this statue prized, not only for its artistic but its historical value, that an officer used regularly to be appointed by the Roman government to take care of it, under the designation of the Custode del Cavallo. On the occasion of the rejoicings by which Rienzi's elevation to the tribuneship was celebrated in 1347, wine was made to run out of one nostril and water out of the other of this famous horse. The statue then stood in front of the Church of St. John Lateran, near to which it was found, and a bunch of flowers has always been presented annually to the chapter of that basilica, in acknowledgment of ownership, since it was removed to its present site on the Capitol. All European capitals are adorned, or disfigured, by numerous equestrian statues, London belonging pre-eminently to the latter category.

EQUESTRIANISM. See HORSEMANSHIP.

EQUIANGULAR, having equal angles. A figure is said to be equiangular all whose angles are equal to one another, as a square, or any regular polygon. Also triangles and other figures are said to be equiangular one with another whose corresponding angles are equal.

EQUID.E, or **SOLIDUNGULA** (Lat. solid-hoofed), a family of mammalia of the order *Pachydermata*, containing only a small number of species, which so nearly resemble each other that almost all naturalists agree in referring them to one genus, *Equus*. They are distinguished from all other quadrupeds by the complete consolidation of the bones of the toes, or the extraordinary development of one toe alone in each foot, with only one set of phalangeal and of metacarpal or metatarsal bones, and the extremity covered by a single undivided hoof. There are, however, two small protuberances (*splint bones*) on each side of the metacarpal or metatarsal bone (*canon* or *cannon bone*), which represent other toes. The E. have six incisors in each jaw, and six molars on each side in each jaw; the males have also two small canine teeth in the upper jaw, sometimes in both jaws, which are almost always wanting in the females. The molars of the E. have square crowns, and are marked by laminae of enamel with ridges forming four crescents. There is a wide space between the canine teeth and the molars. The stomach of the E. is simple, but the intestines are long, and the caecum extremely large; the digestive organs being thus very different from those of the ruminants, but exhibiting an equally perfect adaptation to the same kind of not easily assimilated food. Another distinctive peculiarity of the E. is, that the females have two teats situated on the pubes, between the thighs. But notwithstanding these characters, so dissimilar to those of the ruminants, they approach them very much in their general conformation, and may be regarded as a connecting link between pachyderms and ruminants. The largely developed and flexible upper lip is a character which belongs to the former rather than to the latter order.

The E. are now found in a truly wild state only in Asia and Africa. Fossil remains exist in the newer geological formations in great abundance in many parts of the Old World; very sparingly, however, in the New, although the bones of a peculiar and distinct species (*Equus curvidens*), belonging to the Pleiocene period, have been found in South America.

The horse and the ass are by far the most important species of this family. The dziggethai has also been domesticated and made useful to man. Of the other species, the zebra, quagga, and dawk, it is generally believed that they are incapable of useful domestication.

EQUILATERAL, having equal sides. A square is equilateral. The equilateral hyperbola is that whose axes and conjugate diameters are equal.

EQUILIBRIUM, the state of rest or balance of a body or system, solid or fluid, acted upon by various forces. See **STATICS** and **HYDROSTATICS**.

EQUINIA, or **GLANDERS**. In the article *Glanders*, the disease has been considered simply as one peculiar to animals, and especially the horse. We shall here consider it as a disease affecting man, to whom it is transmissible from animals.

It is remarkable that although the disease in the horse and ass has been recognized from the time of Aristotle (who describes it as common in the ass), it was not till the year 1810 that Waidinger of Vienna drew attention to the fact, that special precautions should be taken in the dissection of horses affected with glanders and farcy, inasmuch as the most serious and often fatal consequences might arise from the inoculation of the morbid matter. Strangely enough, however, he does not seem to have noticed that the disease thus induced in man is identical with that of the horse; and it was not till 1821 that Schilling recognized this important point. It was not till a living physician, Dr. Elliotson, published his *Memoir On the Glanders in the Human Subject*, in 1830, that the attention of the medical profession in this country was directed to the subject. In 1837, Rayer, in his *Memoir De la Morve et du Farcin chez l'Homme*, collected all the cases that had been observed up to that date, and gave a complete description of the various forms of glanders both in the horse and in man; and in 1843, Tardieu published his investigations, *De la Morve et du Farcin Chroniques*. It is to these writers and to the brothers Gangee (*Glanders—Equinia*, by Arthur Gangee, M.D., and John Gangee, in Reynolds's *System of Medicine*, vol. i. 1866) that we owe almost all our knowledge of this terrible disease.

In the great majority of cases, the disease is transmitted from the horse, the ass, or the mule to man; but several instances have been recorded in which it has been transmitted from one human being to another. The disease is no doubt generally due to inoculation, but the virus is also probably capable of being absorbed by unbroken mucous membrane. Most of the recorded cases have occurred in men of good constitution and in the prime of life. The four varieties of this disease which occur in the horse have also been observed in man—viz., (1) *Acute Glanders*, (2) *Chronic Glanders*, (3) *Acute Farcy*, and (4) *Chronic Farcy*.

Acute Glanders is the commonest form. The period of inoculation, ranges, in the majority of cases, from three days to a week. If there is a distinct wound or abrasion through which the poison has been absorbed, the parts around the broken surface become red, tense, and painful, often before the appearance of any of the constitutional symptoms, such as a general feeling of illness, great depression of the spirits, headache, rigors, increased rapidity of the pulse, and pain in the joints. A characteristic pustular eruption, often accompanied by bullæ or blebs, appears on the face and limbs; and abscesses frequently occur on the face and about the principal joints. A yellow, purulent, fetid discharge, often mixed with blood, exudes from the nasal mucous membrane, which is invariably the seat of a pustular eruption, or of ulcerations. The prostration which is observable from the beginning increases during the course of the disease. The pulse becomes weak and frequent, the breathing difficult, the voice feeble, and the bowels very relaxed, the stools being extremely fetid.

Delirium now sets in, which is followed by coma and death. Death usually occurs about the end of the second week, but the duration of the disease has been known to vary from three to fifty-nine days.—*Chronic Glanders* is so rare an affection in man that it hardly requires notice. The course of the disease usually extends over several months; and only one case of recovery is reported.—*Acute Farcy* seems only to differ essentially from acute glanders in the fact of there being no affection in the mucous membrane of the nostrils. The cutaneous eruption may or may not be present; in most cases, it is present, and the disease then follows exactly the same course as glanders. When there is no eruption, there is merely an inflammation of the lymphatic vessels and glands, or *Adenitis* and *Angiolencitis* (q. v.), accompanied with the formation of soft subcutaneous tumors at various parts. This form of the disease often terminates favorably, or may merge into *Chronic Farcy*, which is characterized by the formation of an abscess on the forehead or elsewhere, which is followed by indolent and fluctuating tumors, which follow one another in various parts of the body, open spontaneously, and form very intractable ulcers. The disease usually runs its course in about a year. Of twenty-two cases recorded by Tardieu, six recovered.

Little need be said regarding treatment, since no remedies have been found to exercise any influence in checking the course of acute glanders. Arsenic, combined with strychnia, has been found useful in chronic glanders in the horse, and is recommended by the brothers Gangee as worthy of trial in man; and some relief might probably be afforded by the application of weak injections of carbolic acid into the nostrils.

EQUINOCTIAL is the same with the celestial equator. See **EQUATOR**, **CELESTIAL**. The equinoctial points are those in

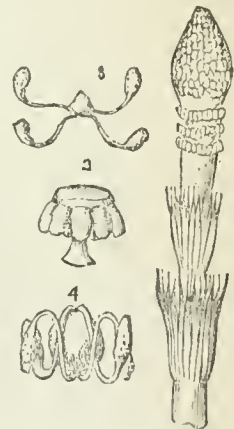
which the equinoctial and the ecliptic intersect. See **ECLIPTIC**. Equinoctial time is time reckoned from the moment when the point of Aries passes the Vernal Equinox. See **EQUINOXES**. This instant is selected as a convenient central point of a uniform reckoning of the time for purposes of astronomical observers.

EQUINOXES. Sometimes the Equinoctial Points (see **EQUINOCTIAL**) are called the equinoxes. More commonly, by the equinoxes are meant the times when the sun enters those points, viz., 21st March and 22d September, the former being called the Vernal or Spring Equinox, and the latter the Autumnal. When in the equinoxes, the sun, through the earth's rotation on its axis, seems to describe the circle of the equator in the heavens, and the days and nights are of equal length all over the world. At the vernal equinox, the sun is passing from south to north, and in the northern hemisphere the days are lengthening; at the autumnal, he is passing from north to south, and the days are shortening. As the earth moves more rapidly when near the sun, or in winter, the sun's apparent motion is not uniform, and it happens that he takes eight days more to pass from the vernal to the autumnal equinox, than from the latter to the former. The equinoctial points are not stationary. See **ECLIPTIC**.

EQUIPMENT, **E'QUIPAGE**, in Military matters, are names given to certain of the necessities for officers and soldiers. During the Crimean War, many officers applied for and obtained money as compensation for the loss or injury of their equipment, comprising horses, horse-appointments, baggage, saddlery, and accoutrements. Equipments issued to private soldiers are expected to last a certain number of years, and small deductions from their pay are made in the event of the articles not lasting their proper time. In those cases (in the English army) where a non-commissioned officer receives a commission on the ground of meritorious service, an allowance of £100, if in the infantry, or £150, if in the cavalry, is made to him to provide an equipment. The equipment of a private soldier is often used as a name for the whole of his clothes, arms, and accoutrements collectively. The *equipage* of an army is of two kinds: it includes all the furniture of the camp, such as tents and utensils, under the name of *camp-equipage*; while *field-equipage* comprises saddle-horses, baggage-horses, and baggage-wagons.

EQUISETUM, a genus of Cryptogamous plants, the structure and affinities of which are not yet well understood, but which many botanists regard as constituting a sub-order of ferns, whilst others prefer to make it a distinct order, *Equisetaceæ*. The English name **HORSE-TAIL** is often given to all the species. They have a leafless, cylindrical, hollow, and jointed stem, each joint terminating in a membranous and toothed sheath, which encloses the base of the one above it. The fructification is at the summit of the stem in spikes, which somewhat resembles trobiles (cones), and are formed of scales bearing spore-cases on their lower surface. The spores are minute, oval, or round, green, and each accompanied with four elastic and hygrometrical threads. These threads are sometimes called *elaters*, but it is by no means certain that they are of the same nature with the spiral filaments so called, which are mixed with the spores of many *Hepaticæ* (q. v.). Each thread terminates in a kind of club. The stems generally have lateral branches, angular, but otherwise similar in structure to the stem, growing in whorls from the joints; sometimes the stem is simple; or fertile stems are simple, and sterile stems are branched. The species of this genus contain a peculiar acid, called *Equisetic Acid*.

Astringent and diuretic properties exist in these plants, and they were formerly used in medicine, but are not now regarded as of much value. It has been said that they are very injurious to cattle which eat them, but this seems to require confirmation. They abound chiefly in damp soils, and sometimes so much that the plough and harrow, or the grubber, must be employed to extirpate them. Some of them, however, grow in dry fields and gardens; whilst others are found chiefly in ditches or the banks of rivers. They exist in almost all parts of the world, and are seldom of large size, varying from a few inches to a few feet in height, but a comparatively gigantic species has recently been discovered in tropical America. The rough siliceous stems of some species are used for smoothing and polishing wood, particularly those of *E. hyemale*, which are imported into Britain in considerable quan-



Equisetum Telmateia :

- 1, summit of fertile stem, with fructification; 2, a scale, with its stalk (lateral view); 3, a spore, with its filaments unrolled; 4, a spore, with its filaments hygrometrically rolled up.

titles from Holland, under the name of DUTCH RUSHES. The stems of this species are unbranched, or a little branched only at the base. It is not uncommon in Britain, and is found also, rather sparingly, in North America. It has been proposed to cultivate it, as it grows well under trees, where few other plants would thrive. The stems of other species, as *E. arvensis*, the most common of all the British species, are used for scouring tin and pewter vessels.

EQUITABLE DEFENCES, at common law were introduced by the Common Law Procedure Act (15 and 16 Vict. c. 76, s. 83), whereby it was enacted that the defendant in any cause, and the plaintiff in replevin, where he would be entitled to relief against the judgment on equitable grounds, may plead the facts which entitle him to such relief. The effect of this enactment had been to extend materially the equitable jurisdiction of common law courts, by enabling them to give effect to a plea in cases where, though courts of law had no remedy, a court of equity would have afforded *unconditional* relief. It has been remarked by Pollock, C. B. *Clark v. Laurie* 26, *Law Jour.* Ex. 36, that 'it is an established rule now . . . that no equitable plea shall be permitted, except in a case where the plea and decision, and judgment of the court upon it, will work out and complete all the equity that belongs to the matter to which the plea refers.' A defendant having pleaded an equitable defence at law, was not precluded from resorting to the Court of Chancery. All this, however, is obsolete, now that law and equity are consolidated, and the same defence is good in all courts alike.

EQUITABLE ESTATES, estates the right to which, according to the strict rules of English common law, was unrecognized, but which received full effect in a court of equity. These estates are the Equity of Redemption (q. v.) which a mortgagor has in his estate, subject to the mortgage, and the right of *cestui que trust* in a trust estate. Formerly, these interests were not even recognized by courts of law; but by 7 Geo. II. c. 20, and 15 and 16 Vict. c. 76, courts of law were empowered to take notice, and give effect to an equitable interest; and now that law and equity are merged together, the same court protects both.

EQUITABLE MORTGAGE is where a person, having an equitable interest in an estate, mortgages that interest. Thus, a *cestui que trust* may mortgage his estate under the trust, or a mortgagor, who has already mortgaged his estate, may convey his Equity of Redemption (q. v.) in security of his debt. In these instances, the interest operated upon being purely equitable, the transaction is an equitable mortgage. An equitable mortgage may also be effected by a deposit of title-deeds in security of debt. See MORTGAGE, ESTATE.

EQUITY, COURTS OF, ENGLAND. The administration of justice in England once embraced two great branches, usually known as common law and equity. Speaking generally, it may be said that equity is partly corrective of the common law, partly supplementary of it; and from this it follows that, in an almost endless variety of matters, the decision of a court would vary according as it was a court of equity or a court of common law; the equity courts giving remedies in cases where the common law—though it may acknowledge a hardship—sees no wrong, and acknowledging and enforcing rights which the common law does not admit. The anomaly of keeping up two sets of courts, acting on different principles, the one to do justice where the traditions of the other prevent it from doing justice, or its rules require it to do injustice, had long been perceived; it had been found, too, that this arrangement was inconvenient as well as anomalous. Attempts had been made to produce a gradual fusion of the conflicting systems by clothing the common-law courts to some extent with the power of resorting to the remedies and admitting the principles employed in the courts of equity; and these attempts had proved partially successful. In 1873, therefore, the legislature proceeded to make provisions for completely revolutionizing the judicial system of England, with a view to getting rid, at one stroke, of its inconvenient and anomalous double system of courts. This was done by the Judicature Act passed in that year, a measure that was soon afterwards modified in important particulars by other Acts passed in 1874 and 1875. These Judicature Acts did not come into force till the 1st of November 1875; and various rules and orders have been made in accordance with them. The Judicature Act merged the existing courts both of equity and common law in one supreme court of judicature, which consisted of a High Court of Justice in five divisions (now three), all of them courts of first instance. There was an appeal in a few cases to the Privy Council; and in the other cases to the Court of Appeal, and then the House of Lords. In the High Court there is now a Chancery Division, before which, at first, the greater part of the equity business requires to be brought; and it is expressly provided that where the rules of the common law conflict with those of equity, every court is to give effect to the latter. The conflict between common law and equity will henceforth be at an end; but as the sources from which the law of the future

will be derived, they will still be referred to. Until the recent change, the courts of equity were the Lords Justices' Court, the Master of the Roll's Court, and the courts of the three Vice-Chancellors.

The origin of a separate equitable jurisdiction in England is to be found in the early adoption by the courts of common law of certain set forms for the redress of grievances, and their refusal to apply any remedy to causes which did not fall within those limits. Suitors finding that in numerous cases redress was not to be obtained in the ordinary legal tribunals, had recourse to the king as the fountain of justice, who, sitting in council, heard the complaints upon their merits without reference to the technicalities of law. As early as the reign of Edward I., the practice began to be adopted of delegating to the chancellor the petitions referred to the king. In this reign, an attempt was made to devise a method whereby the common-law courts should be made the sole tribunal for the redress of grievances. By the statute of Westminster the second (13 Edw. I. c. 24), it was enacted that whenever a case occurred requiring a new writ, the chancery (in which all suits took their rise) should frame a new writ to suit the case. This statute was never acted upon to the purpose intended; but in the reign of Edward III. its provisions were made use of by John Waltham, who was then chancellor, to introduce the writ of *Subpana* (q. v.) returnable to Chancery only, whereby the Lord Chancellor's court was made the forum of a large class of causes. 'From this time,' says Mr. Spence (*Chancery Jurisdiction*, i. 338), 'suits by petition or bill without any preliminary writ became a common course of procedure before the chancellor, as it had been in the council. On the petition or bill being presented, if the case called for extraordinary interference, a writ was issued by the command of the chancellor, but in the name of the king, by which the party complained against was summoned to appear before the Court of Chancery, to answer the complaint and abide by the order of the Court.' Thus was introduced in Chancery the practice of examining upon oath the party in the cause, a practice unknown at that time to common law. The cases heard in the Chancery courts were decided upon the principles of *honesty, equity, and conscience*. The next step which tended to widen the equitable jurisdiction of the Chancery courts, was the exclusion of the Roman law from the courts of common law. This was effected by a prohibition of the judges in the reign of Richard II. One result of this prohibition was to exclude altogether from the common-law courts the question of trusts. The Court of Chancery at once proceeded to give a remedy in this class of cases, which has ever since formed the most important branch of the equitable jurisdiction of that court. The equitable jurisdiction of the Court of Chancery in matters of fraud is to be traced to the abolition of the Star Chamber (q. v.) in the reign of Charles I. Thus sprung up in England jurisdiction of the Court of Chancery as a court of equity. It is not, however, to be supposed that the system administered in courts of equity is an arbitrary one at the pleasure of the presiding judge. Such probably was the case on the first introduction of the equity jurisdiction; but as time progressed, the decisions of previous judges formed precedents for their successors, and the precepts of the Roman law were much imitated as a code for the regulation of the courts.

Now, all the judges acknowledge the authority of decided cases—of the practice of the court—quite as fully as did courts of common law; and though new cases perhaps occur more frequently than they did in the courts of common law, they are dealt with as they were in courts of common law, by the application to them, as far as possible, of accepted principles derived from the decisions of the Court of Chancery, or the principles of the Roman law.

The jurisdiction of equity courts was divided under three principal heads—exclusive, concurrent, and assistant. The first consists almost entirely of the administration of trusts; the second comprises questions of fraud, of account, and also, it is said (Smith's *Principles of Equity*, 217), of specific performance of agreements. This matter appears, however, to fall more naturally under the assistant jurisdiction. In order to appreciate the domain of the equity courts, it must be borne in mind that common law confines its remedy usually to the awarding of damages, and to the pronouncing a judgment absolutely in favor of either plaintiff or defendant; equity, on the other hand, goes into all the merits of the case, and will deliver a modified judgment where circumstances demand it. The judges of the supreme court now all administer equity as well as law in the same manner as the Court of Session in Scotland had been accustomed to do from the beginning. In whichever division of the High Court an action commences, that division must dispose of all the issues raised, and pursue these to final judgment. It is true one of the divisions is still called the Chancery Division, and actions which used to be begun in equity courts now usually begin there still. But there is a power in such division to send an issue of fact to be decided on circuit, and after trial the division resumes its jurisdiction and works it out. The Chancery Division consists of judges chosen from the bar gen-

erally; and the Court of Appeal, which sits in two divisions, consists also of judges some versed in Chancery business, and some versed in common law business. The Lord Chancellor since 1875 has confined his sittings to the House of Lords, and occasionally to the Court of Appeal and to the Privy Council, of all of which courts he is *ex officio* a member.

EQUITY, PRINCIPLES OF, in their widest sense, are the principles of eternal justice, of which all human laws are but adaptations. 'Equity,' says Lord Stair (i. l. s. 17), 'is the body of the law, and the statutes of men are but as the ornaments and vestiture thereof.' In this sense, equity coincides with the Roman precepts of law—'honestè vivere, alterum non lædere, suum cuique tribuere'—(*Inst.* i. 1, s. 3), and with the principles of justice as laid down by the inspired writer—'to do justly, to love mercy, and to walk humbly with thy God.'—Micah, vi. 8. As the object of human law is to give expression to these principles, equity is thus the basis of law. But it is impossible, in the nature of things, that any code of laws should provide a remedy suited to every particular case; it has, therefore, been found necessary in every civilized nation, to establish some form of authority which should control the rigor and remedy the deficiency of positive law. Thus, it is the function of the law to lay down a code of rules whereby the rights of property and the transactions of commerce shall be regulated; but by the diversities of life it happens that various circumstances will occur to cause these fixed rules to operate harshly or unjustly in particular cases.

A party may complain that a contract duly entered into with all legal formalities has been obtained by fraud; the owner of an estate is incapable from infancy or lunacy of managing his affairs; a person ostensibly the owner of large property is found to be placed in possession in trust only for the benefit of others. In these and many other cases, the party who, in compliance with every rule of the law, is in possession, is not in fact the person who should in justice exercise the right. Here equity steps in. While, then, all law may be said to be equitable, inasmuch as it is the purpose of law to dispense justice, yet, in the technical sense, the term equity is confined to those cases not specially provided for by positive law. But, on the other hand, experience has shown that it would be most inconvenient, and subversive of order, if equity should arbitrarily interpose to remedy every apparent grievance, and therefore it is that the operation of equity is checked within certain limits. 'There are many cases against natural justice which are left wholly to the conscience of the party, and are without any redress, equitable or legal; and so far from a court of equity supplying universally the defects of positive legislation, it is governed by the same rules of interpretation as a court of common law, and is often compelled to stop where common law stops. It is the duty of every court of justice, whether of law or of equity, to consult the intention of the legislature.'—Story, *Principles of Equity*, s. 14. Hence arises the maxim, that 'equity follows the law.' The principles of equity, therefore, as understood in modern times, may be said to be those principles of natural justice which are permitted to modify the rigor of positive law. In applying these principles to practice, the equitable jurisdiction has been intrusted by all nations, with the exception of England (but see **EQUITY COURTS**), to the same courts in which the positive law was administered. In the infancy of states, the boundaries of law and equity, and the functions of the equity judge, were not so clearly defined as in the present day. By the Roman law, a power, called the *jus honorarium* or *nobile officium*, was reposed in the prætor of controlling on equitable grounds the decisions of the ordinary tribunals*. Each prætor, on entering upon his office, published an edict declaring the principles by which he would be guided in discharging his duty as an equitable magistrate. The principles so declared were binding on the prætor during his year of office, but not on his successor. There can, however, be little doubt that in process of time a system of equity was gradually evolved; and ultimately, in the reign of the Emperor Hadrian, the edicts of the prætors were collected by a civilian named Julianus, and embodied in a single code called the Perpetual Edict. See **EDICT**. According to the practice of modern nations, the courts of law are accustomed to exercise a certain equitable jurisdiction whereby, within prescribed limits, the rules of law may be modified. In Scotland, the equitable power of the Court of Session is called the *Nobile Officium* (q. v.).

EQUITY OF REDEMPTION, the interest which a mortgager has in an estate which he has mortgaged. An equity of redemption may be devised, granted, or entailed, and the course of descent to an equity of redemption is governed by the same laws as the descent to the land would have been. Formerly the equitable interest of a mortgager could not be recognized in a court of law, but by 7 Geo. II. c. 20, it is provided that where no suit is pending in a court of equity, either for foreclosure or redemption, but the mortgagee attempts to obtain possession by bringing an action of

ejectment, in such a case, the court may restore his estate to the mortgager, on his payment of the principal and interest due on such mortgage.

EQUIVALENTS, in Chemistry. See **ATOMIC WEIGHTS**.

ERA. See **CHRONOLOGY**.

ERASED AND ERADICATED, heraldically signifies that an object is plucked or torn off, and showing a ragged edge; as opposed to *coupé* or *coupy*, cut, which shows a smooth edge. A tree plucked up by the roots is said to be eradicated.



Erased.

ERASISTRATUS, one of the most famous physicians and anatomist of ancient times, flourished in the 3d c. B.C., and is supposed to have been born at Iulis, in the island of Ceos. He resided for some time at the court of Seleucus Nicator, king of Syria, and while there, acquired great renown by discovering and curing the disease of the king's eldest son, who was pining for the love of the young and beautiful Stratonice, whom his father in his old age had married. Afterwards, E. lived for some time at Alexandria, where giving up practice, he devoted himself with great energy and success to his anatomical studies. The date of his death, which seems to have taken place in Asia Minor, is not known. He founded a school of medicine, wrote several works on anatomy—in which branch he was most celebrated—on practical medicine, and pharmacy. He believed that the heart was the origin both of the veins and arteries, and, had it not been his conviction that the arteries contained *air* instead of *blood*, little doubt is entertained but that he would have anticipated Harvey in the discovery of the circulation of the blood. Of his numerous writings only some obscure fragments and titles have been preserved. Compare Hieronymus, *Erasistrati et Erasistrateorum Historia* (Jena, 1790.)

ERA'SMUS, DESIDERIUS, one of the most vigorous promoters of the Reformation, was born at Rotterdam, 28th October 1467. He was the illegitimate son of a Dutchman named Gheraerd, or Garrit, by the daughter of a physician. In accordance with the fashion among scholars of his time, he changed the name Gheraerd into its Latin and Greek equivalents Desiderius Erasmus (more correctly, Erasmus)—meaning desired, loved. Till his ninth year, E. was a chorister in the cathedral at Utrecht. He was then sent to school at Deventer, where his talents began to display themselves in so brilliant a manner, that it was even then predicted that he would one day be the most learned man of his time.

After the death of his parents, whom he lost at the age of fourteen, his guardians determined on bringing him up to a religious life, and—with the intention, it is said, of sharing his small patrimony among themselves—in his 17th year, placed him in the monastery of Emaus, near Gouda. From this constrained manner of life, however, he was released by the Bishop of Cambray. After having taken priest's orders in 1492, he went to Paris, to perfect himself in theology and the humane sciences. Here he supported himself in a somewhat precarious manner, by giving private lectures, and in 1497, accompanied some Englishmen, who had been his pupils, to England, where he was well received by the king. He, however, soon returned to Paris, and in 1506, to enrich his knowledge, visited Italy. At Turin, he took the degree of D.D. Shortly after, he applied to the pope for a dispensation from his monastic vows, which was granted. During the course of his journey, he visited Venice, Parma, Rome, and other interesting cities, in company with his pupil, Alexander Stuart, a natural son of James IV. of Scotland, who, along with his father, was afterwards slain at the battle of Flodden. At Rome, the most brilliant prospects were held out to him. Cardinal Grimani, a famous lover of learning in that day, offered, out of his admiration for E., to make him 'partaker of his house and fortunes.' Other eminent men vied with Grimani in showing respect to the young scholar, among whom may be mentioned John de' Medici, afterwards Leo X., Cardinal Raphael of St. George, and Giles of Viterbo, general of the Augustines. The pope (Julius II.) also offered him a place among his penitentiaries, an office of considerable consequence, and it would appear, a 'step to the highest preferments in that court.' E., who had always an eye to the main chance, regretted, at a later period of his life, that he had not accepted the offers held out to him in Rome, but meanwhile, having pledged himself to return to England, where also he had many friends, he set out for that country in 1509, after the accession of Henry VIII. In several of the cities through which he passed he met with friends and patrons, who wished him to settle amongst them, but as Henry was a correspondent of his, E. was induced to cherish the highest hopes of personal favor from that monarch, and could not be prevailed on to stay for more than a very brief period. He had no sooner, however, arrived in England than he found out his mistake. At first, he lodged with Sir Thomas More, and during his stay with him composed his *Encomium Morie*, or Praise of Folly, the purpose of which is to expose all kinds of fools, but especially those who flourished in the

* This function of the prætor commenced in the earliest times under the kings of Rome, and continued to attach to the office through all the changes which distracted the nation.

church, not sparing the pope himself. For a short time he filled the office of Professor of Greek at Oxford, but on the whole was very scantily supplied with the means of subsistence. In 1514, he returned disappointed to the continent, and resided chiefly at Basel, where he died, 12th July 1536. E.'s extensive and profound learning was equalled by his refined taste and brilliant wit. A natural love of independence and quiet made him prefer a life of learned leisure and retirement to one of greater publicity; nevertheless, the readiness with which he assumed the character of an adroit man of the world, brought upon him the hostility of many of the nobler spirits of his time.

He was no hero, and he knew it. He frankly confesses that 'he had no inclination to die for the sake of the truth.' Luther, in whom the soul and courage of the Apostle Paul seemed to be revived, overwhelmed him with reproaches for his cowardice in regard to the Reformation. But we must not forget that E. by his mental constitution was averse to enthusiasm. He was a scholar and a critic, not a preacher or iconoclast, and he was at least honest enough to abstain from denouncing the opinions of Luther, though he disapproved strongly of his violent language. Besides, there was a tincture of rationalism in the great Dutchman, which probably helped to chill his love of mere Lutheranism. But his services in the cause of science were great and lasting, and his writings are still esteemed for the importance of the subjects treated of, and their classical style. Besides editing several of the ancient authors, and various philological and theological writings, he prepared the earliest edition of the Greek Testament, which appeared at Basel in 1516. This is reckoned by some his greatest work. Michaelis says that perhaps there never existed an abler editor of the New Testament, and that E. possessed in the highest degree natural abilities, profound learning, a readiness in detecting errors, with every qualification that is requisite to produce critical sagacity. His best known work, however, is his *Colloquia*, a master-piece. Of all his writings, this has exercised the greatest influence. The first edition appeared in 1522, but did not please E., who issued a second during the same year. A third appeared in 1524. This book, which was meant, according to Erasmus, only to make youths better Latinists and better men, was condemned by the Sorbonne, prohibited in France, and burned in Spain. No one who takes up the book will wonder at its condemnation. It contains the most virulent and satirical onslaughts on monks, cloister-life, festivals, pilgrimages, &c., but it is distinguished by lewd and unchaste passages, which are wholly inexcusable. The work has been translated into almost all the modern languages. His *Encomium Moria*, or Praise of Folly, has been already mentioned. It was published in the original, with a German translation, and illustrations by Holbein, by W. G. Becker (Basel, 1780). E. himself superintended an edition of his works, published by Frobenius in Basel. The most complete edition is that of Leclerc (10 vols., Leyden, 1603—1606). The life of E. has been written in French by Burigny (2 vols., Paris, 1758), in German by Müller (Hamburg, 1828), and in English by Knight (Cambridge, 1726) and Drummond (2 vols., 1873).

ERASTUS, THOMAS, a learned physician and theologian, was born at Baden in Switzerland, 7th September 1524. His real name was *Lieber*, which, according to the fashion of his times, he translated into Greek. In 1540, he went to the university of Basel, where he studied divinity, philosophy, and literature. He subsequently visited Italy, where he betook himself to medicine, and obtained the degree of M.D. from the university of Bologna. After an absence of nine years, he returned to his own country, and lived for some time at the court of the princes of Henneberg, where he acquired a great reputation as a medical practitioner. The elector palatine, Frederick III., now invited him to his court, and appointed him first physician and counsellor of state. He also conferred on him the chair of physic in the university of Heidelberg. In 1581, he was selected to fill a similar office at Basel, where he died, December 31, 1583, after establishing a liberal foundation for the provision and education of poor students in medicine, which was long called the *Erastian foundation*. Among E.'s medical works may be mentioned his *Disputationum de Medicina Nova Philippi Paracelsi* (Basel, 1572—1573), *Theses de Contagio* (Heidelberg, 1574), and *De Occult. Pharmaco. Potestatis* (Heidelberg, 1574). As a physician, E. is creditably characterized by his distrust of abstract and *a priori* theorizing, and his conviction that experimental investigation is the only road to knowledge. But his fame now rests chiefly on what he wrote in ecclesiastical controversy. In his book *De Cæna Domini*, he contended for the figurative interpretation of the passage, 'This is my body,' &c., and supported this view at the conference held at Maulbronn between the divines of the Palatinate and those of Wittenberg. But his great work is his *Explicatio Questionis Gravissimæ de Excommunicatione*. Although this work was not published till some years after his death, E. had published the same opinions as it contains in the form of theses, directed against Gaspar Olevianus, a refugee from Treves, and various other persons, who

were anxious to confer on ecclesiastical tribunals the power of punishing vices and misdemeanors. E. denied the right of the church to excommunicate, exclude, absolve, censure—in short, to exercise discipline. Denying 'the power of the keys,' he compared a pastor to a professor of any science, who can merely instruct his students; he held that the ordinances of the gospel should be open and free to all, and that penalties being both in their nature and effect *civil* and not *spiritual*, ought to be inflicted only by the civil magistrate. E. formed no *sect*, neither did he wish to do so. His desire was, in fact, of an exactly contrary character—viz., to preserve an external harmony at the expense even of the purity of the visible church. He would have let the wheat and tares grow together until the end of the world. Many eminent men, especially in the Church of England, have shared similar opinions both before and after E., such as Crammer, Redmayn, Cox, Whitgift, Lightfoot, Selden, &c. The term *Erastian* has long been a favorite epithet of reproach in Scotland, but has not been employed with any great precision. All persons who deny the power of an established church to alter her own laws without the consent of the state—as, for example, the law of patronage—are generally accused of *Erastianism*, although the principles of E. have literally nothing to do with such a question. An English translation of the *Explicatio* was published in 1669, and was re-edited by Dr. Robert Lee of Edinburgh in 1845.

ERA'SURE, or RA'ZURE as it is more commonly called in England, from the Latin *rado*, to scrape or shave, is the scraping or shaving of a deed or other formal writing. In England, except in the case of a will, the presumption, in the absence of rebutting evidence, is that the erasure was made at or before execution.—Doe ex dem Tatham v. Gattamore, 17 L. T. Rep 47. 'If an alteration or erasure has been made in any instrument subsequent to its execution, that fact ought to be mentioned (in the Abstract, or epitome of the evidences of ownership), together with the circumstances under which it is done, and more particularly so as a fraudulent alteration by either of those means, if made by the person himself taking under it, would vitiate his interest altogether. It was formerly considered that an alteration, erasure, or interlineation (q. v.), would void the whole instrument, even in those cases where it was made by a stranger; but the law is now otherwise, as it is clearly settled that no alteration made by a stranger will prevent the contents of an instrument from retaining its original effect and operation, where it can be plainly shown what that effect and operation actually was. To accomplish this, the mutilated instrument may be given in evidence as far as its contents appear; and intrinsic evidence will be admitted to show what portions have been altered or erased, and also the words contained in such altered or erased parts; but if, for want of such evidence, or any deficiency or uncertainty arising out of it, the original contents of the instrument cannot be ascertained, then the old rule would become applicable, or, more correctly speaking, the mutilated instrument would become void for uncertainty.'—Hughes's *Practice of Conveyancing*, i. 124, 125. If a will contains any alterations or erasure, the attention of the witnesses ought to be directed to the particular parts in which each alteration occurs, and they ought to place their initials in the margin opposite, before the will is executed, and to notice this having been done by a memorandum, added to the attestation clause at the end of the will (*ib.* p. 945). See also 1 Vict. c. 26. In Scotland, the rule as to erasure is somewhat stricter than in England—the legal inference being that such alterations were made after execution. As to necessary or *bonâ fide* alterations which may be desired by the parties, corrections of clerical errors, and the like, after the deed is written out, but before signature, the rule in Scotland is, that 'the deed must show that they have been advisedly adopted by the party; and this will be effected by mentioning them in the body of the writing. Thus, if some words are erased and others superinduced, you mention that the superinduced words were written on an erasure; if words are simply deleted, that fact is noticed; if words are added, it ought to be on the margin, and such additions signed by the party, with his Christian name on one side, and his surname on the other; and such marginal addition must be noticed in the body of the writ, so as to specify the page on which it occurs, the writer of it, and that it is subscribed by the attesting witnesses.'—Menzies's *Lectures on Conveyancing*, p. 124.

The Roman rule was, that the alterations should be made by the party himself, and a formal clause was introduced into their deeds to this effect, 'Lituras, inductiones, superinductiones, ipse feci.' As a general rule, alterations with the pen are in all cases to be preferred to erasure; and suspicion will be most effectually removed by not obliterating the words altered so completely as to conceal the nature of the correction. 'The worst kind of deletion,' says Lord Stair, 'is when the words deleted cannot be read (but if they are scored that they can be read, it will appear whether they be *de substantialibus*), for if they cannot be read, they will be esteemed to be such, unless the contrary appear by what

precedes and follows, or that there be a marginal note, bearing the deletion, from such a word to such a word, to be of consent.

ERATOSTHENES, an eminent Greek writer, called, on account of his varied erudition, the *Philologist*, was born at Cyrene 276 B.C. Among his teachers were Lysanias the grammarian, and Callimachus the poet. By Ptolemy Euergetes, he was called to Alexandria to superintend his great library. Here he died of voluntary starvation, at the age of 80, having become blind, and wearied of life. As an astronomer, E. holds an eminent rank among ancient astronomers. He measured the obliquity of the ecliptic, and the result at which he arrived—viz., that it was $23^{\circ} 51' 20''$ —must be reckoned a very fair observation, considering the age in which he lived. Hipparchus used it, and so did the celebrated astronomer Ptolemy. An astronomical work which goes under the name of E., but which is certainly not his, is still extant, and is called *Katasterismoi*; it contains an account of the constellations, their fabulous history, and the stars in them. It is believed, however, that E. did draw up a catalogue of the fixed stars, amounting to 675; but it is lost. A letter to Ptolemy, king of Egypt, on the duplication of the cube, is the only complete writing of his that we possess. E.'s greatest claim to distinction, however, is as a geometer. In his attempt to measure the magnitude of the earth, he introduced the method which is used at the present day, and found the circumference of the earth to be 252,000 stadia; which, according to Pliny, is 31,500 Roman miles. But as it is not known *what* stadium E. used, it is possible that he came nearer the actual circumference than the above figures indicate. His work on geography must have been of great value in his times: it was the first truly scientific treatise on the subject. E. worked up into an organic whole the scattered information regarding places and countries related in the books of travels, &c., contained in the Alexandrian Library. He also wrote on moral philosophy, history, grammar, &c. His work on the Old Attic Comedy appears, from the remains which we possess, to have been a learned and very judicious performance. Such fragments of E.'s writings as are still extant have been collected by Bernhardt in his *Eratosthenica* (Berlin, 1822).

ERBIUM (symbol E) is a rare metal, the compounds of which are found in a few scarce minerals, especially in *gadolinite*, obtained from Ytterby, in Sweden. In its compounds and properties it resembles the metal aluminium.

ERCI'LLA Y ZUNIGA, ALONSO, a Spanish poet, was born at Madrid, August 7, 1533. He was the third son of a Spanish jurist, and at an early period became page to the Infanta Don Philip, son of Charles V., accompanying him on his journey through the Netherlands, and some parts of Germany and Italy, and in 1554, to England, on the occasion of the celebration of Philip's nuptials with Queen Mary. Shortly after, E. went with the army dispatched to America to quell the insurrection of the Anacuanians on the coast of Chili. The difficulties with which the Spaniards had to contend, the heroism displayed by the natives in the unequal contest, and the multitude of gallant achievements by which this war was distinguished, suggested to E. the idea of making it the subject of an epic poem. He began his poem on the spot, about the year 1558, occasionally committing his verses, in the absence of paper, to pieces of leather. An unfounded suspicion of his having plotted an insurrection involved him in a painful trial, and he had actually ascended the scaffold before his innocence was proved. Deeply wounded, the brave soldier and poet turned to Spain, but Philip treating him with great coldness and neglect, E. made a tour through France, Italy, Germany, Bohemia, and Hungary. For some time he held the office of chamberlain to the emperor Rudolf II., but in 1580 returned to Madrid, where he in vain exerted himself to realize an independence. The latter years of his life were spent in obscurity and poverty at Madrid, where he died, at what period has not been ascertained. His historic epos, written in the octo-syllabic measure, and entitled *Araucana*, is, with the exception of a few episodes, a faithful description of actual events. Cervantes, in his *Don Quixote*, compares it with the best Italian epics, and it has undoubtedly not a little of the epic style and spirit. The first part is the freshest in character, having been completed before the author's return to Europe, where it was first published separately (Madrid, 1569). The second part appeared nine years later. In it, E. by the introduction of episodes, yielded more to the taste of the time; and this was still more the case in the third part, which was first published, along with the two others, in 1590. In Spain, and likewise in other countries, many reprints of the poem appeared (the most elegant, 2 vols., Madrid, 1776; the most accurate, 2 vols., Madrid, 1828). A continuation was published by Don Diego Santistevan Osorio, of Leon (Salamanca, 1597). A German translation has been published by Winterling (2 vols., Nuremberg, 1831).

ERCKMANN—CHATRIAN (EMILE ERCKMANN and ALEXANDRE CHATRIAN), two French men of letters, the first of whom was born 20th May 1822 at Phalsbourg; the second, 2d December

1826, in the village of Soldatenthal, commune of Abreschwiller, both in what was then the French dep. of Meurthe, but is now re-united to Germany as part of the imperial territory of Alsace-Lorraine. E., the son of a bookseller, went through a rather irregular course of study at the college of his native town, went to Paris in 1842 to study law, which he broke off several times, and only passed his third examination in 1857, and finally abandoned the study in the following year. During the interval, he set himself to make a name in literature, in co-operation with M. Chatrian. The latter, belonging to an old family of glass makers in Meurthe, ruined by reverses in trade, was acting as tutor at the college of Phalsbourg, when, in 1847, he was introduced to M. Erckmann. From that time the two friends employed their pens in the same works, which they signed with the two names united in one; and it was only about 1863 that the authors informed their readers that the numerous works of fiction, which had obtained a widespread popularity, and were supposed by the general public to be the work of a single writer, were the fruits of their friendly collaboration. Their early works attracted comparatively little notice; and it is said that their first work was rejected by all the newspapers of Paris, and by many provincial journals. In 1848, they published several feuilletons in the *Démocrate du Rhin*, which had just been started: *Le Sacrifice d'Abraham*, *Le Bourgmestre en Bouteille*, &c., which they have since published separately. At the same time they wrote a drama, *Le Chasseur des Ruines*, for the Ambigu-Comique, which the theater accepted, subject to changes, which they refused to make. They produced another drama, *L'Alsace en 1814*, for the theater of Strasbourg, which was suppressed by the prefect on the second representation. They wrote numerous novels at this time for different journals, some of which were very little noticed, while others remained in MS. for years. Despairing of being able to live by their pens, E. recommenced his law studies, and C. obtained a situation in the office of the Eastern Railway. It was not till 1859 that *L'Illustre Docteur Mathéus* (1859, in-18; 3d edition, 1864), published by the Librairie-Nonvelle, gave a certain éclat to the collective name of Erckmann-Chatrian. *Le Pou Yégo* (1862, in-18) is one of a series of novels, the subjects of which are taken from their national history, and gives a picture of the invasion of 1814. *Le Conserier de 1813* (1864) and *Waterloo* (1865) are fragments of an autobiography, and are supposed to be the recollections of a common soldier, and relate the disastrous campaigns of 1813 and 1814. These may be called the gems of their collection. *Le Joueur de Clarinette* (1863), a simple story of a village musician, and *Les Amoureux de Catharine*, another tale of village life in the same volume, are nearly perfect. *L'Homme du Peuple* appeared in 1865, and is less favorably spoken of as a work of art. It pictures the life of the modern French workman.

In 1866 appeared *La Maison Forestière*, and *La Guerre*; in 1867, *Le Blocus*, which has been translated under the title, *The Blockade of Phalsbourg*; a historical romance in 1868, *Histoire d'un Paysan*; in 1869, *Le Juif Polonais*, a play. Later works are *The Story of the Plébiscite by one of the 7,500,000 who voted Yes* (trans. in *Cornhill Magazine*, 1871—1872); and *Brigadier Frederic: a Story of an Alsatian Exile* (Eng. trans. 1875). The drama *Les Rantzau* was produced in 1882; and *La Taverne des Trabans* is a libretto set to music.

EREBUS—the name of one of the sons of Chaos—signifies darkness, and is used specially to denote the dark and gloomy cavern beneath the earth, through which the shades pass in going to Hades.

ERECHTHEUS or ERICHTHO'NIUS, AND ERECHTHE'UM. Erechtheus, an Attic hero, is said to have been the son of Hephaestus and the Earth, and to have been reared by Athena. One form of the tradition states that when a child he was placed by Athena in a chest, which was intrusted to Agraulos, Pandrosos, and Herse, the daughters of Cecrops, with the strict charge that it was not to be opened. Agraulos and Herse, however, unable to restrain their curiosity, opened the chest, and discovering a child entwined with serpents, they were seized with madness, and threw themselves down the most precipitous part of the Acropolis. Afterwards Erechtheus was the chief means of establishing the worship of Athena in Attica. He is regarded as the founder of the Erechtheum, the temple of Athena Polias, guardian of the city. This original Erechtheum, which contained Erechtheus's tomb after his death, and which was called by his name, was burned by the Persians, but a new and magnificent temple was raised upon the same site—north of the Parthenon, and near the northern wall of the Acropolis—in the beginning of the 4th c. B.C. The second Erechtheum was a splendid structure of the Ionic order, of an oblong shape, extending from east to west, abutting in side chambers at the western end, towards the north and south, and having porticoes adorned with columns at its eastern, its northern, and southern extremities. It is now a complete ruin.

ERECTION, LORDS OF, those of the nobility in Scotland to whom the king, after the Reformation, granted lands, or tithes, which formerly belonged to the church. They were also called *Titulars of Tithes*; the gifts being by no means confined to the nobility. These titulars had the same rights to erected benefices, both in lands and tithes, which had formerly belonged to the monasteries and other religious houses. The grants were made under the burden of providing competent stipends to the reformed clergy—an obligation which was very little attended to by the grantees, prior to the decrees arbitral of Charles I., in 1629. Ersk. B. ii. tit. 10, s. 18.

EREMACAU'SIS (Gr. *erema*, gently, and *kausis*, combustion) is a term originally proposed by Liebig to indicate the slow process of combustion at ordinary temperatures, which ensues when organic compounds, such as wood, are left exposed to the air, and gradually rot away or decay. The process consists in the oxygen (O) of the air combining with the hydrogen (H) of the wood forming water (HO), and in less quantity with the carbon (C) forming carbonic acid (CO₂), leaving a brown mould or powder, called by chemists *ulmin*, or *humus*, in which carbon preponderates.

ERFURT, a city of Prussian Saxony, anciently capital of Thuringia, stands in a highly cultivated plain, on the right bank of the Gera, 14 miles west of Weimar. Till 1873 E. was strongly fortified, and was accounted a fortress of the second rank. Its two citadels, the Petersberg and the Cyriaksburg, were both formerly monasteries. Among the numerous churches, the cathedral and the Church of St. Severus are the finest. The cathedral is one of the most venerable Gothic buildings in Germany, and possesses, besides a very rich portal, sculptures dating from the 11th to the 16th century. Of the convents, only that of the Ursuline nuns remains. The monastery of St. Augustine, famous as the residence of Luther, whose cell was destroyed by fire in 1872, was converted in the year 1820 into an asylum for deserted children. The other remarkable buildings are, the university, founded in 1378, and suppressed in 1816; the royal academy; the library, containing 60,000 volumes; numerous educational establishments, infirmaries, &c. Pop. (1871) 43,616; (1880) 53,254. Horticulture and an extensive trade in seeds are carried on. The principal manufactures are woollen, silk, cotton, and linen goods, yarn, shoes, stockings, tobacco, leather, &c.

E. is said to have been founded in the beginning of the 5th c. by one Erpes, from whom it took its original name of Erpesford. During the middle ages, at the time of its highest prosperity, E. was strongly fortified, and contained 60,000 inhabitants. In 740, St. Boniface founded a bishopric at E., and in the year 805 it was converted into an entrepôt of commerce by Charlemagne. It afterwards belonged to the Hanse-league, then to the elector of Mainz, from 1801—1806 to Prussia, and from that time until 1813 it was under French rule. E. was finally restored to Prussia by the Congress of Vienna. In the spring of 1850, the parliament of the states, which had combined together for union, held its sittings at Erfurt.

ERGOT, a diseased condition of the germen of grasses, sometimes also observed in some of the *Cyperaceæ*. It begins to show itself when the germen is young; different parts of the flower assume a mildewed appearance, and become covered with a white coating composed of a multitude of minute spore-like bodies mixed with delicate cobweb-like filaments; a sweet fluid, at first limpid, afterwards viscid and yellowish, is exuded; the anthers and stigmas become cemented together; the ovule swells till it greatly exceeds the size of the proper seed, bursts its integuments, and becomes elongated and frequently curved, often carries on its apex a cap formed of the agglutinated anthers and stigmas, and assumes a gray, brown, purple, violet, and at length a black color, as the viscid exudation dries and hardens. The structure differs very much from that of the properly developed seed; the qualities are not less different, almost one-half of the whole substance consists of *fungin*; and the cells contain, instead of starch, globules of a peculiar fixed oil—**OIL OF ERGOT**, to which the remarkable qualities of ergot are supposed to be chiefly or entirely due.

Oil of ergot forms about 35 per cent. of the ergot of rye. Ergot appears to have been first observed in rye, in which it becomes very conspicuous from the large size it attains, sometimes an inch or even an inch and a half in length. It is however, not uncommon in wheat and barley, although in them it is not so conspicuous, from its general resemblance to the ordinary ripened grain. Rye-grass is often affected with ergot, as are many other grasses; and it is of frequent occurrence in maize, in which also it attains its greatest size. Ergot has been supposed to be merely a disease occasioned by wet seasons or other climatic causes. But it appears now to be fully ascertained, that it is a disease occasioned by the presence of the *mycelium* of a fungus; the spores of which may perhaps be carried to the flower through the juices of the plant, for there is reason to think that ergot in a field of grain may be produced by infected seed. Mr. Quekett, in 1838, de-

scribed a fungus, a kind of MOULD (q. v.), which he found in Ergot, and to which he gave the name of *Ergotia abortifaciens*. Link and Berkeley afterwards referred it to the genus *Oidium*; and they, as well as others, believed it to be the true ergot



Ergot of Rye.

fungus. The spores of this ergot mould, however, vegetate readily, under proper conditions of warmth and moisture, in situations very different from that in which ergot is produced; and its presence is perhaps a consequence rather than the cause of ergot. The true ergot fungus seems to have been discovered by Tulasne, who published a description of it in 1853. That of the ergot of rye is called *Cordiceps* (or *Claviceps*) *purpurea*; its mycelium alone exists in ergot, but if the ergoted grains are sown, the fungus develops itself in its perfect form, growing in little tufts from the surface of the ergot, with stem about half an inch long, and sub-globular head. Allied species appear to produce the ergot of other grasses.

Ergot is inflammable; the fixed oil, which it contains, indeed, makes it burn readily if brought in contact with the flame of a candle. It is a valuable medicine, exercising a specific action on the womb, particularly during labor, and by the greater frequency and force of the contractions which it causes when cautiously administered, often most beneficially hastening delivery. Its employment for this purpose is said to have originated—in consequence, probably, of an accidental discovery—with a provincial female practitioner in France. Its introduction into British practice dates only from 1824.

It is the ergot of rye which is always employed; also called **SPURRED RYE**, or *Secale cornutum*. It has been employed also as a sedative of the circulation, to check various kinds of hæmorrhage. Ergot is administered in various forms—powder, decoction, extract, tincture, oil of ergot, &c.—In large or frequent doses, ergot is a poison, sometimes producing convulsions, followed by death; sometimes gangrene of the extremities, resulting in mutilation or in death.

Ergot of rye consists of 35 per cent. of a peculiar fixed oil, 14 of ergotin, 46 of fungin, the remainder being gum, fat, albumen, salts, &c. Ergot burns with a yellow-white flame, and treated with water, yields a reddish colored liquid with acid properties. In considerable quantities, it is a poison to the lower animals as well as to man.

ERGOTISM, the constitutional effect of Ergot of Rye (q. v.). See also **RAPHANIA**.

ERIC is the Scandinavian form of the name Henricus, Enrico, and Henry of southern nations. Many kings of the name reigned separately in Denmark and Sweden, and some ruled over the whole of Scandinavia after the union of Calmar. The memory of the two earliest rulers of the name in Denmark merits our notice from their association with the introduction of Christianity. Eric I., who died in 860, protected the Christians in the latter part of his reign, and, under the direction of the missionary Ansgar or Ansharius, founded the cathedral of Ribe, the first Christian church in the land. In his time, the Northmen began those incursions into more southern countries, which were destined to exercise so permanent an influence on European history. Eric II. followed in the steps of his father, and permitted Ansgar to prosecute the labor of converting and civilizing the people, which won for him the title of the Tutelar Saint of the North. To Eric II. is ascribed the reorganization of those guilds which finally merged in the municipal corporations of the middle ages, but which were, at first, a mere modification of the heathen brotherhoods of the Scandinavian heroic ages, and constituted associations, whose members were a privileged class, separated by distinct laws, rights,

and duties from the rest of the people. Denmark suffered in the 12th c. in an equal degree from the Erics who ruled over her, for while Eric, surnamed Emun, exhausted the strength of the land by the indomitable pertinacity with which he endeavored, by force of arms, to compel the Vandals and other piratical neighbors to accept the Christianity which he thrust upon them, Eric 'the Lamb' crippled the powers and resources of the crown by his pusillanimous subserviency to the clergy. The three Erics (Eric VI., VII., and VIII.) who occupied the throne, with only the intermission of a few years, from 1241 to 1319, are associated with one of the most disastrous periods of Danish history.

Long minorities, the suicidal practice of dismembering the crown-lands in favor of younger branches of the royal house, and futile attempts to restrain the ever-increasing encroachments of the church, combined to bring the country to the brink of destruction. Eric VI. (Plogpenning) and Eric VII. (Glipping) were both assassinated, the former at the instigation of a brother, and the latter in revenge for a private injury. Eric VIII., the last of the name before the union of Calmar, died childless, and was succeeded, in 1319, by his ambitious brother, Christopher, who saw himself compelled to repay his partisans at the expense of almost all the prerogatives and appanages which still belonged to the crown.

In Sweden, the first of the name who merits our notice is King Eric, surnamed the Saint, who was slain in battle in 1161, after a short reign, which was signalized, in that age of anarchy, by the foundation of many churches and monasteries, and by the promulgation of an excellent code of laws, known as *St. Eric's Lag*. This law contained provisions by which a higher status in society was secured to women, by granting them a fixed proportion of the heritage of their male relatives, and certain definite privileges within their households. St. Eric waged frequent war with the Finns, and compelled them to adopt the outward forms of Christianity. The two namesakes and descendants of St. Eric, who ruled in Sweden during the 13th c., and Eric XII., who reigned from 1350 to 1359, have little claim to our notice, for internal disturbances and wars with their neighbors brought about the same fatal results as those which are associated with the reigns of the Erics in Denmark during the middle ages. In 1412, on the death of the great Margaret, her relative, Eric of Pomerania, succeeded to the triple crown of Scandinavia, in accordance with the articles of the famous treaty of Calmar. The noble heritage that had been bequeathed to Eric required a firmer hand and a braver spirit than his to keep in check; and his reckless disregard of treaties and oaths, his neglect of his duties, and his misdirected ambition, led, after years of dissensions, maladministration, and disaffection, to the inevitable result that Eric was declared to have forfeited the respective thrones of the several kingdoms, which proceeded to elect rulers of their own. The intestine wars to which this condition of things gave rise, plunged the whole of Scandinavia into anarchy, and sowed seeds of dissension among the three kindred nations, which bore fatal fruits in subsequent ages. The last ten years of Eric's life were spent in the exercise of piracy in the island of Gothland, whither he had retired with his mistress and a band of followers, and from whence he sent forth piratical expeditions to pillage both friends and foes. Eric married Philippa, daughter of Henry IV. of England, whose memory is still cherished in the north, on account of the many noble deeds with which local tradition associates her name.

Eric XIV., the last of the name who reigned in Sweden, had the distinction of being at once one of the worst and one of the most unhappy of the name. He succeeded, in 1560, to the throne of his father, Gustaf Vasa, who was perhaps the greatest and worthiest monarch that ever reigned over Sweden, and immediately on his accession, he made known the difference that was so unfavorably to distinguish his reign from that of his father, by quarrelling with his brothers, thwarting the nobles, and opposing the lower orders. His fickleness and extravagance were displayed in a succession of embassies, which were in turn sent to almost every European court to demand a consort for this vacillating monarch, who usually changed his mind before his envoys had time to fulfil their missions. Elizabeth of England and Mary of Scotland were more than once the objects of his matrimonial schemes; but when the resources of the country had been seriously crippled by these costly and absurd expeditions, Eric married a Swedish peasant-girl, who ultimately acquired an influence over him which was ascribed by the superstitious to witchcraft, since she alone was able to control him in the violent paroxysms of blind fury to which he was subject. It is probable that Eric labored under remittent attacks of insanity, and that to this cause may be attributed the blood-thirsty cruelty with which he persecuted those of his own relatives or attendants who fell under his suspicion. His capricious cruelties at length alienated the minds of his subjects, who, wearied with the continuous wars and disturbances in which his evil passions involved them, threw off their allegiance in 1568, and solemnly elected his brother John to the throne. For nine years, the unhappy Eric suffered every indignity at the hands of the keepers appointed by his brother to guard him, and in 1577, he

was compelled to terminate his miserable existence by swallowing poison, in obedience to his brother's orders. Singular to say, this half madman was a person of cultivated understanding, and he solaced his captivity with music and the composition of psalms, and in keeping a voluminous journal.

ERICÆ, or ERICA'CEÆ, a natural order of exogenous plants, consisting chiefly of small shrubs, but containing also some trees. The leaves are opposite or in whorls, entire, destitute of stipules, often small, generally evergreen and rigid. The flowers are sometimes solitary in the axils of the leaves, sometimes grouped in different modes of inflorescence, and are often of great beauty, in which respect no order of plants excels this; the beauty of the smallest species, and of those which have very small flowers, rivaling that of others which are trees profusely covered with magnificent clusters. About 900 species of this order are known, of which the greater number are natives of South Africa, which particularly abounds in the genus *Erica*, and its allies—the true Heaths (q. v.)—although some of them are also found to the utmost limits of northern vegetation. They are rare within the tropics, and only occur at considerable elevations. Few species are found in Australia.

Many of the E. are *social* plants, and a single species sometimes covers great tracts, constituting their principal vegetation. This is most strikingly exemplified in the heaths of Europe and the North of Asia. Medicinal properties exist in some of the E., as the BEARBERRY (see ARBUTUS), and the GROUND LAUREL of North America (*Epigæa repens*), a popular remedy in the United States for affections of the bowels and urinary organs. Narcotic and poisonous qualities are of not unfrequent occurrence. See ANDROMEDA, AZALEA, KALMIA, LEDUM, RHODODENDRON. The berries of some species are edible (see ARBUTUS and GAULTHERIA), although none are much esteemed.—The RHODODENDREÆ have sometimes been regarded as a distinct order, but are generally considered a suborder of E., containing the genera *Rhododendron*, *Azalea*, *Kalmia*, *Ledum*, &c. The larger leaves and flowers, and generally also the larger plants of the order, belong to this suborder; which, however, contains also many small shrubs of subarctic and elevated mountainous regions.

E'RICHT or E'RROCHT, LOCH, lies in the north-west of Perthshire and south of Inverness-shire, in an uninhabited district, the wildest and most inaccessible in Scotland, amid the Grampian mountains. Its banks rise steeply from the water's edge. It is fourteen miles long and nearly one mile broad, and it extends in a south-west direction from near Dalwhinnie on the Dunkeld and Inverness road. By one outlet it joins Loch Rannoch, and by another it runs into Loch Lydoch, its waters ultimately reaching the Tay. Its surface is about 1500 feet above the sea, and it never freezes. In a cave at the south end of the loch, Prince Charles lay hid in 1746.

ERICSSON, JOHN, a distinguished engineer, was born in Sweden in 1803. After serving for some time as an officer of engineers in the Swedish army, he removed in 1826 to England, and continued to occupy himself with improvements chiefly on steam machinery and its applications. It is to E. that steam navigation owes the Screw-propeller (q. v.). In 1839 he went to New York, United States, where he brought out his improved Caloric Engine (q. v.), a hydrostatic gauge, a pyrometer, a new sea-lead, and other mechanical novelties. He constructed the iron-clad *Monitor* (see TURRET-SHIP), and other vessels for the American navy.

E'RIE, one of the five great lakes which empty themselves by the St. Lawrence, separates Upper Canada on its left from Michigan, Ohio, Pennsylvania, and New York on its right. It is the most southern of the five, receiving at its south-western extremity the waters of Lakes Superior, Michigan and Huron by the river Detroit, and discharging them at its north-east by the Niagara into Lake Ontario. With a length of 240 miles, E. has a breadth varying from 30 to nearly 60 miles, with an area of 9600 square miles. It is 16 feet below the Huron, and 233 and 565 respectively above the Ontario and the Atlantic. At its south-western extremity are several wooded and partly cultivated islands, the largest of which is about 14 miles in circumference. It is by far the shallowest of the five great lakes. Its mean depth is stated at 120 feet; and from this comparative shallowness and the consequent liability to a heavy ground-swell, as well as on account of the small number of good harbors, the navigation is peculiarly difficult and dangerous. The chief harbors on the south, or United States shore, besides the natural harbor of Erie itself or Presque Isle, are those of Cleveland, Sandusky City, and Toledo; and on the north or Canadian shore, Ports Dover, Burwell, and Stanley. Lake E. receives no rivers of any consequence. Its commercial importance, however, has been largely increased by art. It is connected by one canal with the Hudson, and by more than one with the Ohio; while, on the British side, it communicates with the Ontario by means of a still more available work, the ship-channel of the Welland. Its navigation generally closes at the beginning of December, and the lake remains more

or less frozen till March or April. The commercial importance of this lake has been greatly enhanced the last few years by the establishment of numerous lines of railway connecting its ports with the interior. The amount of traffic on the lake and on these railways is enormous. Lake E. was the scene of a naval engagement between the British and Americans, September 10, 1813, in which the latter were victorious.

ERIE, a port on the lake of its own name in the state of Pennsylvania, stands in lat. $42^{\circ} 8' N.$, and long. $80^{\circ} 10' W.$ Its harbor, one of the largest and best on the coast, is formed by an island of four miles in length, which, under the appellation of Presque Isle, still preserves the memory of its having been a peninsula. The belt of water, which is thus sheltered, is known as Presque Isle Bay, and forms a natural harbor for the city. It is now protected by a breakwater. It is $3\frac{1}{2}$ miles long, and 1 mile wide, and varies in depth from 9 to 25 feet. While much has been done to improve the natural advantages of its position, E. has been connected by means of a canal with the Beaver, a feeder of the Ohio; and this work, independently of its navigable facilities, affords extensive water-power to mills of different kinds. It is the terminus of the Philadelphia and Erie Railway, and is by other lines connected with New York, Cleveland, &c. This port is destined to become an important center of trade. Pop. (1870) 19,646; (1880) 27,730.

ERI'GENA, JOANNES SCOTUS, a famous philosopher of the middle ages, was born probably in Ireland, and flourished during the 9th century. Very little is known regarding his history. He appears to have resided principally in France, at the court of Charles the Bald. In the controversies of his time, regarding predestination and transubstantiation, he took part. His philosophic opinions were those of a Neo-Platonist rather than of a scholastic. His love for the mystic doctrines of the old Alexandrian philosophers was shown by his translation of the writings ascribed to Dionysius the Areopagite, which proved to be a well-spring of mysticism during the middle ages. E. held that God is the essential ground of all things, from whom all things emanate, and into whom they return again. Pantheism, therefore, lurks in his system. His principal work is *De Divisione Naturæ* (published by Gale, Oxford, 1681). One of its leading thoughts is the identity of philosophy and religion, when both are properly apprehended. E. uttered his opinions with great boldness, and he exhibited no less subtlety and strength of intellect in their defence. He expressed his contempt for theological dogmatism, and vindicated the authority of reason over all other authority. His words are: 'Authority is derived from reason, and not reason from authority; and when the former is not confirmed by the latter, it possesses no value.' Consult Hjort's *Joh. E.* (Copenh. 1823); Staudenmayer, *Joh. E.* (Frankfurt, 1834); and Taillandier, *Scot. E. et la Philosophie Scholastique* (Strasb. 1843); Möller *Scotus E.* (1844); Christlieb *Leben und Lehre des Scotus E.* (1861); and Huber, *Johannes E.* (1861).

ERI'GERON, a genus of plants of the natural order *Compositæ*, suborder *Corymbifera*, having heads (flowers) of many florets, the florets of the ray numerous, in several rows, of a different color from those of the disc. Two or three species are natives of Britain, the most common of which, *E. aeris*, has a stem 16—18 inches high, narrow entire leaves, flower-stalks forming a kind of corymb, flowers with yellow disc and pale-blue ray. It has a powerful odor, which is said to keep away fleas, and the name FLEA-BANE is sometimes given to the plant. Its ashes contain about 5 per cent. of potash, for the sake of which it is sometimes collected and burned. *E. Philadelphicum*, a native of North America, with pale-purple ray, and a fetid smell, is valued in the United States as a diuretic.

ERINA'CEUS and ERINACE'ADÆ. See HEDGEHOG.

ERI'NNA, a Greek poetess, concerning the date of whose birth the most different statements are advanced. According to some, she was the intimate friend of Sappho (hence she is likewise called the Lesbian singer), and was born at Rhodes, or on the little island of Telos, situated west of Rhodes; while others maintain that she lived in the age of Demosthenes; and others again, perplexed by such a wide difference in point of time, have recourse to the hypothesis of two poetesses of this name. E. acquired such celebrity by her epic, epigrammatic, and lyric poems, that her verses were compared with those of Homer, although she died at the early age of 19. The genuineness of the fragments that still exist under her name, has been disputed on good grounds. These have been collected by Schneidewin in the *Delectus Poesis Græcæ Elegiacæ* (Göttingen, 1838). Compare Matzow *De Erinne Lesbæ vita et Reliquiis* (Petersburg, 1836).

ERIOBO'TRYA. See LOQUAT.

ERIOCAULA'CEÆ, a natural order of endogenous plants, nearly allied to *Restiaceæ*, and containing about 200 known species,

many of which are aquatic or marsh plants. The E. are chiefly natives of the tropical parts of America and Australia. One species, *Eriocaulon septangulare*, JOINTED PIPEWORT, is found in the west of Ireland, and in some of the Hebrides; a little-grass-like plant, growing in lakes which have a muddy bottom, and exhibiting small globular heads of flowers. From its botanical affinities, and with reference to geographical distribution, no British plant is more interesting. The E. form a remarkable feature of the vegetation of some parts of South America; but many of the species bear little resemblance to their humble northern congener, being almost shrubby, 4—6 feet high, with leafy, much-branched stems, 'each branchlet terminated by a large white ball, composed of a vast number of smaller heads, placed on peduncles of unequal length.' Many of them also grow on arid mountainous regions; others in flat sandy grounds, which are flooded in the wet season.—Gardner's *Travels in Brazil*.

ERIODE'NDRON, a genus of trees of the natural order *Sterculiaceæ*, natives of tropical countries, the thick woody capsules of which contain a kind of wool surrounding the seeds. These trees are therefore sometimes called WOOL-TREES. The wool of *E. Samanna* is used in Brazil for stuffing pillows. *E. anfractuosum*, of which one variety, found in the East Indies, is sometimes called *E. Indicum*, and another found in Africa, *E. Guineense*, is a tree of great height, 150 feet or more. The African variety or species is called RIMI and BENTANG. Park mentions it by the latter name. Barth says it is generally to be seen growing near the principal gate of large towns in Hansa. Its wool is soft and spongy, chiefly used for making canoes. The seeds of *E. Indicum* are eaten in Celebes. They are roundish, and of the size of peas. The trees of this genus have palmate leaves. The flowers are large and beautiful.

ERIWA'N (Persian, *Rewan*), the fortified capital of Russian Armenia, situated to the north of Ararat, in the elevated plain of Aras or Araxes, lat. $40^{\circ} 10' N.$, long. $44^{\circ} 32' E.$, 3312 feet above the level of the sea. It consists of the town, properly so called, and the fortress, which is surrounded on three sides by high walls, and provided with aqueducts; a stone bridge over the Zengra, which here falls into the Araxes; a barracks, three mosques, one of which has been converted into a Russian church, the palace of the Sardar, and a bazaar. Pop. (1880) 15,040, who are engaged in agriculture and commerce. E. was formerly the capital of the Persian province of Aran, celebrated for its silk.

In the beginning of the 16th c., the khan Rewan, at the command of Ismael, the shah of Persia, erected a strong fortress, which he called after his own name. An Armenian school was established at E. in 1629, but transferred to Ejmiadzin in 1631. During the last war between Russia and Persia, E. was stormed by the Russian general, Paskewitsch, who received the surname of Eriwanski; and by the treaty of peace concluded at Turkmanjai, 22d February 1828, it was given up by Persia to Russia, along with the province of the same name. It is now an important Russian post, as in former times it formed the bulwark of Persia against the Turks, and afterwards against Russia. In the year 1840, it was much devastated by an earthquake.

ER'LANGEN, a town of Bavaria, is situated in the midst of a well cultivated district, on the right bank of the Regnitz, 10 miles north of Nürnberg. It is a handsome town, and is surrounded by walls pierced by seven gates; its streets—a great number of which were erected after the year 1706, when a fire consumed a large portion of the town—are straight and regular. It is divided into the Old and New Towns, the latter founded in 1686 by Christian, markgraf of Bayreuth. E. is the seat of a university, of a gymnasium, of agricultural and industrial schools, and other institutions. The university, however, is the chief building. It was founded in 1742, and is celebrated as a school of Protestant theology, is attended by between 400 and 500 students, has a library containing 140,000 vols. and 1000 manuscripts, and also zoological and mineralogical collections, &c. E. owes its prosperity to the migration thither of a number of refugees from France, who were compelled to flee on the revocation of the Edict of Nantes, and who introduced many new branches of manufacture at Erlangen. Besides



Jointed Pipewort (*Eriocaulon septangulare*); a, tuft of leaves, flower-stalk with flowers, and part of creeping root; b, seed; c, bract or scale; d, female flower; e, pistil; f, male flower.

its extensive stocking and glove manufactories, which provide the greater part of Germany with their goods. E. has great mirror and tobacco factories, and manufactures of combs and horn-ware. E. became a Bavarian possession by the treaty of 1809. Pop. (1880) 14,876.

ERLAU (Hung. *Eger*), an episcopal city of Hungary, in the county of Heves, of which it is capital, is situated on both banks of the river Erlau, in a delightful valley skirted with vine-clad hills. It is surrounded by old walls, pierced by six gates; has four suburbs, in which the greater portion of the inhabitants dwell; and although in general its streets are narrow and have a neglected appearance, it is rich in fine public buildings. The principal of these are the Lyceum, with a valuable library, and an observatory 172 feet high; the recently built cathedral, the episcopal palace, the Franciscan and the Minorite monasteries, a richly embellished Greek church, a county hall, and the new barracks. E. has also a gymnasium, an episcopal seminary, a normal and drawing school, a hospital founded in 1730, which possesses a capital of nearly 400,000 guilders, and other important institutions.

The two baths, the *Turkenbad* and the *Bischofsbad*, both of which are much resorted to during the bathing-season, are supplied from two warm springs which rise from the bank of the Erlau. The cultivation of the vine is the principal occupation of the inhabitants. The E. wine, the best red wine of Hungary, is produced in considerable quantities, and is in request even in foreign countries. There are also manufactures of linens, woollens, hats, &c., and an important weekly market, which has a beneficial effect upon the industry of the town. Pop. (1880) 20,669, most of whom are Roman Catholics in religion, and Magyar in race. E. owes its importance to the very old bishopric founded here by St. Stephen in the beginning of the 11th c., and which, in 1804, was raised to an archbishopric.

ERLKÖNIG, in German, is the name applied to a poetical, personified, natural power which, according to German poetical authorities, prepares mischief and ruin for men, and especially for children, through delusive seductions. The name, not connected with the root *erle*, is synonymous with *Elfen König*. The E. was introduced into German poetry from the Sagas of the North, through Herder's translation of the *Erlekönig's Daughter* from the Danish, and has become universally known through Goethe's ballad of the *Erlekönig*.

ERMENONVILLE, a village in the south-east of the department of Oise, in France, in the possession of the Girardin family. It is celebrated for its beautiful and extensive parks, and as being the resting-place of Rousseau, for which reason it is much visited in summer by strangers from Paris. It was also the residence of Gabrielle d'Estrées, the mistress of Henry IV., who inhabited a hunting-tower, part of which is still standing, and bears her name. It became still more celebrated after the death of Rousseau in 1788. During the revolution, his ashes were removed to the Pantheon,

but conveyed back to E. after the restoration. It had nearly been purchased by the *Bande Noire*, but a larger sum was offered by Stanislaus de Girardin, the well-known liberal deputy, and E. was preserved for the lovers of art, of nature, and of historical monuments.

ERMINE, white fur, with black spots; the reverse of which, or a black fur with white spots, also used in heraldry, is called *Contre Ermine*.

Ermine is commonly used to difference the arms of any member of a family who is connected with the law. A cross composed of four ermine spots is said to be a Cross Ermine.

ERMINE, or **STOAT** (*Mustela erminea*), a species of Weasel



Ermine:—Summer and winter dress.

(q. v.), considerably larger than the common weasel, but much resembling it in general form and other characters, as well as in

habits. The E. is almost ten inches in length, exclusive of the tail, which is fully four inches and a half long. It is of a pale reddish-brown color in summer, the under parts yellowish-white, the tip of the tail black; in winter—in cold countries or severe seasons—the upper parts change to a yellowish-white or almost pure white, the tip of the tail, however, *always* remaining black. This change takes place more frequently in the northern than in the southern parts of Britain, but sometimes even in the south of England; and when it is only partially accomplished, the animal presents a piebald appearance, and very often remains so during the milder winters of Britain. It is in its winter dress that it is called E., and yields a highly valued fur; more valuable, however, when obtained from the coldest northern regions than from more southern and temperate countries. In its summer dress it is called Stoat. It displays indomitable perseverance in the pursuit of its prey, which consists very much of rats, water-voles, and other such small quadrupeds; with young hares and rabbits, grouse, partridges, &c. The eggs of birds are as welcome to it as the birds themselves. The E. is a native of all the northern parts of the world. Its range extends even to the south of Europe. It delights in moorish districts, and is tolerably abundant in the north of Scotland. It is from Norway, Lapland, Siberia, and the Hudson's Bay territories that the E. skins of commerce are obtained, which are used not only for ladies' winter garments, but for the robes of kings and nobles, and for their crowns and coronets. E. has thus obtained a distinct recognition in heraldry. In making up E. fur, the tails are inserted in a regular manner, so that their rich black shall contrast with the pure white of the rest of the fur.

ERNE (*Haliaeetus*), a genus of birds of the family *Falconidae*, and of the eagle group; differing from the true eagles in the greater length of the bill, in the toes and lower part of the tarsi



Common Erne (*Haliaeetus albicilla*).

being destitute of feathers, and generally, also, in frequenting the sea-coast and the banks of lakes and rivers to feed on fish, in feeding like vultures on carrion almost as readily as on newly killed prey, and in inferior courage. The only British species is the **COMMON E.** (*H. albicilla*), also known as the Sea Eagle or White-tailed Sea Eagle. It is much more common in Britain than the Golden Eagle, is sometimes seen even in the south of England and in inland districts, occasionally visiting deer-parks to prey on very young fawns or to devour dead deer; but is of more frequent occurrence in the north of Scotland, doing considerable injury to flocks in Sutherlandshire, particularly during the season of young lambs. Its favorite haunts, where it roosts and makes its nest, are the shelves and ledges of stupendous precipices on the coast, where its scream often mingles with the noise of the perpetual surge. It sometimes also breeds on crags beside inland lakes, as at the Lakes of Killarney, and more rarely even on trees. Fishes are certainly its favorite food, although its mode of procuring them is not well known; but water-fowl are also its very frequent prey. It is found in most parts of Europe, and even in the islands of the Mediterranean, but is more abundant in the north of Europe and in Siberia. It is not known as a native of America. In size, the E. is inferior to the Golden Eagle, being seldom more than 33 inches in its whole length. The general color of the plumage is brown, the head having a paler yellowish tinge, the tail in the adult bird is pure white. The young, sometimes called the Cinereous Eagle, has a grayer plumage and mottled tail.—Another notable species of this genus is the **WHITE-HEADED E.** (*H. leucocephalus*) of America, and also called the White-headed Eagle, Bald Eagle, and Sea Eagle, the chosen symbol of the United States. It is a bird of about the same size with the Common E., with dark-brown plumage, and—in an adult

state—the head, neck, tail, and belly white. It is found in almost all parts of North America, visiting the arctic regions in summer, but abounding chiefly in the southern states between the Atlantic and the Mississippi. It frequents both the sea-coast and the lakes and rivers, and may be often seen sailing through the column of spray at the Falls of Niagara. It is very fond of fish, which it procures by wading in shallow streams, and also by compelling the osprey to relinquish prey just taken. The soaring and evolutions of the birds in the air on such occasions are described as sublime. The White-headed E. feeds also on lambs, fawns, poultry, &c.; kills swans, geese, and other water-fowl; and does not disdain to compel vultures to disgorge for its use the carrion which they have swallowed.

On account of its habits and dispositions, Franklin expressed his regret that it had been chosen as the symbol of his country.—More nearly resembling the Common E. is another North American species, the BIRD OF WASHINGTON (*H. Washingtonii*).—Australia produces a beautiful species (*H. leucogaster*), and numerous species are found in other parts of the world, amongst which are some of comparatively small size, as the PONDICHERRY KITE or BRAHMANY KITE (*H. ponticerianus*) of India, which is constantly to be seen fishing like a gull in the rivers of that country, and is by the Hindus considered sacred to Vishnu.

ERNE, a river and lake in the south-west of Ulster province, Ireland. The river rises in the south of Cavan county, in the small but beautiful Lough Cowna. It runs north and north-west, merging in Lough Oughter, in Cavan county, and in Lough Erne in Fermanagh county, and passes Enniskillen and Ballyshannon. It then flows through the south corner of Donegal county into Donegal Bay. It has a total course of 72 miles. On the river, at Ballyshannon, is a salmon-leap fall, over a rocky ledge 20 feet high and 150 yards broad, and the river leaps over another rocky ledge near Beleek, 2½ miles below the lower end of the loch. Lough Erne, one of the finest lochs in the kingdom, is the most attractive feature of Fermanagh county, which it bisects lengthways, and almost entirely drains. It extends 40 miles from south-east to north-west, and consists of two lakes, the upper and lower, joined by a narrower part 10 miles long, and assuming in parts the character of a river, with Enniskillen midway between the two lakes. The Upper Lough is 12 by 4 miles in extent, 10 to 75 feet deep, 151 feet above the sea, and has 90 green hilly islets. The Lower Lough is 20 by 7½ miles in extent, 100 to 266 feet deep, 148 feet above the sea, and has 109 similar islets. On one of the islets is a round tower. They contain salmon, trout, pike, bream, and eels. The scenery around is singularly varied and beautiful.

ERNE'ST, JOH. AUG., the founder of a new school of theology and philosophy, was born at Tennstädt, in Thuringia, 4th August 1707. He studied at Pforta, Wittenberg, and Leipzig; but after having been appointed rector of the Thomas-school in Leipzig, in 1734, turned his attention chiefly to the old classic literature, and the studies connected with it. In 1742, he became professor extraordinary of ancient literature in the university of Leipzig, in 1756 professor of rhetoric, in 1759 professor of theology, and died 11th September 1781. E. paved the way to theological eminence by a thorough study of philology, and was thus led to a more correct exegesis of the biblical authors, and to more liberal views of theology in general.

In fact, it is mainly to him that we owe the proper method of theological exposition, in so far as it rests upon correct grammatical elucidation. He showed his ability as an accurate critic and grammarian, in his editions of Xenophon's *Memorabilia* of *Socrates*; the *Clouds* of Aristophanes, *Homer*, *Callimachus*, *Polibius*, *Suetonius*, and *Tacitus*; but above all, by his admirable edition of Cicero (5 vols., Leip. 1737–1739), to which he added a *Clavis Ciceronia*, by way of supplement. He was also the first reviver of true and manly eloquence in Germany. His theological writings are numerous. The most remarkable are the *Initia Doctrinæ Solidioris*, the *Institutio Interpretis Novi Testamenti* (translated into English), the *Anti-Muratorius* (1755), and the *Opuscula Theologica* (1792). Compare Bauer, *Formule ac disciplinæ Ernestianæ indoles* (1782); Stallbaum, *Die Thomas-schule zu Leipzig* (1839).

ERNST, HEINRICH WILHELM, an eminent violinist, born at Brünn, in Moravia, in 1814. He studied at the Vienna Conservatorium. At the age of 16, his talents excited much interest in Germany; and he soon afterwards performed in Paris. His first visit to London was in 1843; and he returned in subsequent years, spending the intervals in Paris and in different parts of Germany. His playing was characterized by immense brilliancy, combined with passion and sentiment. He suffered much from acute neuralgia, which latterly interfered with the exercise of his art; and the last seven years of his life were spent at Nice, where he died, October 8, 1865. E.'s compositions have generally a bravura character, and include works for the violin and orchestra, quartetts, &c.

ERNST, Elector of Saxony, the founder of the Ernestinian line, or the elder branch of the princely House of Saxony, was the

elder son of the Elector Friedrich the Mild, and of Margaret, Archduchess of Austria. When only 14 years of age, he was seized and carried off from the castle Altenburg, along with his brother Albrecht, but was speedily recaptured. This incident, known in German history as the Stealing of the Princes (*Prinzenraub*), has been described with extraordinary vividness by Carlyle in the *Westminster Review*, January 1855. He succeeded to the electoral dignity on the death of his father in 1464, but governed in common with his brother, for 21 years. In 1485, however, E. and Albrecht divided the paternal possessions, when the former obtained as his share Thuringia, the half of the district then called Osterland, with Voigtland, the Franconian estates of the House, the electoral dignity, and the dukedom of Saxony. E. was a man who took a great interest in the welfare of his people. Against injustice, tyranny, and lawlessness, he was implacable. He died in Kolditz in 1486. It is next to impossible to trace the course of the Ernestinian line through the labyrinthine mazes of the endless German genealogies; it is sufficient to say that after 1638 the Ernestinian line was represented by the Dukes of Weimar, who gradually obtained the whole possessions of the House. Johann, Duke of Weimar, who died in 1605, left several sons, the eldest of whom, Wilhelm, became the founder of four different branches, all of which, however, were reunited under Ernst August, Duke of Weimar, who died in 1748. After 1815, the ducy of Weimar became the grand-duchy of Saxe-Weimar-Eisenach, and its present ruler is of course the direct representative of the Ernestinian line. The other three families by which it is now also represented are those of Meiningen, Saxe-Coburg-Gotha, and Altenburg.

ERNST I., surnamed the Pious, Duke of Saxe-Gotha and Altenburg, founder of the House of Gotha, was born at the castle of Altenburg, 24th December 1601. He was the son of that Johann, Duke of Weimar, mentioned in the previous article, who died in 1605, and was thus connected with the main Ernestinian line. E. was the ninth of ten brothers, the youngest of whom was the famous Bernhard (q. v.) von Weimar. He received an excellent education from his mother, Dorothea Maria von Anhalt. After the arrival of Gustavus Adolphus in Germany, E. entered the Swedish service, and in various engagements exhibited great courage and skill, completing the victory of the Protestants at Lützen, after the fall of Gustavus. After the battle of Nördlingen, 26th of August 1634, E. withdrew from the theater of strife, and for the rest of his life devoted himself to restoring the prosperity of his territories, which had been frightfully devastated during the Thirty Years' War. He died in 1675. Of his seven sons, the eldest, Friedrich, continued the line of Gotha, while the third became the founder of the House of Meiningen, and the seventh, the founder of the House of Saalfeld. E. is a fine type of the old German Protestant prince. Zealously attached to the doctrines and government of the Lutheran Church, he exercised a constant watch over its religious and educational interests. With the formalism, however, that often characterizes 'strictly religious' people, he compelled his children to learn the whole Bible by heart. He was much interested in the cause of Christianity abroad, and invited to his court the Abbot Gregorius from Abyssinia, besides sending thither on a religious embassy Joh. Mich. Wansleb of Erfurt. He also carried on a correspondence with the king of Ethiopia and the Patriarch of Alexandria. His line became extinct by the death of Friedrich IV. in 1825.

ERNST II. (AUGUST KARL JOHANNES LEOPOLD ALEXANDER EDUARD), Duke of Saxe-Coburg-Gotha, elder brother of the late Prince Albert (q. v.), born at Coburg 21st June 1818. Both brothers received an admirable literary and scientific education. The family to which he belongs is a branch of the Ernestinian line, having been founded in 1680 by Albrecht, second son of Ernst the Pious (q. v.). When E. had completed a university curriculum at Bonn, he entered the military service of the king of Saxony, but left it on the occasion of his marriage with the daughter of the Grand-duke of Baden. In 1844, he succeeded his father as Duke of Saxe-Coburg-Gotha. In his opinions and aspirations, imbued with the spirit of his age, he has introduced into his little dominions many beneficial reforms, and allayed not a few long-standing jealousies. Yet one regrets to say, that his enlightened views of his duty as a ruler have not been generally appreciated by his subjects. During the stormy period of 1848–1849, by spontaneous concessions on the one hand, and on the other by an energetic repression of the political anarchists, he contrived to save his territories from the perils of revolution. In the Slesvig-Holstein war, E. took a prominent part, and on the 5th April 1849 won the battle of Eckenförde. E. was a great advocate for the unity of the German nation, and took a prominent part in most of the efforts made in that direction. His leisure hours are devoted to music and the fine arts. His operas, *Casilda*, *Santa Chiara*, and *Diana von Solanges*, are well known in Germany. In 1861 he published a pamphlet vindicating his government, and in 1864 an account of a tour in Egypt.

EROS. See CUPID.

EROSION, the influence of a stream or river in hollowing out its channel. Even the smallest streams, when running over soft strata, as clay or sand, cut out channels, and remove the eroded materials. Hollows thus produced have been observed among the stratified rocks. One that occurs in the coalfield of the forest of Dean has been carefully described. The trough was found to branch, when traced in the progress of mining, over a considerable area, and to assume all the appearances of a little stream, with small tributaries falling into it. When the hollows thus abraded are of considerable extent, 'valleys of erosion' are produced. Many of the earlier geologists held that rivers had hollowed out their own valleys. The immense amount of materials brought down by rivers, and deposited at their mouths as deltas, shows without doubt that they have contributed materially to produce inequalities on the earth's surface; but the examination of the geological structure of valleys, plainly testifies that almost every great hydrographical basin has derived its form originally from some other agency, although its outline may have been subsequently altered by the continued action of currents within it.

EROTIC (from the Greek *eros*, love), signifying in general whatever is marked by love or passion; but the term is chiefly applied to poetical pieces of which love is the predominating subject.

EROTOMANIA, a species of mental alienation caused by love. See MANIA.

ERPENIUS (Latinized from Thomas van Erpen), one of the earliest and most eminent of European Orientalists, was born at Gorkum, in Holland, 7th September 1584. At an early age he was sent to Leyden, where he directed his attention first to theology, but afterwards more particularly to the study of Oriental languages. Having completed his educational course, he traveled through England, France, Italy, and Germany; and in 1613, became professor of Oriental languages at Leyden. Here he erected an Arabic press in his own house, caused new types to be cut, and not only wrote but printed a great number of important works bearing on his favorite studies. The professorship of Hebrew not being vacant at the time of E.'s translation to the university of Leyden, a second Hebrew chair was founded expressly for him in 1619. Soon after this he was appointed Oriental interpreter to the government, in which capacity he read and wrote replies to all official documents coming from the East. Such was the elegance and purity of his Arabic, as written at this time, that it is said to have excited the admiration of the Emperor of Morocco. Towards the close of his life, tempting offers of honors and distinction came pouring in upon him from all parts of Europe; but he was never prevailed upon to leave his native country, where, in the midst of an eminent career, he died 13th November 1624.

Although the present standard of Oriental knowledge in Europe is much in advance of that of E.'s day, there is no doubt that it was through him principally that Eastern, especially Arabic studies have become what they are. With hardly any better material than a few awkwardly printed Arabic alphabets, he contrived to write his famous grammar (*Grammatica Arabica, quinque libris methodice explicata*, Leyden, 1613; recent edition by Michaelis, Gött. 1771), which for 200 years, till the time of Silvestre de Sacy, enjoyed an undisputed supremacy; and there are many who think his *Rudimenta* unsurpassed, even at the present day, as a work for beginners. Among his other important works the best known is his *Proverborum Arabicorum Centurie Duæ* (Leyden, 1614).

ERRATA, the list of errors with their corrections placed at the end of a book. From greater carefulness in correcting the sheets of a work in passing through the press, errors in sense or typography are now much more rare than formerly; in many instances, indeed, books are now produced without a single error which needs to be pointed out and corrected. As an example of one, for 'errors' read 'errors' on first line of this article. On this subject interesting particulars are given in Disraeli's *Curiosities of Literature*, of which the following is a specimen: 'Besides the ordinary *errata* which happen in printing a work, others have been purposely committed, that the *errata* may contain what is not permitted to appear in the body of the work. Wherever the Inquisition had any power, particularly at Rome, it was not allowed to employ the word *fatum*, or *fata*, in any book. An author, desirous of using the latter word, adroitly invented this scheme: he had printed in his book *facta*, and in the *errata*, he put, "For *facta*, read *fata*."

ERRATICS, the name given to the water-worn blocks of stone that have been washed out of the boulder clay, or are still enclosed in it, because they have generally been derived from rocks at a distance. See BOULDERS and BOULDER-CLAY.

ERRHINES, (Gr. *en*, in, and *rhin*, the nose), medicines administered locally to produce sneezing and discharge from the nostrils, in catarrh, and in various disorders of the head and eyes.

Common snuff, and various other vegetable irritants in powder, have been used for this purpose.

ERROR, PROCEEDINGS IN, the form by which in England, the unsuccessful party in an action at law, until the Judicature Acts of 1875, brought his case for consideration before a court of review. Error may be in fact or in law. If the error were in fact, the case, under the old system, was heard before the court in which the action was originally tried; if the error were in law, proceedings required to be taken before the Court of Exchequer Chamber (q. v.). Where a party disputed the ruling of the judge, the form was by Bill of Exceptions (q. v.) under statute of Westminster the second (13 Ed. I. c. 31). According to the former practice, it was necessary, in order to obtain a review on the ground of error, that an original writ, called a Writ of Error, should be issued.

The writ, if the error was in fact, was styled *coram nobis*, where the case was in the Queen's Bench, the sovereign being presumed to preside in that court; if in the other courts, the writ was *coram vobis*. Writ of error is abolished by the Judicature Acts, and so is a bill of exceptions. Since 1875 all appeals are to the Court of Appeals by way of rehearing, and are brought by notice of motion in a summary way, and no petition or other formal proceeding other than such notice of motion is now necessary. The appellant may by the notice of motion appeal from the whole or part of any judgment, and this does not usually stay proceedings. Nearly all the judgments of the Divisional Courts of the High Court are subject to appeal to the Court of Appeal and thence to the House of Lords. The jurisdiction was transferred to the High Court of Justice in 1875, which used formerly to be vested in the Common Pleas at Lancaster and at Durham, and which used to be by writ of error to the Queen's Bench. Writs of error used formerly also to be brought on judgments of inferior courts. But since the establishment of County Courts and the changes introduced by the Judicature Acts, the analogous proceeding is an appeal by way of a case stated for opinion of the High Court, and sometimes by motion in a summary way.

ERROR, WRIT OF, in civil causes. See ERROR, PROCEEDINGS IN. In criminal causes, is an original writ from the High Court of Justice, and is in form addressed to the judges of a superior court, by which they are authorized to examine the record on which judgment was given in the inferior court, and to confirm or reverse the judgment. Writ of error formerly lay for every substantial defect appearing on the face of the record, for which the indictment might have been quashed; but by 7 Geo. IV. c. 64, it was provided that several technical defects should be cured by verdict. By 14 and 15 Vict. c. 100, every formal defect apparent on the face of the indictment must be objected to before the jury is sworn, and not after, and may then be amended. Writ of error now, therefore, lies only for defect in substance appearing on the record, as where a man having been indicted for perjury, it appears that the false statements were not made upon oath. Writ of error is not to be confounded with an appeal on the merits, which is not competent in criminal cases, the verdict being final.

ERRORS. In all observations, errors must be made. The best instruments have imperfections; and no man, however equable his temperament, can always rely on his making a proper use of his senses. As in astronomy numerical correctness in the results of instrumental measurements is of the first consequence, it is the constant care of the observer to detect and make allowance for errors.

The three principal sources from which they may arise are—1st, External or incidental causes, such as fluctuations of weather, which disturb the amount of refraction; changes of temperature, affecting the form and position of instruments, &c.; 2d, *Errors of observation*, being such as arise from inexactness, defective vision, slowness in seizing the exact instant of an occurrence, atmospheric indistinctness, &c.; and such errors as arise from slips in clamping and momentary derangements of the instrument; 3d, Instrumental defects owing to errors in workmanship, and such as arise from the instrument not being properly placed—called errors of adjustment. The first two classes of errors, so far as they cannot be reduced to known laws, vitiate the results of observations to their full extent; but being accidental, they necessarily sometimes diminish and sometimes increase them. Hence, by taking numerous observations under varied circumstances, and by taking the mean or average of the results obtained, these errors may be made to destroy one another to a great extent, and so far may be subdued. With regard to the third class, it is the peculiarity of astronomical observations to be the ultimate means of detection of all defects of workmanship and adjustment in instruments, which by their minuteness elude every other mode of detection. See Sir John Herschel's *Outlines of Astronomy*, § 138 *et seq.* It may be mentioned, however, that the method of subduing errors of the first two classes by the law of average is not applicable in all cases.

In certain cases, recourse must be had to what is known as the method of least squares. See SQUARES, METHOD OF LEAST; see also PROBABILITY.

ERSCH, JOHANN SAMUEL, the founder of German bibliography, was born at Grossglogan, in Lower Silesia, 23d June 1766; and exhibited from an early period a decided bias towards that branch of literature in which he afterwards obtained so high a reputation. At Halle, where he was sent to study theology in 1785, he devoted himself to historical investigations. After several vicissitudes, he obtained, in 1800, the office of librarian to the university of Jena. Three years later, he was called to Halle as professor of geography and statistics; and in 1808, was appointed, in addition, principal librarian. He died at Halle, 16th January 1828. E. was long engaged in miscellaneous bibliographical work for other scholars; but in 1818, along with Gruber, commenced the publication at Leipzig of the *Allgemeine Encyclopädie der Wissenschaften und Künste* (Universal Encyclopædia of the Sciences and Arts), a work of immense value. By his *Handbuch der Deutschen Literatur seit der Mitte des 18. Jahrh. bis auf die Neueste Zeit* (Handbook of German Literature from the middle of the 18th Century to the most recent Time, 4 vols., 1812–1814), he first established modern German bibliography in the technical sense of the word; and by its completeness, accuracy, and mode of arrangement, it is undoubtedly fitted to serve as a model for the imitation of other nations.

ERSE (a corruption of *Irish*), the name given by the Lowland people of Scotland to the language spoken by the inhabitants of the Western Highlands, as being of Irish origin. See BRETTES AND SCOTS. The proper name is Gaelic (q. v.).

ERSE'K-UJVA'R. See NEUHAUSEL.

ER'SKINE, REV. EBENEZER, the founder of the Secession Church in Scotland, was the son of the Rev. Henry Erskine, minister of Chirnside, in Berwickshire, a descendant of the noble family of Mar, and was born June 22, 1680. He studied at Edinburgh, and after acting for some time as tutor and chaplain in the family of the Earl of Rothes, he was licensed to preach the gospel by the presbytery of Kirkealdy in 1702. His abilities and excellent character soon brought him into notice, and in the following year he was appointed minister of Portmoak, in the shire of Kinross. Here he applied himself indefatigably to the study of the Scriptures, and became so deeply convinced that to preach 'Christ crucified' was his grand and constant duty as a minister, that after some time the earnestness, unction, and piety which now marked his discourses, became exceedingly attractive to the people accustomed to the chilling 'legalism' which then predominated in the Scottish pulpit. E.'s popularity was not confined to the Parish of Portmoak; serious Christians from all parts of the country were eager to enjoy occasionally the benefits of his ministry, and on sacramental occasions, he had frequently attendants from the distance of 60 or 70 miles. In 1731, he was translated to Stirling, after having discharged the pastoral office in Portmoak for 28 years. Previous to this event, however, the religious peculiarities of E. had brought him into unpleasant relations with some of his brethren, by the interest which he exhibited in a book called the *Marrow of Modern Divinity*, marked by its strong evangelicalism of doctrine and sentiment. After his transference to Stirling, E. distinguished himself by his advocacy of popular rights in the settlement of ministers; and ultimately involved himself in such antagonism to the Church of Scotland, or at least to the ruling party in it of the time, along with other three clergymen, he was deposed in 1733. (For an account of the circumstances which led to these depositions, see UNITED PRESBYTERIAN CHURCH.) He was shortly after joined by his brother Ralph and several other ministers. They now virtually formed a distinct sect, but they still continued to occupy their parish churches. An effort was made in 1734 to restore them to their legal connection with the church; it was unsuccessful. In 1736, E. and his friends formally seceded, but still it was not till 1740 that they were ejected from their churches. Shortly after this, a furious, and, as it seems to people now-a-days, a contemptible squabble broke out among the seceders in regard to the propriety of taking the burgess-oath. The result was a division of the sect into two bodies, the Burghers and Antiburghers. See UNITED PRESBYTERIAN CHURCH. E. was the leader of the Burghers. He died June 22, 1756.

ERSKINE, REV. RALPH, brother of the preceding, was born at Mouilav, in Northumberland, March 18, 1685, and after completing the usual course of study incumbent on a minister, was ordained to the parish church of Dunfermline in 1711. Sympathizing with the sentiments of his brother Ebenezer, he withdrew from the judicatures of the Established Church in 1737. In the controversy concerning the burgess-oath he also took part with his brother. E. died November 6, 1752. His fame rests chiefly on his *Gospel Sonnets* and other religious works, which were once highly popular.

ERSKINE, JOHN, of Carnock, and afterwards of Cardross, an eminent Scottish jurist, and Professor of Scots Law in the university of Edinburgh, was the son of the Honorable John Erskine of Carnock, third son of Lord Cardross, whose descendants have now succeeded to the earldom of Buchan. John Erskine, the father, was a man of importance in his day, not only on account of the family to which he belonged, which even then had been prolific in historical characters, but in consequence of his personal qualities and the positions which he held. Having been forced to quit Scotland, from his attachment to the Presbyterian religion, he retired to Holland, and became an officer in the service of the Prince of Orange. At the Revolution, he accompanied William to England, and, as a reward for his services, was appointed lieutenant-governor of Stirling Castle, and lieutenant-colonel of a regiment of foot. John E., the younger, born 1695, became a member of the Faculty of Advocates in 1719, but did not succeed as a practitioner of the law. On the death of Alexander Bain in 1737, Mr. E. was nominated to succeed him in the chair of Scots Law, an office the duties of which he performed with great reputation for 28 years. For many years Mr. E. made use of Sir George Mackenzie's (q. v.) *Institutions of the Law of Scotland* as his text-book; but in 1754 he published his well-known *Principles of the Law of Scotland*, which were thenceforth used for that purpose by himself and by his various successors down to the present time. On his retirement from the professorship in 1765, Mr. E. occupied himself in preparing his more important work, *The Institutes of the Law of Scotland*, but it was not published till 1773, five years after his death. Mr. E. was twice married—first to Miss Melville, of the noble family of Leven and Melville, by whom he left the afterwards celebrated clergyman, John Erskine; and, second, to Ann, second daughter of Stirling of Keir, by whom he had four sons and two daughters. As a legal writer, Mr. E. is inferior to none of our Scottish jurists, with the single exception of Lord Stair, who had the benefit of the more learned and wider judicial training of our earlier lawyers, who were educated in a continental school.

In consequence of the extent to which lands changed hands in Scotland subsequent to the rebellions, feudal conveyancing became the most prominent subject of study amongst the lawyers of Mr. E.'s day, and the principles of commercial law, of which Stair laid the foundation, and which have become so important in our own time, were somewhat thrown into the shade. The labors of Mr. Bell in these departments have again brought the law of Scotland into connection with the general current of European law and mercantile practice throughout the world. But of all those departments which constitute the law of Scotland, as developed by the usages and forms of society in the country itself, there is at the present day no clearer, sounder, or more trustworthy expositor than Mr. Erskine.

ERSKINE, REV. DR. JOHN, son of John Erskine of Carnock, the author of the *Institutes of the Law of Scotland*, was born June 2, 1721, studied at the university of Edinburgh, and in 1743 was licensed to preach by the presbytery of Dunblane. In the following year, he was ordained minister of Kirkintilloch, where he remained till 1753, when he was presented to the parish of Culross, in the presbytery of Dunfermline. In 1758, he was translated to New Greyfriars Church, Edinburgh; in 1766, the university of Edinburgh conferred on him the honorary degree of Doctor of Divinity; and in 1767, he was promoted to the collegiate charge of Old Greyfriars, where he had for his colleague Dr. Robertson. In the General Assembly of the Church of Scotland, he was for many years the leader of the popular or evangelical party; and there the openness and integrity of his character secured him the confidence and affection of his friends, and the esteem and respect of his opponents. Between him and Principal Robertson, the leader of the moderate party, there was a courteous and honorable friendship; and the funeral sermon which he preached on the death of his colleague, did equal honor to E.'s head and heart. He died January 19, 1803. E.'s writings are exceedingly numerous. They consist of essays, letters, sermons, dissertations, and pamphlets, &c., mainly of a religious character, and exhibit a superior degree of ability. Sir Walter Scott, in his *Guy Rannering*, gives a graphic and accurate description of his powers as a preacher.

ERSKINE, THOMAS, LORD ERSKINE, was the youngest son of Henry David, tenth Earl of Buchan; and was born in Edinburgh, 10th January 1750. Although his father, at the period of his birth, was reduced to an income of £200 a year, he transmitted to him the blood of a race which had been prolific in men of great ability, and had been ennobled before the era of genuine history. The countess, who was the daughter of Sir James Stewart of Goodtrees, in the county of Midlothian, was not only a godly Presbyterian and a skilful housewife, but a gifted and accomplished woman.

After E. had attended for some time the High School of Edinburgh, the family removed to St. Andrews, at the grammar school of which place, and subsequently at the university, though

never it would seem as a matriculated student, Thomas E. received the rest of such education as fell to his share. His desire was to study for a profession; but his parents, who had sent his eldest brother, Lord Cardross, to Leyden, and were educating his second brother, Henry, afterwards the well-known Harry Erskine, for the Scottish bar, could not afford the expense of a third learned education, and sent him to sea as a midshipman. In this capacity he served for four years, until the death of his father, when he purchased a commission in the First Royals, and was for some time stationed at Minorca, where he employed his leisure time in the study of English literature. On his return to London, his birth, his acquirements, the elegance of his manners, and volubility of his conversation, led to his being warmly received in the best circles. It was then that he had the controversy with Dr. Johnson on the respective merits of Fielding and Richardson which Boswell has recorded; and that he published a pamphlet on the prevailing abuses in the army, which, though anonymous, was well known to be his, and obtained a great circulation. E. now grew tired of the army as a profession, in which he saw little chance of promotion; and while in this humor, an accidental interview which he had with Lord Mansfield at an assize court, determined him to prosecute the study of law. E. was admitted a student of Lincoln's Inn, 26th April 1775, and on the 13th January 1776, he entered his name on the books of Trinity College, Cambridge, as a gentleman commoner. Many anecdotes are told of the privations which E. underwent when studying for the bar—how he lived on 'cow-heel and tripe,' dressed so shabbily as to be quite remarkable, and boasted that *out of his own family* he did not know a lord. Such stories, though probably exaggerated, prove that he endured considerable privations—considering his rank—in fitting himself for the legal profession. Lord Campbell says, that 'during Easter and Trinity terms he excited a great sensation in the dining-hall by appearing with a student's black gown over the scarlet regimentals of the Royals; *probably not having a decent suit of plain clothes to put on.*' Though E. was aided by his aristocratic connection, his rise was still very wonderful. Without the advantage of a business training, or what, probably even in those days, was far more important, a business connection, he rose into practice with almost unprecedented rapidity. After his first speech, the attorneys actually flocked round him with their retainers, and in telling the story, he used sometimes to bring the number which he received before quitting Westminster Hall up to sixty-five! His first two clients were officers in the navy—Captain Baillie, who held an office in Greenwich Hospital, against whom a rule had been obtained calling upon him to show cause why a criminal information for a libel reflecting on Lord Sandwich's conduct as governor of the charity, should not be filed upon him; and Admiral Keppel, who was tried by a court-martial at Portsmouth for incapacity and misconduct in an encounter with the French fleet off Ushant; and in both cases E. derived benefit from his own early connection with the service and the special information which he thus possessed.

Admiral Keppel sent him two five-hundred-pound notes as a fee. From this time forth, E.'s good-fortune as an advocate was uninterrupted. In 1783, he was returned to parliament for Portsmouth. Four years and a half after he was called to the bar, he had cleared £8000 to £9000, besides paying his debts, he had got a silk gown, business of at least £3000 a year, and a seat in parliament, and had made his brother Lord Advocate. In parliament, on the other hand, he failed so egregiously in his first speech as to leave scarcely any hope in the bosoms of his admirers, and what is very singular, his failure and Lord Eldon's took place the same night. To some extent the phenomenon was accounted for by Sheridan's remark when he said to him: 'Erskine, you are afraid of Pitt, and that is the flabby part of your character.' But notwithstanding his political mortifications, his professional career went on with increasing brilliancy. In 1786, he was made Attorney-general to the Prince of Wales, by whom he was warmly patronized, but towards him and every one else he exhibited that manly independence which was the best part of his character. The fact of his appearing as counsel for Thomas Paine is more to his credit, than even the brave and honest speech which he made in his defence; whilst his removal in consequence from his office is, as Lord Campbell has said, a lasting disgrace to those from whom the measure proceeded. Throughout the political trials which occurred in this country at that troubled period, he enacted the same manly part. When E. was proposed for the woolsack, an office far beyond his legal attainments, the king, George III., in consenting exclaimed: 'What! what! well! well!—but remember he is your chancellor, not mine.' Yet his decisions as lord-chancellor, according to Lord Campbell, are not so much *bad* as *superficial*, by some equity practitioners they are spoken of as the *Apocrypha*. E. was engaged in the defence of Queen Caroline. He died 17th November 1823.

ERYNGO (*Eryngium*), a genus of plants of the natural order *Umbellifera*, having simple umbels, which resemble the heads of

composite flowers, a leafy involucre and leafy calyx, and obovate, scaly fruit destitute both of ridges and vittæ. The species are numerous, mostly natives of the warmer temperate parts of the world, with alternate, simple, or divided leaves, which have marginal spines. One species only is common in Britain, the SEA ERYNGO, or SEA HOLLY (*E. maritimum*), which is frequent on sandy sea-shores; a very stiff, rigid, and glaucous plant. *E. campestre* has also been found in England and Ireland, but is very rare. Its root was formerly much employed in some parts of Europe as a tonic.

That of *E. maritimum* is used in the same way, and possesses the same properties, being sweet and aromatic. It is sold in a candied state, and was formerly reputed stimulant, restorative, and aphrodisiac. Shakspeare makes Falstaff allude to the snowy color and supposed properties of this now almost disused sweetmeat, for the preparation of which Colchester has long been famous above all other places. E. root has also been used as an aperient and diuretic. Linnaeus recommends the blanched shoots of *E. maritimum*, as a substitute for asparagus. *E. fetidum*, a native of the warm parts of America, is called Fit-weed in the West Indies, a decoction of it being much used as a remedy in hysterical cases. *E. aquaticum*, a native of low wet places in North and South America, is called Rattlesnake Weed and Button Snake-root. The root is diaphoretic and expectorant, and has a spurious reputation as a cure for the bite of the rattlesnake.

ERY'SIMUM, a genus of plants of the natural order *Crucifera*, tribe *Sisymbriacæ*. The pod is four-sided. *E. cheiranthoides*, a branching annual, about 18 inches high, with lanceolate scarcely toothed leaves and small yellow flowers, is found in many parts of Europe, and also in North America. It is not uncommon in waste places and cultivated grounds in Britain, but may perhaps have been originally introduced for its medical use. Its seeds were formerly much employed as an anthelmintic, from which it has the name of WORM-SEED. It is also called TREACLE MUSTARD, because it was employed as an ingredient in the famous *Venice Treacle*. *E. perfoliatum* is cultivated in Japan for the fixed oil of its seeds. Some of the plants formerly referred to E. are now included in other genera, as *Sisymbrium* and *Alliaria* (q. v.).

ERYSIPELAS (Gr. derivation uncertain), an inflammatory and febrile disease of the skin, attended by diffused redness and swelling of the part affected, and the end either by desquamation or by vesication of the cuticle, or scarf-skin, in the milder forms, and by suppuration of the deeper parts in the severer varieties of the disease (phlegmonous erysipelas). Erysipelas affects, in a large proportion of instances, the face and head; it is apt to be attended with severe and typhoid fever (see FEVER), and often with great disorder of the nervous system, arising in some instances from inflammation of the membranes of the brain.

In other parts of the body, severe or phlegmonous erysipelas is apt to be succeeded by protracted and exhausting suppurations, and sometimes by diseases of the bones, or inflammations of the internal organs. Erysipelas is frequently an Epidemic (q. v.) disease; it is also very apt to recur in a person who has been attacked once or oftener; and this is especially true of the form which affects the face. It is seldom that depletion is allowable in erysipelas, but the bowels should be well cleared out in most cases, and a Diuretic (q. v.) given, after which the treatment consists for the most part in watching narrowly the progress of the case, keeping up the strength as well as possible, and obviating special dangers as they occur. In some cases, iron is used as a specific remedy.

ERYTHE'MA (Gr. *erythaino*, I redden), a minor form of Erysipelas (q. v.), presenting the same tendency to diffusion and redness, but not so much swelling, and little disposition towards suppuration, or even vesication. Erythema is chiefly dangerous when it presents itself in a wandering shape, attended with slow consuming fever. The muriated tincture of iron, in doses of twenty drops in water every hour or two, has been regarded as a specific in this disease, as well as in erysipelas. Some forms of



Erysimum Cheiranthoides :

a, root; b, a branch, in which flowering has recently begun; c, the summit of a branch in a more advanced state, showing the fruit; d, the calyx; e, the parts of fructification, divested of floral envelopes; f, a flower.

erythema are distinctly connected with constitutional diseases, as gout, rheumatism, syphilis, &c., and depend for their cure on the removal of the cause.

ERYTHRE'A. See CENTAURY.

ERYTHRI'NA. See CORAL FLOWER.

ERYTHRO'NIUM, a genus of bulbous-rooted plants of the natural order *Liliaceæ*, with drooping flowers and the segments of the perianth reflexed. *E. dens canis*, the DOG-TOOTH VIOLET, so called because of the resemblance of its little white bulbs to dogs' teeth, is a well-known ornament of our flower-borders in spring. It is a native of the central parts of Europe and south of Siberia. Anthelmintic properties are ascribed to the bulbs. Those of *E. Americanum* are emetic.

ERYTHROPHL'E'UM, a genus of trees of the natural order *Leguminosæ*, sub-order *Mimoseæ*. *E. Guineense*, a native of Guinea, is a very large tree, 100 feet high, remarkable for the great quantity of red juice which every part of it contains, and interesting on account of the employment of this juice by the natives for an ordeal to test the innocence or guilt of a person accused of crime. The juice is swallowed in large draughts, and those who remain uninjured by it are supposed to be innocent.

ERYTHROXYLA'CEÆ, a natural order of exogenous plants, allied to *Malpighiaceæ*. They are trees or shrubs, with alternate simple leaves, stipules, flowers growing from amidst scale-like bracts, calyx of five sepals, corolla of five petals, each petal having a curious appendage—a plaited scale—at the base, ten stamens united at the base, a 3-celled ovary with two cells empty, and the third containing a single ovule, three styles, and the fruit a drupe. Nearly 100 species are known, natives of warm countries, and chiefly of tropical America. To this order belongs the COCA (q. v.). The wood of some of the species is bright red; that of *Erythroxylon* (Gr. red wood) *suberosum* is used in Brazil for dyeing, and a permanent red is obtained from it. That of *E. phagerythifolium* is the *Bois d'huile* (Oil-wood) of Mauritius.

E'RZBERG. See EISENERZ.

ERZERU'M, or ERZROU'M, properly *Erserum*, a strongly fortified town in Turkish Armenia, in lat. 39° 55' N., long. 41° 20' E., not far from the northern source of the Euphrates. It is situated in a high, but tolerably well cultivated plain; its site being 6200 feet above the level of the sea. The climate is cold in winter, but dry in summer. E. is the residence of an English, a Russian, and a French consul; and its population is estimated at 40,000, consisting of 30,000 Turks, 8000 Armenians, and 2000 Persians, who carry on a brisk trade, and have thus attained to a degree of prosperity unusual in the East. The copper and iron wares of E. have acquired a wide celebrity. Situated at the junction of the important highways leading from Trebizond, Transcaucasia, Persia, Kurdistan, Mesopotamia, and Anatolia, E. forms an entrepôt of commerce between Europe on the one hand, and the interior of Asia, and particularly Persia, on the other. The streets, the houses of which are built chiefly of volcanic stone cemented with mud, are narrow, crooked, and filthy; and ruins of fortifications and of buildings formerly magnificent, everywhere meet the eye. The town consists of the fortress, strictly so called, and four suburbs. The fortress, which is enclosed by a high wall, has, on the west, a citadel called *Ikkaleh*, with many curious monuments, and a mosque of Christian origin. The fortress also contains 15 mosques, the residence of the chief magistrate, some caravanseras, and a few elegant houses belonging to the higher order of officials and Mohammedan merchants. The suburbs boast 24 mosques, several Armenian churches, and a number of large bazaars and caravanseras. E. imports shawls, silk goods, cotton, tobacco, rice, indigo, &c.; and exports corn, sheep, and cattle, horses, mules, and gall-nuts. The principal trades carried on are tanning, dyeing morocco, and blacksmiths' and coppersmiths' work. But since Russian Transcaucasia has provided a safe trade-route to Persia, the prosperity of E. has greatly suffered. E. is a very ancient town. Its Armenian name was *Garin Khalkh*. Near it stood the old Syro-Armenian town of Arsen. When the Seljuks captured this place, the inhabitants fled to a fortress at E., which the Seljuks accordingly called *Arsen-er-Rum*, i. e., Arsen of the Romans (or Byzantines), whence the modern Erzerum. In 1201 it fell into the hands of the Seljuks; of the Mongols in 1242; and, finally, in 1517, into those of the Turks. It still, however, continued to be the most important city in the country, and at the commencement of the 19th c. had a population of 100,000 inhabitants. In the war of 1829, between the Turks and Russians, the taking of E. by the latter decided the campaign in Asia. E. was an important military center during the war of 1877-78, and much hard fighting was done in its neighborhood. In December 1877, the Russians closed round the city, already hard pressed, and reduced its defenders to the utmost distress: in February 1878 it was surrendered to Russia. The Russians held it till October 1878, when it was given up to the Turks.

E'RZGEBIRGE ('Ore Mountains'), the name given to the chain of mountains, rich in metals, stretching in a south-westerly direction, on the confines of Saxony and Bohemia, from the valley of the Elbe to the Fichtelgebirge, in long. 12° 20' E. In the south, it rises to a height of from 2000 to 2500 feet, forming a steep wall of rock; in the west, it forms broad, slaty plateaux, and gradually slopes down towards the Saxon side to the level districts of Altenburg and Leipsic. In consequence of this formation, the streams flowing southward are small, while the north side of the chain, which is well wooded, presents a series of romantic, and occasionally fertile and thickly peopled valleys, watered by the Mulde, the Pleisse, and their numerous tributaries. The town of Gottesgabe, the site of which is the highest in Germany, is situated towards the south of the E. range, in long. 12° 54' E., at an elevation of 3162 feet. The Keilberg, the highest point of the range, is 3802 feet above the level of the sea. The E. is chiefly of the gneiss-granite formation, in which most of the metal strata are to be found. Porphyry and basalt likewise appear.

E'SAU ('hairy' or 'rough'), the eldest son of Isaac, and twin-brother of Jacob. As E. grew up, he became 'a man of the field,' a cunning hunter, and his father's favorite. He seems to have been a wild, rough, hearty Bedouin, or son of the desert, thinking nothing of to-morrow, but living with joyous carelessness from day to day. This is apparent from the manner in which he allowed Jacob to defraud him of his birthright, although it carried with it, besides many temporal advantages, the *Covenant-blessing* itself. After this transaction, E., when 40 years of age, married two Canaanitish women, 'which were a grief of mind unto Isaac and to Rebekah' (Gen. xxvi. 35). Then follows the narrative of Jacob's personation of his brother, and his securing irrevocably the blessing to himself. E. now swore to kill his brother, whereupon Rebekah sent Jacob to his uncle Laban in Padanaram. E. next married his cousin Mahalath, the daughter of Ishmael; and appears to have established himself in his wife's country, to the south of Palestine in Mount Seir. Here he lived probably as a predatory chief. When Jacob was returning from Padanaram, E. encountered him with 400 of his Bedouins. The meeting was a touching one. The wild borderer at least was in earnest. 'Esau ran to meet him, and embraced him, and fell on his neck, and kissed him' (Gen. xxxiii. 4). His anger had long died out. E. next appears at the burial of his father, Isaac, whom he seems to have loved with the warm and simple affection of a child of nature, and having obtained his share of the property, 'went into the country from the face of his brother Jacob' (Gen. xxxvi. 6). From E. the region of Mount Seir took the name of Edom (q. v.), and his posterity are generally called Edomites.

E'SCALADE (Fr. from Lat. *scala*, a ladder), in siege operations, is a mode of gaining admission within the enemy's works. It consists in advancing over the glacis and covert-way; descending, if necessary, into the ditch by means of ladders; and ascending to the parapet of the curtain and bastions by the same ladders differently placed. The ladders are either procured on the spot, or are sent out with the siege-army. A convenient form is in pieces of 12 feet length, fitting end to end by means of sockets. A firing-party is usually told off, to keep down the fire of the enemy upon the escaladers, especially a flank fire lengthwise of the ditch, which might sweep them off with terrible rapidity. The leaders of an escalade constitute a 'forlorn hope.'

ESCA'LOP-SHELLS are often used in heraldry to signify that the bearer has made many long voyages by sea. As the Pilgrim's (q. v.) emblem, they were commonly given to those who had been to the Crusades; they came to be regarded as indicating either that the bearer or his ancestor had been a Crusader. The escalop-shell was the emblem of St. James the Great, and is generally met with in churches dedicated to him. The more ordinary form of the name is SCALLOP-SHELL (q. v.).



Escalop-Shell.

ESCAPE WARRANT is a warrant issued by a judge for the apprehension of persons who have escaped from the Queen's Bench or Fleet prisons. This power is conferred by 1 Anne, s. 2, c. 6, followed by 5 Anne, c. 9. The warrant may be issued by any judge of the court wherein the action was tried, or judgment and execution obtained, upon oath in writing, of the escape of the party, made before himself, or before one of the commissioners to take oaths. The apprehension may be effected on Sunday. The person apprehended is committed to the charge of the sheriff of the county, who is made responsible for his safe keeping.

ESCA'PEMENT is the term applied to that part of the machinery of a watch or clock by which the onward revolving motion produced by the moving power, whether weights or spring,

is brought into contact with the regulating movement of the pendulum or balance-wheel. See HOROLOGY.

ESCARP', in Fortification, is the side or slope of the ditch next the rampart, and of the parapet itself. When the ditch of a fortress is dry, the escarp is usually faced with mason-work, to render it difficult of ascent; and behind this facing (*revêtement*) there are often passages or casemates for defence. In temporary fortifications, the *revêtement* is sometimes of wood; and in field-works, palisades at the foot, or fraises on the *berme* or edge of the ditch, are held sufficient. The escarp is always made at as large an angle as the nature of the soil will allow; the design being to offer the greatest possible obstacle to an assailant.

ESCARS are large heaps of gravel, consisting chiefly of carboniferous limestone, that were accumulated during the Pleistocene period. They occur in Central Ireland, but are identical with the *ösar* of Sweden; and under the name of *kames*, they are not unknown in Scotland. The gravel is often heaped into narrow ridges 40 to 80 feet high, and from 1 to 20 miles long.

ESCAUT. See SCHELDT.

ESCHAR (Gr. *eschara*), a slough or portion of dead or disorganized tissue. The name is commonly applied to artificial sloughs produced by the application of Caustics (q. v.).

ESCHAROTIC (Gr.), causing an eschar. See CAUSTIC.

ESCHEAT (Fr. *echoir*, from Lat. *cadere*, to fall or happen), an incident of the feudal law whereby, when a tenant in fee-simple died, leaving no heir capable of succeeding, the land reverted to his lord. By the earlier usages, this effect took place where there was no representative of the vassal in the seventh degree, which, according to later custom, was extended to male descendants in *infinitum* (Lib. Feud. i. 1, s. 4). According to the law of England, escheats are of two kinds—*propter defectum sanguinis*, and *propter delictum tenentis*. The former was in accordance with the feudal usage; so that if the owner of an estate in fee-simple dies without leaving an heir, and without having disposed of his estate by deed or will, the land reverts to the overlord, who in the present day is almost invariably the sovereign, except in copyhold estates, which escheat to the lord of the manor. The most frequent instance of escheat is in the case of the death of a bastard, who, having no relations but descendants, the lands on his death intestate and without issue, must revert to the crown. Escheat *propter delictum tenentis* is peculiar to the English law. It happened where a tenant in fee-simple had been guilty of treason or felony, in which case, not only his estate in possession, but any estate might devolve upon him by the rules of descent, escheated to his lord; so that all who might succeed through him were cut off from the inheritance. This rule applied to all felonies, and was productive of much hardship. By modern legislation, it has been provided that attainder for felony shall not operate as a bar to inheritance, except in case of treason or murder (54 Geo. III. c. 145, 3 and 4 Will. IV. c. 106, 13 and 14 Vict. c. 60). This species of escheat is to be distinguished from forfeiture of lands to the crown for treason, which prevailed in other countries besides England. See FORFEITURE.

Escheat in Scotland is of two kinds—1. The total forfeiture to the crown of all property heritable and movable belonging to a person who has been convicted of treason. 2. It signifies the forfeiture of goods by a debtor who has failed to make payment of debt in obedience to legal Diligence (q. v.). This species of escheat for debt was abolished by 20 Geo. II. c. 50. It was of two kinds: single escheat, and liferent escheat. By the former, all the debtor's movables were forfeited to the crown; by the latter, the annual profits of the debtor's estate were forfeited to the superior. Single escheat still exists in Scotland as a punishment of crime. In all capital convictions, it is ordered that the prisoner's 'whole movable goods and gear be escheat and inbrought to his majesty's use.' In cases of deforcement, bigamy, perjury, and some others, single escheat is imposed by statute as a portion of the penalty on conviction. Single escheat also falls upon denunciation for outlawry; and if the rebel continues for a year under denunciation, his liferent escheat falls to his superior.

ESCHELLES, LES, a village in Savoy (formerly a Sardinian, now a French state), is situated on the Guier, 12 miles south-west of Chambéry. The valley beyond this village and on the road to Chambéry is blocked up by a huge limestone rock 800 feet high, over which travelers formerly used to climb by means of ladders, and hence the name given to this village. Through this mass of limestone the public road now passes by means of a tunnel, which is 25 feet high, of equal width, and 1000 feet long. The tunnel was projected and commenced by Napoleon I., and finished in 1817 by the King of Sardinia.

ESCHENBACH, WOLFRAM VON, a celebrated poet of the middle ages, was born in the second half of the 12th c., of a noble family, which derived its name from the village of Eschenbach near Ansbach. He received the honor of knighthood at Henne-

berg, and passed his life in knightly fashion. In 1204, he came to the court of Hermann, landgraf of Thuringia, where he shone among the poets of the time, at the so-called Wartburg-war (a rivalry of the German minstrels held at Wartburg in 1206 or 1207). Hermann's successor, Ludwig the Pious, appears to have shown E. little favor, in consequence of which he withdrew from the Thuringian court towards the close of his life. He died some time between 1219 and 1225, and was buried in his native village. E.'s poems are partly original, and partly fashioned after French and Provencal models. His rich fancy, deep sentiment, and vivid power of representation, as well as his elegant mastery of language and versification, give something of an epic character to his works, the principal of which are *Parzival*, composed before 1212, *Wilhelm von Orange*, and *Titarel*. Besides these, we have several love-songs of his. E. exercised an important influence on his time, but subsequently was almost forgotten; and it is only recently that he has been restored to his place of honor. The first critical edition of his works was that by Lachmann (Berl. 1833). They were translated into modern German by San-Marte (2 vols., Magdeb. 1836—1841), and with greater acumen, though with too slavish literalness, by Simrock (2 vols., Stuttg. 1842).

ESCHER, JOH. HEINR. ALFRED, a distinguished Swiss statesman, was born at Zurich, 20th February 1819, and studied at Bonn and Berlin. In 1842, he was created Doctor of Law at Zurich, and spent the two following years in Paris, devoting his attention chiefly to studies connected with Roman law. On his return to Zurich, E. became a lecturer in the High School, the subject of his lectures being chiefly the political law of the Swiss confederacy. In 1844, he was elected member of the great council of the canton, and was thus drawn into the arena of practical statesmanship. Even at that early period, his sentiments were decidedly liberal. In January 1845, along with six others who shared his opinions, he published the famous summons to the popular assembly in Unterstrass for the expulsion of the Jesuits. His election into the Council of the Interior in 1845, and into the Council of Education in 1846, opened a wide field for his administrative talents in his native canton.

The reorganization of the schools in the canton of Zurich, according to the demands of the time, is chiefly his work. In December 1847, he became president of the great council; and in his opening speech, recommended the complete reform of the confederacy, and the greatest possible centralization. In 1848, he was sent as a deputy to the Federal Diet; and, along with M. Müzinger, was charged with negotiations entered into between Switzerland and Austria, in regard to the canton of Tessin. In Dec. of the same year, E. became president of the newly elected Council of Regency. Since that time, his energies have been chiefly directed to education, the reorganization of church policy, and the promotion of railway enterprise and banking institutions in Switzerland. He became president of the National Council in 1849, and in 1871 was chief promoter of the St. Gothard Railway.

ESCHOLTZ BAY, a portion of the Arctic Ocean in Alaska, U.S., forms the innermost part of Kotzebue Sound, the first great inlet to the north-east of Behring's Strait. It is about long. 161° W., being barely on the outside of the polar circle. It is worthy of notice chiefly on account of its fossil remains, which, though common on the northern coast of Siberia, are comparatively rare on that of the new continent.

ESCHSCHÖLTZIA, a genus of plants of the natural order *Papaveraceæ*, of which *E. Californica* and other species, natives of California, have now become very common in our flower-gardens, making a showy appearance with their large deep yellow flowers. The genus is remarkable for the calyx, which separates from the dilated apex of the flower-stalk, being thrown off by the expanding flower, and much resembling in its form the extinguisher of a candle.

ESCHWEGÉ, a town of Prussia, in the province of Hesse-Nassau, is situated on the left bank of the Werra, 25 miles east-north-east of Cassel. It consists of an old and new town, and a suburb; is surrounded with walls pierced by six gates; and is well built. The only building of note is the castle, which was long the residence of the landgrafs of Hessen-Rotenberg. E. has manufactures of woollen and linen fabrics, numerous tanneries, and several oil and other mills, also some trade in fruit and victuals. Pop. (1880) 9001.

ESCHWEILER, a town of Rhenish Prussia, in the circle of Aachen, and nine miles east-north-east from the city of Aachen (Aix-la-Chapelle), is a station on the railway between Aix-la-Chapelle and Cologne, and stands at the confluence of the Inde and Dente. It has extensive manufactures of ribbons, woollens, canvas, needles, iron-wire, and machinery, also of wax-cloth, lace, glass, vitriol, and vinegar. In the vicinity are mines of zinc and lead. Pop. (1880) 15,623.

ESCORT. See CONVOY.

ESCUDO DE VERA'GUA denotes at once a river and an island on the Atlantic side of Central America—the latter being at the mouth of the former. They are situated a little to the east of the boundary between New Granada and Costa Rica. The island is in lat. 9° N., and long. 81° 30' W.; and the river, being only 15 miles long, derives its importance, if any, from the narrowness of the belt which here separates the two oceans.

ESCU'RIAL (the correct title is EL REAL SITIO DE SAN LORENZO EL REAL DE ESCORIAL), a famous monastery of New Castile, in the province of Madrid, and situated 30 miles north-west of the town of that name. This solitary pile of granite has been called the eighth wonder of the world, and at the time of its erection surpassed every building of the kind in size and magnificence. It owes its origin (at least, so it is said) to an inspired vow made by Philip II. during the battle of St. Quentin. On that occasion, he implored the aid of St. Lorenzo, on whose day, 10th August 1557, the battle was fought; and vowed, should victory be granted to him, he would dedicate a monastery to the saint. The E. is built in the form of a gridiron, in allusion to the instrument of St. Lorenzo's martyrdom, and forms a huge rectangular parallelogram 744 feet from north to south, and 580 feet from east to west, and divided into long courts, which indicate the interstices of the bars. Towers at each angle of this parallelogram represent the feet of the gridiron, which is supposed to be lying upside down; and from the center of one of the sides, a range of building abuts, forming the royal residence, and representing the handle. The E. was begun in 1563, and finished in 1584, and was intended to serve as a palace, mausoleum, and monastery. It has a splendid chapel with three naves, 320 feet long, and 320 feet in height to the top of the cupola. The *Pantheon*, or roval tomb, is a magnificently decorated octagon chamber, 36 feet in diameter by 38 feet high, in the eight sides of which there are numerous black marble sarcophagi. Kings only and the mothers of kings are buried here. The E. is an immense building; it is stated that it has 14,000 doors and 11,000 windows, and its cost was 6,000,000 ducats. Its library, previous to the sack of the E. by the French in 1808, contained 30,000 printed and 4300 MS. volumes, mainly treasures of Arabic literature, of which a catalogue, but not a good one, was drawn up by Casiri in his *Bibliotheca Arabico-Hispanica* (2 vols., Madrid, 1760–1770). They were, however, at that time removed to Madrid; and on being sent back to the E., it was discovered that the library consisted only of about 20,900 volumes—a third of the whole having been lost. The French also plundered the place of its valuable collection of coins, medals, and pictures. On October 2, 1872, the E. was struck by lightning and partially burned. The E. is saved from going to ruin by grants of public money, which are occasionally made.

ESCU'TCHEON, in Heraldry, is synonymous with Shield (q. v.).

ESCUTCHEON OF PRETENCE, or INESCUTCHEON, is a small shield placed in the center of the larger one, and covering a portion of the charges on the latter, in which a man carries the arms of his wife when she is the heiress of her family. It is said to be carried *surtout*, or over-all. Sometimes also a shield over-all is given as a reward of honor; thus, the Earl of Stirling did bear two coats quarterly, and over-all an inescutcheon of Nova Scotia, because he was the first planter of it.—*Mackenzie, Heraldry*, p. 82.

E'SDRAS, BOOKS OF. (The word *Esdras* is the Greek form of Ezra, and indicates that the books so named do not exist in Hebrew or Chaldee.) In the Vulgate, the first book of Esdras means the canonical book of Ezra; and the second, the canonical book of Nehemiah; whilst the third and fourth are what we call the first and second books of Esdras. But in the Vatican and other editions of the LXX., what we call the first book of Esdras comes first, and is followed by the canonical book of Ezra, which is termed the *second* book of Esdras. In all the earlier editions of the English Bible, the order of the Vulgate is followed. The Geneva Bible was the first to adopt the classification now used, according to which Ezra and Nehemiah give their names to two canonical books, and the two apocryphal became first and second Esdras. As regards the *first* book of Esdras, it is for the most part a transcript—and not a very accurate one—of Ezra and a portion of Nehemiah, together with the two last chapters of 2d Chronicles. It is impossible to ascertain anything regarding its age or authorship. Josephus quotes it extensively in his Antiquities, even when it contradicts Ezra proper, a fact which indicates that it was highly valued by the Jews. It may perhaps be interesting to notice that the hackneyed phrase, *Magna est veritas et prevalebit* (Truth is great, and will prevail), is taken from the 41st verse of the 4th chapter of this book. The *second* book of Esdras, or Revelation of Esdras, is wholly different in character from the first, and it has even been doubted whether it is the work of a Jewish or of a semi-Christian writer. Lawrence and Hilgenfeld

argue for its being composed 28–25 B.C.; Lücke, shortly after the death of Caesar (44 B.C.); while Gröber, Bauer, and Wieseler assign it to a period as late as the reign of Domitian (81–96 A.D.). The opinion which has the weightiest evidence in its favor is, that the book was originally the composition of a Jew, but that it has been largely interpolated by Christian writers. The book was probably written in Egypt, and forms part of what has been called the 'Apocalyptic Cycle' of Jewish literature (see REVELATION OF ST. JOHN). It consists of a series of angelic visions and revelations made to Ezra, regarding the mysteries of the moral world, and the final triumph of the righteous, who, however, are to be but 'a very few.' The descriptions are occasionally very striking, and even sublime, and if the doctrinal portions contain the original views of a man living before the apostolic era, the source of the Pauline phraseology can in part be discovered.

ESENBE'CKIA, a genus of trees of the natural order *Diosmaceæ*. The bark of *E. febrifuga* is said to be equal in its effects to Peruvian Bark. It is a tree forty feet high, a native of the south of Brazil.

ESK (Gaelic, *uisg*, water), the name of several small Scotch rivers. The Dumfriesshire Esk is formed by the confluence of the Black and White Esk, which rise on the borders of Selkirkshire, near Ettrick Pen, the center of the Southern Highlands, and run each 10 miles south-south-east. The united stream runs 35 miles south, and forms for a mile the boundary between Scotland and England. For the last 8 miles it runs south-south-west in Cumberland, and finally falls into the head of the Solway Firth. It flows in a Silurian, Carboniferous, and Permian basin, through some charming scenery, past Langholm, Canobie, and Longton. The upper part of the valley of this E., which is wild and pastoral, is called Eskdale Muir.—The Edinburghshire North and South Esk rise in the north of Peebleshire, between the Pentland and Moorfoot Hills, and both run north-north-east through a beautiful tract in the east of Edinburghshire, the north branch, 20 miles long, passing Roslin and Hawthornden, and the south branch, 15 miles long. The two branches unite in Dalkeith Park, and run 3 miles north into the Firth of Forth at Musselburgh. The basin of the two streams is chiefly Carboniferous.—The Forfarshire North and South Esk. The North Esk rises in the Grampians, in the north of the county, and runs 25 miles south-east into the sea, 4 miles north of Montrose. At Ganachy Bridge it runs half a mile through a sandstone gorge 20 to 30 feet deep. In the lower half of its course it divides Forfarshire from Kincardineshire. The South Esk rises in the Grampians of the west of Forfarshire, and runs 40 miles south-east and east, crossing the valley of Strathmore. It passes Brechin, and ends in the tidal basin or lagoon of Montrose. The basins of both consist of gneiss, mica-slate, clay-slate, and old red sandstone.

E'SKAR, a term applied in Ireland to certain objects in the superficial drift, which occur in several parts of that country, and are not unknown in Scotland, but which are more abundant in Sweden than in any other known country, being there recognized as *ösar*. An *eskar* is generally a long linear ridge of rounded gravel, including pieces of considerable size; in Sweden, they often have rough erratic blocks deposited upon them. It is an unsettled point whether they are connected with glacial action; if connected with it, the whole appearance and consistency demonstrate at least subsequent marine action. There is a remarkable eskar on a moor spreading below Durrington Law, in Berwickshire (900 feet above the sea); another, about a mile long, has been pointed out amidst a vast alluvial accumulation at St. Port, Fifeshire.

E'SKI-DJU'MNA, a town of the principality of Bulgaria, is situated 20 miles west of Shumla. Estimated population, 10,000.

E'SKI-SA'GRA, a town of European Turkey, in the province of Eastern Roumelia, is situated at the southern base of the Balkan Mountains, 70 miles north-west of Adrianople. In the vicinity are numerous gardens and orchards, and also several mineral springs, which are in great repute. The manufactures are carpets, coarse linens, and leather. Pop. 15,000 to 20,000.

E'SLA, a river of Spain, and an important affluent to the Douro, rises in the province of Palencia, Old Castile, from the southern base of the Asturias mountains, 10 miles north-west of the town of Valleburon. Throughout the whole of its course, it flows south west, and joins the Douro 15 miles below the town of Zamora. It is 125 miles in length. Its waters, which are joined by numerous streams, are well stocked with fish.

ESMERALDAS (signifying *Emerald* in Spanish) denotes a river, a town, and a province, all in the state of Ecuador (q. v.) in S. America.—1. The river rises near the city of Quito, and enters the Pacific after a course of 110 miles in lat. 1° 5' N., and long. 79° 40' W.—2. The town stands 10 miles from the mouth of the river, containing about 4000 inhabitants.—3. The province, watered by the above-mentioned river, occupies the N.W. of Ecuador. It is mostly covered with forests, but produces excellent cacao and tobacco. Pop. 8000 to 10,000.

ES'NÉ, E'SNA, or E'SNEH, the hieroglyphic *Sen* and the Greek *Latopolis* or *Lattónpolis*—the city of the *Latus* fish or *Latus nobilis*, from the fish there worshipped—is a thriving but badly built town of Upper Egypt, and is situated on the left bank of the Nile, in lat. 25° 15' N. It contains about 12,000 inhabitants, many of whom are Copts, and has some manufactures of the cotton, shawls, and pottery. It is an entrepôt for the Sennar caravans. There are famous ruins at E., which consist of a sandstone temple, with a portico of four rows of six columns, which appears to have been founded by Thothmes III., whose name is seen on the jambs of a door. The temple, however, seems to have been restored or principally constructed by Ptolemy Euergetes (246—222 B.C.), and the pronaos was erected in the reign of the Emperor Claudius (41—54 A.D.), and completed in that of Vespasian. The interior is of the date of Trajan, the Antonines, and Geta, whose name, erased or replaced by that of Caracalla, is there found. The great temple was dedicated to Chnumis, Satis, and Har-Hek. It has a zodiac like that of Denderah, formerly thought to be of the most remote antiquity, but now known to be no older than the Romans. A small temple with a zodiac, erected in the reign of Ptolemy Euergetes, formerly stood at E'Deyr, 2½ miles north of E., but it has been destroyed. At E. is also a stone quay, bearing the names of M. Aurelius. This city was the capital of a nome, and the coins struck in it in the reign of Hadrian, 127—128 A.D., represent the fish *latus*.—Champollion, *Not. Descr.* p. 283; Wilkinson *Mod. Egypt*, ii. p. 268; Tochon d'Annecy, *Mémoires*.

ESO'CIDE, a family of malacopterous fishes, which is now regarded as including only the Pikes (q. v.), but in which the flying fishes (*Exocoetus*) and other fishes now constituting the family *Scomberesocidae* (q. v.), and of the order *Pharyngognathus*, were until recently included.

ESOTERIC (Gr.) is a term derived from the ancient mysteries, in which it was applied to those doctrines that were designed for the initiated, in contradistinction to those that were imparted to the uninitiated, which were termed *exoteric*. It is now used in various relations of an analogous kind.

ESPALIER, a term borrowed from the French, and signifying a railing on which fruit-trees are trained as on a wall. Such railings are very variously constructed—sometimes of wood, sometimes of iron, sometimes of upright rails held together by a horizontal rail at top, sometimes chiefly of horizontal rails with upright posts for their support. Espaliers may be very conveniently and cheaply made of strong iron wire, sustained by upright iron or wooden posts, as in ordinary wire-fences. They vary in height from four to about eight feet, according to situation and the size of the garden. They have the advantage of securing the fruit in a great measure from the effect of winds, which often shake off great part of the crop of standard trees whilst still unripe; and from the full exposure to sun and air, excellent fruit is produced, although there is no reflected heat as from a wall, which is therefore still superior. Espaliers are very common in gardens in Britain, and add at once to the beauty and the productiveness of a garden, the ground not being overshadowed as by standard trees, although, of course, the roots of the trees render it unsuitable for many crops to some distance on both sides of the espalier. Espaliers are often used to separate flower-borders from plots occupied by culinary vegetables. Apples and pears are considered more suitable for espaliers than any other kinds of fruit trees commonly cultivated in Britain. The treatment is generally similar to that of wall trees, but the training is usually by horizontal branches. It is not unusual, when trees have become old and their branches thick and firm, to dispense with great part of the rails necessary in their earlier training.

ESPARTERO, JOAQUIN BALDOMERO, ex-regent of Spain, Count of Luchana, Duke of Vittoria, &c., was born in the year 1792, at Granatula, in La Mancha (Ciudad Real), where his father, Antonio Espartero, followed the occupation of a cartwright. E. was intended for the ecclesiastical profession, and in 1806 went to the university of Almagro, but two years later, on the invasion of Spain by the French, he entered the Sacred Battalion (*Batallón Sagrado*), so called from being composed almost entirely of students. After the close of the War of Independence in 1814, he went to South America, where he fought against the insurgents; but after the victory gained by Bolívar at Ayacucho, December 9, 1824, had put an end to the Spanish rule on the continent of America, E. returned to Spain. In 1832, he declared himself openly in favor of the succession of the daughter of Ferdinand VII.; and on the breaking out of the civil war after the king's death, he soon rose to the rank of lieutenant-general. In August 1836, he succeeded in saving the city of Madrid, and became successively general-in-chief of the army in the north, vice-roy of Navarre, and captain-general of the Basque provinces.

When the army of Don Carlos appeared before Madrid on the 13th September 1837, E. had again the glory of saving the capital. His successful campaign of 1839, which resulted in the ex-

pulsion of Don Carlos from Spain, procured him the title of Grantee of Spain, and Duque de la Vittoria y de Morella. In 1840, the queen-mother Christina was compelled to resign her office of regent, and on the 8th of May 1841, E. was appointed by the Cortes to supply her place until the queen (Isabella) should have reached her majority. E. guided the helm of the state with energy, firmness, and ability; but in 1843, an unscrupulous and unprincipled combination of parties naturally inimical to each other, the Republicans and the Moderados, brought about his fall. E. sailed for England, where he resided for four years. In 1847, he returned to Spain, and lived quietly at Logroño till 1854, when the wretched despotism and profligacy with which the name of Christina is associated, caused an insurrection of the people, and compelled the queen-mother to leave the kingdom. E. was again called to the head of the government, and conducted the affairs of the nation for two years; but in July 1856, he was supplanted by General O'Donnell. In 1857 he resigned his dignity as senator, and after that time rarely took part in politics. After the revolution of 1868, which resulted in the expulsion of Queen Isabella, E. gave his full and hearty adhesion to the provisional government, though he took no part in their proceedings. In 1870, E. was induced to become a candidate for the throne of Spain; but withdrew in June of the same year, alleging his age and the division of parties as excuse. In 1875 he adhered to King Alfonso. He died in January 1879.

ESPARTO (*Stipa* or *Macrochloa tenacissima*), a grass nearly allied to the well-known and beautiful Feather-grass (q. v.), a native of the south of Europe (especially Spain) and North Africa. It is used by the Spaniards for making sandals, nets, sacks, &c., and has become an important material in paper-making. As our supplies for the purpose have fallen off of late through the reckless custom of tearing up the grass by the roots, attention has been directed to substitutes, including what has been called Irish esparto (*Molinia carulea*), which grows wild on Irish waste land, and is very suitable for making paper.

ESPE'JO, a small town of Spain, 20 miles south-east of Cordova. It has an ancient castle. Pop. 5284.

ESPINASSE, JULIE JEANNE ELEONORE DE L', one of the most fascinating women of her time, and one who combined sparkling gifts with a heart susceptible of the strongest affections, was born at Lyon, 19th November 1732, and was the illegitimate daughter of a Madame d'Albion. After the death of her mother, Mademoiselle de l'E., who had received an excellent education, went to live at the house of her brother-in-law, the Marquis de Vichy-Chamroul, in whose family she held the position of *gouvernante*. In 1752, she left her brother-in-law's house, and went to Paris in the quality of *demoiselle de compagnie* to the Marquis Du Defand (q. v.).

The two ladies lived together for a time most agreeably, until it became evident that the charms of the young and beautiful *demoiselle* had enlisted on her side the admiration of the circle in which Du Defand had formerly been the chief attraction. Even D'Alembert, the famous encyclopédist, who hitherto had been the most constant admirer of Du Defand, now manifested an entire devotion to the younger and more fascinating Espinasse. A rupture between the ladies was the consequence. The friends of E., however, obtained for her, through the Due de Choiseul, an annuity from the king. It is said that D'Alembert sought her hand in vain. She died 23d May 1776. Her *Lettres*, &c. (Paris, 1809) bear witness to her remarkable cultivation.

ESPINEL, VINCENT DE, a Spanish poet and musician, was born at Ronda in Granada, 28th December 1551. He studied at Salamanca, afterwards entered into the army, and traveled as a soldier through a great part of Spain, France, and Italy, meeting with the adventures which he relates in his *Relaciones de la Vida y Aventuras del Escudero Marcos de Obregon* (Madr. 1618, later 1804; in German, by Tieck, Bres. 1827). He afterwards returned to his native country, entered into holy orders, and received a benefice in Ronda, his native town. He was subsequently chaplain in the royal hospital at Ronda. The last years of his life were spent at Madrid, in the retirement of the monastery of *Santa Catalina*, where he died in 1634. He published a book of poems (Madr. 1591), containing chiefly lyrics, and a translation of the *Epistola ad Pisones*, the *Ars Poetica* of Horace. He was, if not the inventor, the improver of the ten-line octosyllabic stanza. Verses written in this form have, since E.'s day, been called in Spain *Espinelas*. He was a performer on the guitar, to which he added the fifth string.

ESPINHACO (SERRA DO), a mountain-chain of Brazil, extends in a direction generally parallel with the coast, from the right bank of the San Francisco to the head-waters of the Uruguay. Its northern part forms the eastern limit of the basin of the former river. The Serra, as a whole, is said to be rich in diamonds.

ESPIRITU SANTO, besides having been long applied by the Spaniards to their imaginary continent in the southern hemisphere, denotes various actual localities.—1. E. S. is a small maritime province of Brazil, extending in S. lat. from $15^{\circ} 30'$ to $21^{\circ} 20'$, and lying immediately to the north of the metropolitan province of Rio Janeiro. This province contains also a town and a bay of its own name.—2. E. S. is the largest and most westerly island of the New Hebrides, being in lat. $15^{\circ} S.$, and long. $167^{\circ} E.$ It is said to measure 80 miles by 40.—3. E. S. is a cape of Tierra del Fuego, in lat. $52^{\circ} 38' S.$, and long. $68^{\circ} 37' W.$ —4. E. S. is a considerable town near the center of Cuba. It contains about 9982 inhabitants, fully one-half being whites.—5. E. S. is a bay of the Gulf of Mexico, forming part of the almost continuous back-water of Texas. It is in lat. $28^{\circ} 30' N.$, and long. $97^{\circ} 30' W.$ Towards the open sea, it is breasted by Matagorda Island, and on the side of the mainland, it receives the Guadalupe.

ESPLANA'DE (in Fort.) is the open space intentionally left between the houses of a city and the glacis of its citadel. It requires to be at least 800 paces broad, that the enemy, in case of his getting possession of the town, may not be able to assail the citadel under cover of the nearest houses. For this purpose, the citadel must command the esplanade, and be able to send a direct fire into the streets opening upon it. In old works on fortification, the term is often applied to the glacis of the counterescarp, or the slope of the parapet of the covered way towards the country.

ESPRINGAL, or SPRINGAL, in the military engineering of the days before the introduction of gunpowder into European warfare, was a machine for throwing missiles. These missiles were either large darts called *mouchettes*, or arrows winged with brass, and called *viretons*, from their whirling motion when shot forth. The espringal probably resembled in some degree the machine engraved in BALISTA.

ESPRIT D'IVA, an aromatic liqueur made in Switzerland, from a plant called GENIPI (*Achillea moschata*, or *Parnica Moschata*; see ACHILLEA). Like the *Swiss tea*, made from the same plant, it possesses sudorific properties.

ESPY, JAMES P., one of the most original and able meteorologists of the present century, was the son of a farmer in Western Pennsylvania, where he was born in 1784 or 1785. He received a superior education, and during the earlier part of his career, was one of the best classical and mathematical instructors in Philadelphia. E.'s attention was first strongly turned to science by the writings of Dalton and Daniell on meteorology. After some time, his enthusiasm became so great, that he resolved to give up teaching, and to rely for the means of prosecuting his meteorological researches upon his slender savings and the success of his lectures on the subject, which, fortunately, turned out to be far more attractive than the average of popular lectures. His first course was delivered before the Franklin Institute of Pennsylvania. E.'s theory of storms (with which his name is specially connected) drew general attention to itself, especially in the United States. See STORMS. A memoir on this subject gained for him, in 1836, the Magellanic premium of the American Philosophical Society of Philadelphia. In 1841 appeared his work on the *Philosophy of Storms*, regarding which the Report of the *Académie des Sciences* (Paris) says 'that the theory on which it is based alone accounts for the phenomena. . . . In a word, for physical geography, agriculture, navigation, and meteorology, it gives us new explanations, indications useful for ulterior researches, and redresses many accredited errors.' Later in his life, E. became Professor in the Philadelphia High School, and afterwards in the Franklin Institute of that city. He traveled extensively through the United States, lecturing on his favorite theory of storms, and studying the laws of climate, until he acquired the popular title of 'Storm-king.' After the organization of the Smithsonian Institution at Washington, he was commissioned by Dr. Henry, its superintendent, to pursue his researches.

It was in the halls of the Smithsonian that his experiments on the rate of cooling of gases of different densities when expanded were made. The cooling effects of expansion on dry and moist air also formed the subject of nice experiments. The results of these experiments have thrown much light on the formation of cloud and rain, and the propelling power of winds. They afforded materials for his elaborate and valuable reports on meteorology, presented to the Senate of the United States. Four of these reports were published at the expense of government. The last was issued in 1857, which embodies all his matured opinions on meteorological phenomena. This is one of the most valuable works on the principles of the science. He died in Cincinnati, Ohio, 24th January 1860, at the residence of his nephew.

ESQUIMAUX, or ESKIMOS, is the name of a nation inhabiting the coasts of all the seas, bays, inlets, and islands of America north of the 60° of N. lat.; from the eastern coast of Greenland, in long. 20° , to the Strait of Behring, in long. $167^{\circ} W.$

On the Atlantic, they are to be found along the entire coast of Labrador to the Strait of Belleisle, and down the east side of Hudson's Bay nearly as far as James's Bay; while on the Pacific they reach as far as the peninsula of Alaska. They are also to be met with on the Asiatic side of Behring's Strait, and though few in number, may be regarded as the most widely spread nation in the world, occupying, according to Mr. Gallatin, not less than 5400 miles of coast, without including the inlets of the sea. 'The Eskimo,' says Dr. Latham, 'is the only family common to the Old and New World—an important fact in itself, and one made more important still by the Eskimo localities being the only localities where the two continents come into proximity.' Nothing, however, has as yet come out of a consideration of this fact in the way of tracing, with absolute certainty, a connection between the E. and any well-defined Asiatic race. The name itself, *Esquimaux* or *Eskimo*, does not help us in any such attempt, being from an Algonquin or Abenaki word, signifying 'eaters of raw flesh.' This is not the native name, for they call themselves 'Inuit,' or 'people'; the Scandinavians of the 10th c. called them 'Skroelingar,' or 'wretches'; while the seamen of the Hudson's Bay ships designate them as 'Seymos,' or 'Suckemos'—appellations, according to Richardson, 'evidently derived from the vociferous cries of Seymo or Teymo with which the poor people greet the arrival of the ships.' The E. are usually reckoned by ethnologists to belong to the Mongolian race, but Duponceau and Gallatin find a strong resemblance between them and the Red Indians of North America, which is the view also taken by Prichard—the last mentioned regarding them as a kind of link between the Northern Asiatic and American family of nations. Latham, on the other hand, pronounces them to be Mongolian in physiognomy, with flat nose, projecting cheek-bones, eyes often oblique, and skin more brown than red or copper colored; thus presenting a marked contrast to the North American Indians. Their language, however, is, he acknowledges, American in respect to its grammatical structure, being composed of long compound words, and regular, though remarkable, inflections. With respect to the complexion of the E., Sir John Richardson is of a different opinion from any of these authors, describing it as nearly white, when relieved from the smoke and dirt with which it is usually incrustated. Many of the young women, he considers, may even be called pretty, when this operation has been performed.

'The young men,' he says, 'have little beard; but some of the old ones have a tolerable show of long gray hairs on the upper lip and chin, which the Red Indians never have, as they eradicate all stray hairs. The Eskimo beard, however, is in no instance so dense as a European one.' In stature, the E. are usually represented as not being more than five feet in height; but the authority just mentioned describes them as ranging from five feet to five feet ten inches, and even more. They are broad-shouldered, and, when seated in their boats, look tall and muscular, but, when standing, appear to lose some of their height, from the shortness of their lower extremities. The E. live usually throughout their long lines of coast in small villages, containing about five or six families each. The men occupy themselves entirely in hunting, while the women perform the domestic drudgery, which consists principally in preparing the food, of which both sexes consume a large quantity. This is almost entirely of an animal nature, but not without variety, embracing the reindeer, geese and other birds, the seal, walrus, salmon-trout, and various other kinds of fish. They are expert hunters and fishers, and, aided by their dogs, make considerable havoc among the arctic animal tribes. Where whales are common, August and September are devoted to the pursuit of these animals, and great joy is manifested when they capture any of them, as from the blubber of these they get their supply of oil for lights in the long winter season. Of vegetables, they scarcely taste any except in the autumn. 'Carbon is supplied to the system by the use of much oil and fat in the diet, and draughts of warm blood from a newly killed animal are considered as contributing greatly to preserve the hunter in health.' The habits of the E. are filthy and revolting in the extreme. A great part of their food is consumed without any attempt at cooking it, and they drink the blood of newly killed animals as the greatest delicacy that could be offered them. In the short summer, those who can afford it live in tents; but in the winter they all equally live in snow-huts, the stench of which, from the offal with which they are stored, and the filthy oil that gives them light, makes them insupportable to the European. The dress of both sexes is nearly the same, consisting of the skins of animals, reindeer, birds, and even fish—whatever conduces most to warmth, without much regard to appearance; but in their winter abodes they usually wear nothing except trousers. Their religion consists principally in superstitious observances, but they believe, we are told, in two greater spirits, and many lesser ones. The Moravian mission in Greenland, commenced by the benevolent Hans Egede (q. v.), in 1721, has succeeded in converting many of them to Christianity; and they are represented by the missionaries to be a mild and teachable people, easily led by kindness to distinguish between

what is morally right and wrong. Where the missionaries, however, have not penetrated, our arctic voyagers generally speak of them as honest among themselves, but incorrigibly dishonest, and prone to lying and exaggeration with strangers.—See Dr. Rink's *Tales and Traditions of the Eskimo*.

ESQUIMAUX DOG, a kind of dog extensively spread over the most northern regions of North America and of Eastern Asia;



Esquimaux, Dogs, and Sledge for one person.

large, powerful, with long rather curling hair, tail much curved over the back and very bushy, short and pointed ears, and somewhat wolf-like aspect. These dogs are much used for drawing sledges. They are very sagacious, docile, and patient. The color is generally black and white, brown and white, or dingy white.

ESQUIRE (Fr. *escuyer*, a shield-bearer, from Lat. *scutum*, a shield). The esquire in chivalry was the shield-bearer or armor-bearer to the knight, and hence was called *armiger* in Latin. He was a candidate for the honor of knighthood, and thus stood to the knight in the relation of a novice or apprentice, pretty much as the page did to him. In this capacity he was spoken of as a bachelor, just as the knight-bachelor came latterly to be distinguished from him who had already attained to the higher honors of chivalry. When fully equipped, each knight was attended by two esquires. The esquire was a gentleman, and had the right of bearing arms on his own shield or escutcheon, which is surmounted by a helmet placed sideways, with its vizor closed, to distinguish him from a knight or nobleman. He had also the sword, the emblem of chivalry, though he was not girded with the knightly belt. His spurs were silver, to distinguish them from the golden spurs of the knight; and when the king created esquires of old, it was by putting silver spurs on their heels, and collars of SS round their necks. Those who received this honor directly from the sovereign were in general the esquires for the king's body, or those whose duty it was to attend him in his capacity of a knight; an office now nearly obsolete. Tenants of the crown who held by knight's service were a class of feudal esquires generally supposed to correspond to the simple *ritters* or knights of Germany, as opposed to the *ritters* who were *geschlagen* or dubbed, inasmuch as these English esquires were entitled to claim the rank of knighthood.

Though the title of esquire has now come to be given without discrimination to all persons above the rank of a tradesman or shopkeeper, the following seem to be those whose claim to it stands on the ground either of legal right or of long-established courtesy: 1. All the untitled sons of noblemen; 2. The eldest sons of knights and baronets; 3. The sons of the younger sons of dukes and marquises, and their eldest sons. All these are esquires by birth. Then there are esquires by profession, whose rank does not descend to their children; and esquires by office—e. g., justices of the peace—who enjoy the title only during their tenure of office. To the former class belong officers in the army and navy, barristers and doctors of law, and doctors of medicine, but not surgeons.

ESQUIROL, JEAN ETIENNE DOMINIQUE, one of the greatest physicians for the insane of modern times, was born at Toulouse, 4th January 1772. He served in the military lazarette at Narbonne in 1794, obtained his degree of Doctor in 1805, and was appointed physician to the Salpêtrière at Paris in 1811. After 1817, he delivered clinical lectures on the diseases of the mind, and their cures; in 1818, his exertions secured the appointment of a commission, of which he became a member, for the remedy of abuses in mad-houses; in 1823, he became inspector-general of the University; and in 1825, first physician to the *Maison des Aliénés*. In the following year, he was also appointed principal physician of the Private Lunatic Asylum at Charenton, which he had organized with admirable skill. At the July revolution, he lost all his public offices, and withdrew into private life. He died 12th De-

cember 1840. E. combined, in a truly rare and wonderful manner, the qualifications requisite for a physician of the body and a physician of the mind. By his humane and moral treatment of the insane, he often effected the happiest cures. His writings embrace all the questions connected with the treatment of insanity. E. also paid great attention to a very important subject, viz., the construction of suitable buildings for the insane; and most of the modern lunatic asylums of France, such as those of Rouen and Montpellier, have been built according to his advice. His most important work is *Des Maladies Mentales considérées sous les Rapports, Médical, Hygiénique et Médico-légal* (1838).

ESQUIROS, HENRI ALPHONSE, a poet and romancer of France, a representative in the National Assembly, was born at Paris in 1814. He made his *début* as an author in 1834, when he published a volume of poems, entitled *Les Hirondelles*, which although highly praised by M. Victor Hugo, had but a very limited sale. *Les Hirondelles* was followed by two romances, *Le Magicien* (1837) and *Charlotte Corday* (1840). About this time he also published a philosophic and democratic commentary on the life of Christ, under the title of *Evangile du Peuple* (1840). For the publication of this work, E. was prosecuted, and sentenced to eight months' imprisonment and to a fine of 500 francs, 30th January 1841. In the same year he published his *Chants d'un Prisonnier*. He also wrote three little works between 1841 and 1842—these were *Les Vierges Martyres*, *Les Vierges Folles*, and *Les Vierges Sages*. His *Histoire des Montagnards* appeared in 1847.

After the revolution of February 1848, E. was elected a member of the Legislative Assembly. Distinguished by his radical opinions, he was included, after the 2d December 1851, among the number of members to be expelled; on which he retired to England. His *La Vie Future au Point de Vue Socialiste* appeared in 1857; and his *La Morale Universelle*, his *L'Angleterre et la Vie Anglaise*, and his *La Hollande et la Vie Hollandaise* in 1859. In 1869, he was returned to the Corps Legislatif for the fourth circumscription of the Bouches du Rhone; and was appointed supreme administrator of that department by the government of the National Defence in 1870. In 1871 he was returned to the National Assembly, and in Jan. 1876 was made a member of the Senate. He died 13th May 1876, at Versailles.

ESSAAD-EFFENDI, MOHAMMED, a Turkish historian, was born at Constantinople, 16th December 1790. He was surnamed Sahaf-Zadeh, 'son of the bookbinder,' on account of his father having been president of a corporation of bookbinders and librarians. At the age of 18, he became a teacher; in 1825 he was appointed historiographer to the Ottoman empire. In 1831, the superintendence of the *Tatavir-i-rekaii* (Table of Events), the official journal of the empire, was placed in his hands. In 1835, he was employed by the late Sultan Mahmoud on an embassy to Mohammed, the son and successor of the king of Persia. E. had also the titles of Grand Judge of Roumelia, Inspector-general of Schools, and member of the Council of Public Instruction.

The works of E. comprise, among others, the *Uss-i-Tzafer* (the Establishment of Victory), a work which has been translated into French, and published by M. Causin de Perceval, with the following title: *Historic Summary of the Destruction of the Janizaries by the Sultan Mahmoud in 1826* (Par. 1833).

E'SSEN, a town in Rhenish Prussia, situated between the Rhine and the Emscher, 20 miles north-east of Düsseldorf, stands in the midst of a rich coal and iron district. The town is surrounded by the high chimneys of the steam-engines used in working the mines. As it has risen only very recently to its present importance, its architectural beauties are not great; it has, however, an imposing cathedral, containing many curious reliquaries, crosses, &c. E. owes its prosperity to the inexhaustible coal-mines in its vicinity. Owing to this, there are in the neighborhood extensive works for all sorts of manufactures in iron. The enormous works of Herr Krupp, the discoverer of the method of casting steel in very large masses, who employs about 15,700 men, are at E. At them are manufactured many articles for peaceful purposes, but the gigantic steel guns which the Germans used with such terrible effect at the siege of Paris (1870—1871) have made the name of Krupp world-renowned. The annual production is about 130,000 tons of steel, and 26,000 tons of iron. Pop. (1880) 56,944. Although the industrial activity of E. is recent, the town itself dates from the foundation of the Benedictine nunnery in 873 A.D.

ESSENCE DE PETIT GRAIN is obtained by distillation from small nuripe oranges, about the size of a cherry, and is used as a perfume in the same manner as *Orange-flower Water*.

E'SSENCES are solutions of the essential oils in alcohol, and may be prepared (1) by adding rectified spirit to the odoriferous parts of plants, or to the essential oils, and distilling; or (2) simply by adding the essential oil to the rectified spirit, and agitating till a uniform mixture is obtained. Thus the essence of lemons is merely a solution of the volatile oil of lemons in rectified spirit.

ESSE'NES (*Essenoi, Essaioi*), a small religious fraternity among the Jews, whose name and origin, as well as character and history are alike involved in obscurity. Still, in the wide field of the history of the Semitic religions, there are not many subjects of inquiry of greater importance, or calculated to inspire a deeper interest. The Essenes bore one of the most momentous parts in the development of Judaism. Christianity stands in so close connection with them, that John the Baptist and Christ himself have been pronounced to have originally issued from their ranks. More surprising than all, out of Essenism, in the stage of Sabæism, has sprung Islam itself, and in the last development of its tenets and practices are still preserved some of its principle rites. It is but natural that from the days of the Fathers to our own, an infinite number of writers, more or less qualified for the task, should have endeavored to throw light on this mysterious brotherhood, but with success far from satisfactory. The reason of this is obvious enough. Josephus, Philo, Pliny, Solinus, Eusebius and the Fathers generally, were considered the sources, and the only sources, from which the genuine history of this fraternity could be deduced. Of these, Pliny indeed has a geographical notice, which cannot be traced to either Philo or Josephus; but the rest have so evidently derived their shallow and contradictory accounts indirectly, and through corrupted channels, from those two writers, that they lose all claim to consideration. Of the two books of Philo in which information regarding the Essenes is contained, one (*De Vita Contemplativa*) is proved to have been written about three centuries after Philo's death by a Christian monk as a panegyric on ascetic monachism. The other (*Quod Omnis*) is, to say the least, of doubtful genuineness, and is, moreover, at variance with Josephus. As to Josephus himself, it is now pretty generally allowed that his Essenes stand in much the same relation to the historical Essenes as the ideal inhabitants of the *Germania* of Tacitus stand to the real Germans of his time. Strange that for so many centuries the real and genuine sources—the Talmudical writings—should never have been thought of. These, together with Josephus and Philo, Pliny, and the Arabians Maerisi and Abulfarag, will perhaps better enable us to form an idea, not only of the real state of this community, but, what is of no less moment, to trace the process by which they gradually arrived at their peculiar mode of life and worship. We need not remind the reader that we must strictly confine ourselves here to an epitome of facts and conclusions.

We have to premise, that exception must at the outset be taken to the opening statement of Josephus, that there were three different 'sects' among the Jews: the Pharisees, the Sadducees, and the Essenes—a statement which has been copied and accepted from that day to the present. The Sadducees were a political party, nothing more nor less, and, as a matter of course, held religious views antagonistic to, or rather they did not accept the traditions of, their adversaries, the Pharisees, who, again, forming as they did, the bulk of the nation, cannot rightly be called a *sect*. Least of all were the Essenes such. They were Pharisees of stronger convictions, and carried out the Pharisaic views with a consistency which made them ridiculous even in the eyes of their own mother-party (Sota, 26, a.); neither were they known by the names of Essenes, this being a very late designation, derived either from a Chaldee word *Sacha*, and meaning Bathers, or Baptists; or from *Asa*, meaning Healers. The Mishna, Beraita, and Talmud speak of these advanced Pharisees in general as Chasidim (*Assidaioi*, Pious Men), Nazirim (Abstinent), Tobe Shacharich (Hemerobaptists), Banai (Builders), and Chaberim (Friends). The Arabic book of *Maccabees* calls the Essenes simply *Assidaioi*, and Maerisi speaks of 'Nazirs, Essenes, and Baptists' as all being 'Asanium,' or Essenes.

The Nazirhood, a kind of voluntary priesthood, enjoining abstinence from wine, flesh, and other sensual enjoyments, had, in the troublous times of anti-Syrian agitation, and the general upheaving of society, found numerous adherents (*Tosifta Nazir*, c. 4; *Talm. Babil. Berach.* 48, a. 1; *Macc.* ii. 49; *Jos. Antiq.* xviii. 1); and gradually there sprang up (contrary to the Bible, which restricts this asceticism to a certain period) a host of men calling themselves 'Nazirs for ever'—*Nazire olam* (*Nazir*, 4, a.). Pharisees of a spiritual and contemplative bias, with no natural taste for the conflicts and activity of political or public life, or wearied, perhaps, with the vanity of human aims, took this vow of Nazirship for life, and constituted themselves into a sort of religious club. Levitical purity in its strictest and highest sense made them draw closer and closer the innumerable 'fences' which the traditional law had erected round the biblical law. Any one, friend or foe, could at any moment, by having touched something impure, disturb this purity for the time, and necessitate new and endless purifications. Thus it became necessary, or at least expedient, that those among them who could break all ties of friendship and family, should retire into a solitude not easily approachable by a stranger to their community. Food, again, could not be prepared save by those of the brethren who knew and strictly obeyed the hyper-traditional injunctions. Their dress, every implement of

daily use, had to be made under similarly stringent laws of purity. A natural consequence of this their exalted notion of outward priesthood, was—the different phases of woman's life taken into consideration—their general celibacy. (The explanation given by Josephus—the fear of the corruption of both towns and women—is entirely gratuitous, and utterly in discordance with the Jewish notions of the time.) In this state of voluntary isolation, trading was out of the question; they tilled the ground, and lived on the fruits of the earth.

Taking their meals, and these of the coarsest and plainest description, in common, they idealized the table into an altar, and, prayer having been said, they remained standing silently round it during the repast. That they had no individual property, follows of course, and their communistic motto, which the Mishna (Aboth) has preserved to us—'Mine is thine, and thine is mine'—explains itself. We need not enlarge further on their small eccentricities—on the white linen garment, the apron (*kenaphaim*), the scoop or shovel; they are one and all, signs and symbols of Levitical purity, the scoop reminding us of a certain Mosaic ordinance during the wanderings in the desert, the apron becoming necessary from the frequent ablution of their hands. Every morning, they bathed, like the priests who ministered in the temple, in pure spring water. They abhorred blood as a source of impurity, and for this reason, probably, some of them abstained also from going up to the temple, where sacrifices were daily offered; others we find present at a festival in the temple (Succah, 51, 53). Their offerings were sent alive under the care of the messengers. But these were but outward signs of purity, stepping-stones to inner piety, to communion with God, which was only to be acquired, according to their notion, by solitude and an ascetic life. The belief in the efficacy of the most rigid simplicity and willing self-sacrifice, they held in common with the Pharisees; their horror of oaths, their frequent prayers, their occupation with mystical doctrine, were their own. Untroubled by the noise of war or the strife of parties, leading a life divided between the bath, ablutions, contemplation, and prayer; despising the body and bodily wants; what more natural than that by degrees they should be led into a kind of mystical enthusiasm and fanaticism. They allegorized, they symbolized; and their efforts culminated in seeing the unseen. Absorbed in the attempt to fathom the mysteries of the nature of God, one of their principal occupations was the study of the name of God; of that unpronounceable name which only the High-priest dared utter once a year in the Holy of Holies during the most awful and solemn service on the Day of Atonement. The knowledge of that name in four, in twelve, and in twenty-four letters, would give them the power of prophecy and of 'receiving the Holy Ghost.'

Angelology, derived from the Magi, formed a prominent feature of their creed. In course of time, they were looked upon by the vulgar as saints and workers of miracles. A wonderful book of cures (*Sepher Refuoth*), which Talmudic, Arabic, and Byzantine authorities alike ascribe to Solomon, was in their hands, and with this, 'by the aid of certain roots and stones,' by the imposition of hands, and certain whisperings—a practice strongly condemned by the Pharisees (*Synhedr.* 90, a.)—they cast out demons, and healed the sick. Philosophy they regarded in so far only as it treated of the existence of God.

Jehovah is the original light; from Him proceed a number of spirits (the Platonic Ideas), and at their head stands the Wisdom, or *Logos*, into which, after death, the soul is again absorbed. Their code of Ethics was threefold—the love of God, of virtue, and of man; their scale of perfectibility reaching its acme in the communion with the Holy Ghost (*Ruach Hakodesh*). (Mishn. Sota, 99). In fine, mixing up, in the strangest manner, the most exalted and the most puerile notions, they became the forerunners of the Christian Gnostics and of the Jewish Cabbalists, and, it may be, of many secret, still existing orders, who may have derived from this source their ceremonies and the gradations of initiation.

They seem never to have numbered more than 4000, including even those Nazirs or Essenes who remained in their own families. Their colony appears to have been established chiefly near the Dead Sea, and it is undoubtedly this colony which has served Josephus as a basis to his romantic Essene republic. But, however distant from each other they might be, a constant intercommunication was kept up through a body of delegates, or angels (*Malachim*). As they had sprung from the Pharisees, so they again merged into them—part of them, we should rather say; the remaining part became Therapeutæ, or Christians. See THERAPEUTÆ and JEWISH SECTS. The Talmud gives a distinct account of their ceasing to exist as a separate community (*Bechorot*, 27), and so soon after their extinction did they fall into oblivion, that in the third century we find a Jewish Sage asking who these *Hemerobaptists* had been (*Berachot*, 22, 1).

Much has been written and said of a certain literature which they possessed; on this we are unable to decide, deprived as we are of all trustworthy authority. One fragment only remains; it is quoted in the Talmud (*Jerush. Berachoth*. End) in the follow-

mg words: 'It is written in the Book of the *Chasidim*, If thou leavest it (the divine law) for one day, it will leave thee for two.'

In addition to the Talmud and Midrash, we refer the reader to Joseph. *Antiq.* xv. 10, xviii. 1; *Jew. War.* ii. 7, 8; Philo, *Quod Omnis Prob. lib* § 12; Plinius, *Hist. Natur.* v. 17; Epiphani, *Heres.* xxix.; Hieron., *Cyrril.*, Chrysost., &c. Beckermann, *Ueber die Ess.* (1821); the histories of the Jews by Lost, Ewald, and Grätz; articles by Franckel; Sprenger's *Leben Mohammad's* (1861); Leutbecher's *Die Essäer* (1857); the works of Reuss and Keim.

ESSENTIAL OILS. See OILS.

ESSEQUIBO, the most westerly of the great rivers of British Guiana, rises in the Acarai Mountains, 41 miles north of the equator, and after a course of 620 miles enters the Atlantic near the Venezuelan frontier, forming an estuary 20 miles wide, in which lie numerous fertile islands. The E. receives numerous large tributaries, as the Cuyuni and Mazaruni; on the Potaro, another affluent, is the magnificent Great Kaieteur Fall, above 700 feet in sheer descent, discovered in 1870. On the banks of the E. are forests of locust-tree, iron-wood, ebony, greenheart, and other fine timber trees, festooned with orchids, and laced together with lianas and other climbing plants. Beyond the forests are vast savannahs, formerly forests destroyed by fire, and now swamps of brushwood, reeds, and coarse grass.

The E. is navigable for large ships to the first cataracts, about 60 m. from the sea. The county of E. has not prospered so much as Demerara and Berbice. Many of the old plantations are out of cultivation. Pop. 27,000, exclusive of about 2000 Indians.

ESSEX, a maritime county of the south-east of England, having the North Sea on the E.; the Thames estuary, dividing it from Kent, on the S.; Middlesex and Hertford on the W.; and Cambridge and Suffolk on the north. Its greatest length from north-east to south-west is 63 miles, and the greatest breadth from east to west is 54 miles. It has 1,055,161 statute acres, nine-tenths being arable or in grass, and a twentieth in wood. The coast-line is 85 miles long. Some cliffs at the Naze are 35 feet high. The center and north of the county are beautifully diversified and richly wooded, the highest point being Langdon Hill, 620 feet above the sea. Besides the Thames, the other chief rivers are the Stour, 50 miles long; Blackwater, 46 miles; Lea, Roding, Crouch, and Chelmer. The east of the county is mostly on London clay, with limestone beds near Harwich. In the north-west, chalk appears. In the middle and north, there is much diluvium, with chalk fragments. Crag occurs near Harwich, and stones of phosphate of lime are found here and there. E. has few manufactures, except in the neighborhood of London, where are chemical works, tar, and other works of a kind that could not be carried on in a large scale within the metropolitan boundaries. The Thames Iron-work and Ship-building Company, near the new Victoria Docks, are another manufacturing feature of the county. At Colchester, there is a great silk-mill, as there are also at Bocking, Braintree, and Halstead. Tambour lace is made at Coggeshall and a few other places; there is straw-plaiting in some of the smaller towns, but the county has, notwithstanding, comparatively few distinctive manufactures. The chief crops are wheat, barley, oats, beans, potatoes, saffron, curaway, and hops. Great numbers of calves are fattened for the London market, and there are large sheep-flocks. E. has valuable oyster fisheries. Pop. in 1871, 466,436; in 1881, 575,930. The county is almost entirely in the diocese of Rochester. E. returns six members to parliament. E. was once forest-land, and the seat of a powerful tribe, the Trinobantes, whose famous chiefs, Caractacus and Boadicea, were overthrown by the Romans. E. constituted part of the Roman *Flavia Caesariensis*. It has afforded many Roman remains, and a Roman road once passed through Colchester, which was an important Roman station. The Saxon kingdom of Essex included London and parts of Middlesex, Hertford, Bedford, and Essex.

ESSEX, ROBERT DEVEREUX, EARL OF, son of Walter Devereux, first earl of E., was born at Netherwood in Herefordshire, 10th November 1567; entered Trinity College, Cambridge, at the age of ten, where he remained for four years. Lord Burleigh, to whose guardianship he had been intrusted, introduced the handsome and gifted youth at court in 1584. Here, by his agreeable manners, his appearance, and talents, he established himself among troops of friends, and gained the special favor of Elizabeth. In 1585, he accompanied the Earl of Leicester to Holland, where he distinguished himself at the battle of Zutphen, and on his return to England was made Master of the Horse and Knight of the Garter. After the death of Leicester, E. continued to rise in the favor of Elizabeth, who loaded him with honors. In 1591, he commanded the forces sent to the assistance of Henry IV. of France against the Spaniards, but achieved no success. The next few years were spent in endeavoring to get the better of Burleigh—the wisest, the most prudent, and the most politic of all Elizabeth's advisers. In 1596 he was appointed joint-commander with

Lord Howard in the expedition against Spain, to which Burleigh was strongly opposed; and though E. displayed all his wonted courage, and contributed to the capture of Cadiz, which caused immense loss to the Spaniards, yet the expedition resulted in nothing, and E. had to defend himself against various accusations on his return. In 1597, he was made Earl Marshal of England, and, on the death of Lord Burleigh, Chancellor of Cambridge. In 1598 occurred the first fatal mistake in E.'s career. Presuming upon Elizabeth's admiration and feminine fondness for his person, he differed from her about some trifling matter, and angrily and rudely turned his back upon her in the presence of some of the council, and her majesty, whose language was hardly more delicate than her father's, gave him a vigorous box on the ears, telling him to 'go and be banged.' A violent quarrel ensued, which, though apparently smoothed up, was never really so. E. was afterwards, in 1599, sent to Ireland—part of which at that time was in a state of rebellion—as lord-lieutenant of that country; but here his government was ill-advised and ineffectual, and after a few unimportant undertakings, he concluded a truce with the rebels, which was regarded at court as high-treason. In order to confront his enemies, he hastened back to London, contrary to the queen's express commands, and forced his way into Elizabeth's bedchamber. Justly offended, the queen deprived him of his dignities, and commanded that he should be called to account for his behavior. E. advancing from one degree of foolhardiness to another, tried to excite an insurrection in London. He was imprisoned, tried, and found guilty. Elizabeth long delayed signing the warrant for his execution, in the hope that he would implore her pardon. He was beheaded on the 25th February 1601, after defending himself with pride and dignity. E. was rash, bold, and presumptuous; but brave, generous, and affectionate, and the friend and patron of literary men.

ESSIOUT. See SIOUT.

ESSLINGEN, a manufacturing town of Germany, in the kingdom of Württemberg, is situated near the right bank of the Neckar, in the center of a pleasing and fertile district, seven miles east-south-east of Stuttgart. It consists of the town proper, and five suburbs, and is surrounded by strong walls, and fortified by towers. The chief buildings are the *Frauenkirche*—a splendid edifice in the purest Gothic style, built in 1440, and surmounted by a spire 230 feet high—the old and new town-houses, and the old castle. It has the greatest machine-making trade of the kingdom, has manufactures of a wine called Esslingen champagne, of woollens, and cotton and woollen yarns, lackered iron, silver-plate and tin wares, and paper, with a good trade in wine and agricultural produce. Pop. (1880) 20,758.

E. was founded in the 8th c., and received in 1209 the rights of a free city of the German empire. The long and bloody quarrel which existed between it and the House of Württemberg was brought to an end at the peace of Lunéville (1802), when E., with its territory, was assigned to the duchy of Württemberg.

ESSOUAN, or ESWAN. See ASSOAN.

ESTABLISHED CHURCH, a church established and maintained by a state for the teaching of Christianity in a particular form within its boundaries. Subsequent to the Reformation, many of the opinions which had given sanctity to the Church of Rome still kept possession of men's minds; amongst these was the notion, that the civil government of each state was bound to maintain a particular form of Christianity.—The same fallacious reasoning which in more recent times has led to the search for one absolutely best form of civil government was at work then with reference to the church. The Roman Catholic Church was not the best form—of that the Protestant states had become convinced—but all forms were not therefore indifferent; and if one was better than another, and another better than that, there must be an absolutely best, which the state was bound to discover, and when discovered, to substitute for that which had been abolished. The idea that the good or bad qualities of forms of government, whether civil or ecclesiastical, so long as they did not violate the fundamental doctrines of Christianity or morality, were relative, and not absolute, and that whilst one might be the best for men in one stage of development or of one particular temperament, another might be the best for those who differed from them in these respects, did not belong to that age. Each Protestant state consequently established a church, conformity to the tenets of which it enforced, not only upon those who as ministers were henceforth to enjoy the property which in Roman Catholic times had been devoted to the spiritual interests of the community, but very often on its own civil servants and advisers.

The benefit of the arrangement was, that, to a greater or less extent, the means which the community had set apart for its own spiritual improvement were protected from the spoliation of private individuals; and this benefit was secured more effectually the more completely the new church took the place of the old—in England, for example, better than in Scotland; but as each of the Protestant states had substituted one form of church-government

for another, and as the same form had not been adopted by them all, the idea of there being one form which was absolutely preferable to the others, though not abolished, was rudely shaken. In England, Queen Elizabeth had stated in her celebrated declaration, that she, as head of the church, 'would not endure any varying or departing in the least degree' from the doctrines of the Episcopal Church of England as set forth in the Thirty-nine Articles; and yet Presbyterianism was established in England in 1649. In Scotland, where Presbyterianism had at first taken root, Episcopalianism had more than once become the law of the land. The effect of such occurrences was to counteract the belief in any one form as the form for all Christendom, and to facilitate dissent and the formation of sects. The pastors of these sects were not at first recognized by the law as entitled to any of the privileges of Christian ministers. Whatever they might be to their own flock, to the state they were laymen, and their churches were mere secular lecture-rooms, or, at most, places of meeting for private devotion. See NONCONFORMISTS, DISSENTERS, CHURCH, &c. Gradually this view became modified, and the civil consequences attaching to sacred rites, when performed by a clergyman of the establishment, were extended to them when performed by dissenters. See MARRIAGE. But though many of the privileges, and all the liberties belonging to the established church, have now been extended to dissenting bodies, including Roman Catholics (see ROMAN CATHOLIC EMANCIPATION) and Jews (see JEW), the established churches of England and Scotland are supported by the state, and guarded from spoliation by the Coronation Oath (q. v.). The grant to the Roman Catholic college of Maynooth, and the *Regium Donum* (q. v.) to the Presbyterian minister in Ireland, were capitalized by the act (1869) which disestablished the Irish Church. There is no endowment to other religious denominations, as in France; and the emoluments of the established church in England, though modified in their distribution by the labors of the Ecclesiastical Commissioners (q. v.), have not yet been appropriated to any other than religious uses in connection with that church.

The cause of established churches is very generally maintained on the ground of the alleged duty of the state to provide for the religious instruction of the whole body of the people, as most essential to their moral welfare, and so to the general prosperity of the community. It is further argued, in support of the same cause, that civil rulers, or the people as associated in a free state, are under a moral obligation of the highest kind, to acknowledge God, his law, and his ordinances. Concerning which, and other arguments, for and against established churches, as far as it belongs to the scheme of this work to notice them, the reader is referred to the article VOLUNTARIISM. It may here, however, be observed, that the arguments just mentioned do not necessarily infer, even when admitted to the utmost, that the state is bound to support in any exclusive way a particular sect or denomination, unless, on the further assumption that religious truth and worth belong to that denomination alone. Nor does the *endowment* of a church by the state necessarily follow from the fullest adoption of the principles thus contended for. And, on the other hand, it is a point which may very reasonably be disputed, how far the common arguments against state endowments are applicable to those endowments which were not originally bestowed by the state, but which the state has, from a very early period, recognized as belonging to the church; a description which will be found to comprehend great part of the existing endowments of established churches. The exclusive possession of them by a particular denomination, and their rightful appropriation to religious uses, are, however, distinct questions.

ESTA'TE. In the law of England, an estate in lands, tenements, or hereditaments, signifies such interest as the tenant hath therein; so that if a man grants all his estate in Dale to A. and his heirs, everything that he can possibly grant shall pass thereby.—Blackstone, *Comm.* ii. 103. The first division of estates is into legal and equitable. By the former is signified the estate which a man has by the common law; by the latter, the interest which has been created by the operation of a court of equity. See EQUITABLE ESTATES, USES, TRUST. Legal estates are considered in England with reference to the quantity of the estate, the time of enjoyment, and the number of persons who may unite in the enjoyment. Under the first head, estates are either freehold or less than freehold. Freehold estates, again, are divided into freeholds of inheritance, or Fees (q. v.); and freeholds not of inheritance, or for life. An estate for life may be for the life of the person to whom it is granted, or for that of another person, or for more than one life. A person holding an estate for the life of another is called tenant *pour autre vie*. An estate *pour autre vie* being a freehold, descends, in case of the death of the tenant during the term, to his heir, and not to his executor. An estate by the Courtesy of England (q. v.), and an estate in Dower (q. v.), are estates for life. A conveyance to A. B., without mention of heirs, makes the grantee tenant for life. An estate to a woman during her wid-

owhood, or to a man until the occurrence of a specified event, as till he receive a benefice, will be construed to be an estate for life. Tenants for life are entitled to take Estovers (q. v.), but they must not commit Waste (q. v.).

The representatives of a tenant for life are also usually entitled to take the Emblements (q. v.) on the expiry of the term. Estates less than freehold are called also chattels real. This species of estate, on the death of the tenant, passes, like other Chattels (q. v.) to the executor, and not to the heir. They are divided into estates for years, estates at will, and estates on sufferance. See LEASES. Estates, with reference to the time of their enjoyment, may be either in possession or in expectancy. An estate in possession comprehends not only an estate in the actual occupation of the tenant, but one from which he has been wrongfully ousted. In this latter case, the law regards the rightful tenant as having the actual estate, to which is attached the Right of Entry (q. v.). An estate in expectancy may be either in REVERSION or REMAINDER (q. v.). Estates of this character form a large portion of the rights to land in England, and are the subject of some of the most subtle learning of the English law. With reference to the number of persons entitled to the enjoyment, estates may be in severalty, in joint-tenancy, in co-parcenary, or in common. An estate in severalty is where the sole right to the estate is in a single person. See JOINT-TENANCY, COPARCENARY, TENANCY IN COMMON.

ESTATE TAIL. See ENTAIL.

ESTATES OF THE REALM. The three estates of the realm are not King, Lords, and Commons, as is popularly believed, but the Lords Spiritual, the Lords Temporal, and the Commons. The ancient parliament of Scotland consisted of the king and three estates of the realm, by which latter was meant—1st, the archbishops, bishops, abbots, and mitred priors; 2d, the barons, under which head were comprehended not only the nobility, but the commissioners of shires and stewartries; and 3d, the commissioners from the royal burghs. All these assembled in one house, and formed one meeting, by a majority of the votes of which all matters, whether legislative or judicial, were determined.—Ersk. b. i. tit. 3, s. 2. *Bell's Dictionary.* See STATES.

E'STÉ (ancient *Ateste*), a town in the Italian province of Padua, situated on the southern slope of the Euganean Hills, 17 miles south-south-west of Padua. It is an old town, and has a decidedly Lombard appearance, many of the houses being supported by arches. It has several interesting buildings, among which the chief are the *Rocca*, or castle of Este, with a grim-looking donjon tower, overhanging the town, and the church of *San Martino*, in the Romanesque style, surmounted by a campanile, which slopes as much as the Leaning Tower of Pisa. Both church and tower have been sadly disfigured by an attempt to modernize them. E. manufactures silk goods, saltpetre, hats, and earthenware and has numerous silk-mills and whetstone quarries in the vicinity. Pop. about 6000.

E'STÉ, one of the oldest and most illustrious families of Italy, which, according to the historian Muratori, owed its origin to those petty princes who governed Tuscany in the times of the Carolingians, and who were in all probability of the race of the Longobards. The first whose figure is more than a mere shadow is Adalbert, who died about 917 A.D. The grandson or grandnephew of Adalbert, named Oberto, was one of the Italian nobles who offered the crown of Italy to Otho of Saxony. He is afterwards styled *Comes sacri palatii*, and appears to have been one of the greatest personages in the realm; he married a daughter of Otho's, and died about 972 A.D. In later times, the family of E. received from the emperors several districts and counties, to be held as fiefs of the empire. The family divided, at an early period, into two branches, the German and Italian. The former was founded by Welf or Guelfo IV., who received the investiture of the duchy of Bavaria from the Emperor Henry IV. in 1070. The Houses of Brunswick and Hanover, and consequently the sovereigns of Great Britain, also called Este-Guelfs, are descended from this person. In the 12th, 13th, and 14th centuries, the history of the E. family, as heads of the Guelf party, is interwoven with the destinies of the other ruling families and small republics of Northern Italy. During this period, they first gained possession of Ferrara and the march of Ancona (1208 A.D.), and afterwards of Modena and Reggio (1288—1289), and were widely celebrated as the patrons of art and literature. One of the most illustrious was Azzo VII., who encouraged Provençal troubadours to settle at his court at Ferrara, and also founded schools in that city. Alfonso I. (died 1534) was equally distinguished as a soldier and a statesman, and was celebrated by all the poets of his time, particularly by Ariosto. His second wife was the notorious Lucrezia Borgia. His quarrel with the Popes Julius II., Leo X., and Clement VII., was unfortunate, as an interdict was laid upon him for his adherence to the league of Cambray, and his papal fiefs declared to be forfeited. After the siege of Rome, in 1527, the duke was restored to his former possessions by Charles V.

His successor, Ercole or Hercules II., who married Renée, daughter of Louis XII. of France and Anne of Brittany, attached himself to Charles V. He and his brother, a dignitary of the Catholic Church, were also liberal patrons of art and science; the latter erected the magnificent Villa d'Este at Tivoli. The next prince, Alfonso II. (died 1597), would have been no ways inferior to the preceding but for his immoderate love of splendor, his inordinate ambition, and the cruelty he displayed towards the poet Tasso, whose eccentricities, however, it must be confessed, were enough to try the patience of any reasonable mortal. Alfonso IV., who flourished in the latter half of the 17th c., was very fond of the fine arts, and founded the Este gallery of paintings *Rinaldo* (died 1737), by his marriage with the daughter of the Duke of Brunswick-Lunenbourg, united the German and Italian Houses, separated since 1070.

The male line of the House of E. became extinct on the death of Ercole III. in 1803, his possessions having been previously seized by the French invaders, and annexed to the Cisalpine Republic. His only daughter married the Archduke Ferdinand, third son of Francis, emperor of Austria. Their eldest son, Francis IV., by the treaty of 1814—1815, was restored to the territories which had belonged to his maternal ancestors, comprising the duchy of Modena; and, on his mother's death, obtained the duchies of Massa and Carrara. He was succeeded by his son, Francis V., 21st January 1846. The connection which the family of E., like others of the small Italian principalities, had formed with Austria, gave it, of course, pro-Austrian sympathies, the result of which has been fatal to its popularity and dynastic existence. In 1860, the sentiment of Italian unity and independence, which for the previous 15 or 20 years had been steadily fostered by the policy of Sardinia, triumphed in a universal explosion of national feeling, which united the peninsula (with the exception of Rome and Venice) under the authority of Victor Emmanuel. Venice was added to the kingdom of Italy in 1866, and Rome became the capital in 1870.

ESTELLA, an ancient city of Spain, in the province of Navarre, is pleasantly situated on the left bank of the Ega, about 27 miles south-west of Pamplona. It is a well-built, clean town, with several squares, and has, in the environs, a variety of agreeable promenades and pleasure-grounds. It has two interesting churches, both old, and one of them, San Juan, a fine building with a very lofty tower. The manufactures are woollen and linen fabrics, brandy, and earthenware. A tolerable wine is made in the vicinity. E. has some trade in fruits, wool, hardware, and grain. Pop. about 7000. Here Don Carlos was proclaimed king in November 1833; and at E., again become a Carlist stronghold, battles were fought in 1874 and 1875. The city was taken by the Government troops in Feb. 1876.

ESTE'PA, a town of Spain, in the province of Seville, and 60 miles east-south-east of the town of that name. It is, on the whole, well built; has four squares, and numerous religious edifices, among which are the churches of Santa Maria and San Sebastian; the former, a noble specimen of Gothic, having three naves, and a richly ornamented interior. It has manufactures of coarse cloth, baize, and oil, with a trade in grain, fruits, oil, brandy, wool, and cattle. In the vicinity are marble and building-stone quarries. Pop. 8339.

ESTEPO'NA, a maritime town of Spain, in the province of Malaga, and 25 miles north-north-east of Gibraltar. It is well and regularly built; its streets wide, clean, and well paved. It supplies Gibraltar with fruits and vegetables; and its chief industrial features are its fishing, linen-weaving, and manufactures of leather. Pop. 9900.

ESTERHAZY, an ancient Hungarian family, afterwards raised to the rank of princes of the empire, the representative of which is at present the richest landed proprietor in Austria. The family divided into three main branches—the Esesznék, Altsóhl or Zolyom, and Forchtenstein lines. A descendant of the last family, Nicholas de Esterhazy, born in 1765, traveled over a great part of Europe, and resided for a considerable time in England, France, and Italy. He founded the splendid collection of pictures at Vienna. He also made a choice collection of drawings and engravings. When Napoleon, in 1809, entertained the notion of weakening Austria by the separation of Hungary, he made overtures to Prince Esterhazy respecting the crown of Hungary, which, however, were declined. The great Haydn composed most of his works at the court of Prince Nicholas. His son, Prince Paul Anton d'Esterhazy, born in 1786, entered at an early age on a diplomatic career. After the peace of Vienna, he went as ambassador to the court of Westphalia. From 1815 to 1818, he represented the Austrian government at London. He filled the same office between 1830 and 1838, and distinguished himself by his diplomatic tact and ability. In 1842, he returned home, and continued to exert himself in the cause of political and literary progress. In March 1848, he became Minister of Foreign Affairs, in the cabinet presided over by Batthyani; but when the struggle between Austria

and Hungary broke out, he exhibited more prudence than heroism by retiring from public affairs altogether. He died in 1866. The hereditary prince, Nicholas Paul Charles Esterhazy, born 25th June 1817, married Lady Sarah Villiers, daughter of the Earl of Jersey.

ESTHER (the word signifies 'the planet Venus') is the Persian name of Hadassah, daughter of Abihail, the son of Shimei, the son of Kish, a Benjamite. She is represented in Scripture as an orphan, and as having been brought up by her cousin Mordecai, an officer in the household of the Persian monarch Ahasuerus. Her history, as recorded in the book of Esther, is well known and extremely interesting. When the misconduct of Vashti had cost her her 'royal estate,' all 'the fair young virgins' of the kingdom were gathered together that Ahasuerus might choose a successor. He selected Hadassah, who received the name of E. on account of her loveliness. The great event of her life was the saving of her Jewish countrymen from the horrors of that universal massacre planned by the malice of Haman, and consented to by the thoughtless cruelty of an Oriental despot. The details of this event are too familiar to require narration. It is sufficient to say that E.'s success was signal; and the feast which she and her cousin Mordecai appointed in memory of their deliverance—viz., the feast of Purim (i. e., of Lots), is, in consequence, celebrated with great enthusiasm. E. is not mentioned in profane history, whence it has been inferred by some that she was not exactly the wife of Ahasuerus (Xerxes), but rather the favorite of his harem, to which she undoubtedly belonged; for, as we read (ii. 8), E. was consigned 'to the custody of Hegai, keeper of the women.' This hypothesis is rendered probable by the fact, that the Persian kings did not choose wives from their harem, but from the principal Persian families, or else from the daughters of foreign potentates.

ESTHER, BOOK OF, one of the very latest of the canonical works of the Old Testament, and commonly, but without a shadow of evidence, supposed to be written by Mordecai or Ezra. This is the view of Abenesra, Clement of Alexandria, Augustine, Gerhard, and others. The Talmud assigns the authorship to the members of the Great Synagogue, a semi-mythical body, who are made use of by Jewish rabbis and Christian divines as a sort of *Deus ex machina* to solve every difficulty. According to the opinions of the most learned and unprejudiced critics, the date of its composition must be placed after the downfall of the Persian monarchy. The language is much later than that of Ezra and Nehemiah, and the fact of occasional explanation of Persian customs fits the period of the Seleucidæ better than an earlier one. The Hebrew text is that which has been followed in the English version; but the Septuagint is full of late interpolations and additions by Alexandrian Jews. The book is held in the highest reverence by the Jews; so much so, that Maimonides declared that, in the days of the Messiah, every Jewish scripture would be forgotten except the book of Esther and the Pentateuch. The book is not written in a theocratic spirit, like the rest of Jewish literature. Nothing is directly attributed to God; in fact, his name is not once mentioned. Neither is there the remotest trace of religious feeling of any kind. Luther, in his usual off-hand hasty way, expressed his contempt for the book, in spite of the admiration which the Jews bestowed on it, censuring it for its 'heathenish extravagance,' and declaring that, in his judgment, it was 'more worthy than all of being excluded from the canon.' The absence of all recognition of God, perplexed some of the ancient Jewish commentators, who therefore invented the hypothesis, that the book was originally a part of the Persian chronicles, probably executed by Mordecai; and that, being intended for the heathen, the sacred name was wisely left out!

ESTHONIA, called by the inhabitants themselves *Wiroma* (i. e., the Border-land), a Russian government, and one of the Baltic Provinces (q. v.), extends immediately south of the Gulf of Finland; has an area of 7787 square miles, and a population (1880) of 353,108. It was conquered (1182—1244) by the Danes, who sold it to the Teutonic knights in 1346. It came into the possession of the Swedes in 1561, but was taken from them by Peter the Great in 1710; and by the treaty of Nystadt was finally secured to Russia in 1721. One-third of the entire surface, which is in general flat, is under cultivation, and produces great quantities of rye and barley; the remaining two-thirds are chiefly composed of sandy tracts and marshes, strewn in many places with large blocks of granite; there are also extensive forests of birch and pine. The government of E. is divided into four circles; its principal town is Revel or Reval (q. v.).

The inhabitants are divided into Esthlanders and Esths. The former are a mixture of Swedes, Germans, and Russians, and comprise the nobles and the town-populations. The latter belong to the Finnish race, and are the original possessors of the soil. Their language is soft and musical, and is divided into two leading dialects, that of Revel and that of Dorpat. They also possess a literature rich in splendid national songs. See Neus, *Esthnische Volkslieder* (Reval, 1850—1851). They are industrious,

kind-hearted, and in the main religious and attached to the Protestant doctrines. A great part of Livonia is peopled with Esths, the entire number of whom in the Baltic provinces is about 650,000.

ESTO'C (Italian), a small dagger worn at the girdle, called in Elizabethan times a tucke.

ESTOILE, or STAR, in Heraldry, differs from the Mullet (q. v.) by having six waved points; the mullet consisting of five plain points.

ESTO'PPEL, an impediment or bar to a right of action, arising from a man's own act. It is called estoppel or conclusion, because a man's own act or acceptance stoppeth or closeth up his mouth to allege or plead the truth.—*Co. Litt.* 352 a. Estoppels are of three kinds.—1. By matter of record, where any judgment has been given in a court of record, the parties to the suit are estopped from afterwards alleging such matters as would be contradictory to the record. 2. By matter in writing. Thus, a party who has executed a deed will be precluded from afterwards denying, in any action brought upon that instrument, the fact of which it is evidence. 3. By matter in *pays*, as by livery, by entry, by acceptance of rent, &c.—by any of which acts a man is barred from pleading anything to the contrary. The principle of estoppel is that what a man has once solemnly alleged is to be presumed to be true, and therefore he should not be suffered to contradict. The doctrine of estoppel prevails in America as well as in England. In Scotland also, the same principle is recognized under the name of Personal Exception (q. v.).

ESTO'VEY (Fr. *Estoffer*, to furnish), an incident to the estate of a tenant for life or for years. It is the right which the tenant has to make use of the wood on the estate for certain definite purposes. Estovers, or *botes* (Saxon), are of three kinds—housebote, which is twofold—viz., *estoverium edificandi et arandi*, a right to wood for fuel and repairs of the house, ploughbote, *estoverium arandi*, wood for ploughs and carts; and haybote, *estoverium claudendi*, wood for repairing hedges and fences.—*Co. Litt.* 41 b.

ESTREA'T (Lat. *extractum*), in English Law, a true extract copy or note of some original writing or record, and specially of fines or amercements, as entered in the rolls of a court, to be levied by bailiffs or other officers. When, however, it is applied to a Recognizance (q. v.), it signifies that the recognizance itself is entreated, or taken out from among the other records, and sent to the Exchequer.—Blackstone, *Comm.* iv. 253. If the condition of a recognizance be broken, the recognizance is forfeited; and on its being estreated, the parties become debtors to the crown for the sums in which they are bound.—Archbold, *Crim. Practice*, 78. The Court of Exchequer has power over penalties and forfeitures incurred at assizes, and can discharge or compound them at its discretion; but that court has no power over recognizances forfeited before justices of the peace.

ESTRÉMADU'RA, previous to the new distribution of the country, a province of Spain, situated between Portugal and New Castile, and watered by the Tagus and the Guadiana. It is bounded on the N. by Leon, on the S. by Andalusia, and, since 1833, has been divided into the two provinces of Badajoz and Caceres. It has an area of 16,554 sq. miles, and contained, in 1877, 739,403 inhabitants. Although a continuation of the high tableland of New Castile, E. is not, like it, a uniform plain, but is mountainous on the north and south, and is well watered, the slopes of the hills being covered with wood, and the valleys with rich grass. Notwithstanding the fertility of the soil, the land has lain desolate and uncultivated ever since the expulsion of the Moors in the 13th century. This is chiefly to be attributed to the Mesta, or right of pasture, which causes the land to be regarded as the common property of the possessors of flocks. The breeding of goats, swine, horses, asses, and mules is much attended to. Silk and honey form no inconsiderable branches of trade. Corn is still imported. The mines, which were formerly very productive, are no longer wrought. Commerce is confined almost entirely to a contraband trade with Portugal. The inhabitants are poor, and, from the want of roads, isolated from the rest of Spain, and consequently in a low state of civilization. They make excellent soldiers, however, and have produced a series of brave *conquistadores* and generals.

ESTRÉMADURA, next to Alentejo, the largest province of Portugal, has an area of 6907 square miles, and, including the capital, Lisbon, contained in 1878, 951,545 inhabitants. The greater part of the country is hilly, but the hills do not attain any great elevation. To the west of the estuary of the Tagus are the granite mountains of the Serra da Cintra, varying from 1500 to 1800 feet in height, and terminating in the Cabo de Roca. To the south of the Tagus are barren moors, partly broken by morasses, and the limestone chain of Arrabida, rising to a height of 1000 feet, and terminating in the Cabo de Espichel. Many districts are extremely fertile, others are barren and uncultivated.

The Tagus, which is only navigable as far as Abrantes, receives the waters of the Zezeres, the Sorraya, and the Canha, and is strewn with islands at its mouth. The chief productions of the country are wine, oil, fruits, corn, and cork; but even the sandy plains are covered with cistus, rosemary, myrtles, and other flowering and fragrant plants. The breeding of cattle is not much attended to. The minerals are marble, coal, and sea-salt. This province has been frequently visited by earthquakes.

ESTREMO'Z, a fortified town of Portugal in the province of Alentejo, is 23 miles north-east of Evora, and about the same distance east of Elvas. It is built round the base of the hill on which its once formidable castle, erected in 1360, is placed. It now ranks as the fourth or fifth stronghold in Portugal. E. is famous for its manufactures of earthenware; its jars, which are made of a porous clay, and have the property of keeping water singularly cool, are of elegant shape, and are used all over the peninsula. The earthenware manufactures of E. seem to have continued unchanged since Roman times, as until the present day the forms into which the jars are cast are purely classical. In the neighborhood of E. is a marble quarry. Pop. (1878) 7278.

ESZEK, a royal free town of Slavonia, on the right bank of the Drave, twelve miles above its confluence with the Danube, is the administrative capital of the 'Kingdom,' and the most prosperous trading-town of Slavonia. Since the Drave began to be navigated downwards to E. by steamers, the town has driven a prosperous trade in corn, wood, pigs, iron, deals, wine, and flax. The fortress of Eszek, known in Roman times under the name of Mursia, is protected by a fort situated on the left bank of the Drave. In the fortress, the commander's dwelling and the town-house, and in the lower town the county buildings, are specially worthy of mention. During the Hungarian revolution, the town was at first held by Count Casimir Batthyányi, but capitulated, after a siege of several weeks, to the Austrian general. Pop. (1800) 18,000; more than half are Roman Catholics, the rest being Greek Catholics, Protestants, and Jews. *Eszeq* is the Hungarian spelling of the Slavonian name *Essek*.

ETAMPES (anc. *Stampa*), a town of France in the department of Seine-et-Oise, is situated 32 miles south-south-west of Paris, on the Orleans Railway. It consists mainly of one street about four miles long. The chief buildings are the ecclesiastical edifices. E. possesses a public granary, capable of containing 1400 tons of wheat. In and around E. there are upwards of 40 flour-mills, constantly employed in providing for the Paris market; considerable quantities of garden-stuff are sent from this neighborhood to the capital. Pop. (1876) 7399.

ETANG DE BERRÉ, a salt-lake of France, in the south of the department of Bouches-du-Rhône, communicates with the sea by a narrow channel, called Tour-le-Bouc, and is 11 miles long by 9 broad at its widest part. This lake contains great quantities of eels and other fish. Salt works are in operation on its banks.

ETAWAH, a town of the Doab, stands near the left bank of the Jumna, about 70 miles below Agra, in lat. 26° 46' N., and long. 79° 4' E. Though it is, on the whole, a dreary and mean place, yet it presents some remains of ancient grandeur, more particularly many of those ghats or flights of stairs which facilitate the approach to the river for the purpose of ritual ablution. It contains (1872) 30,549 inhabitants; and its prosperity, such as it is, is owing chiefly to its position at the junction of the two roads which lead to Agra from Cawnpore and Calpee.

ETAWAH, or ITAWA, the district of which the above town is capital, belongs to the lieutenant-governorship of the North-west Provinces. It lies entirely in the basin of the Jumna, and almost exclusively within the Doab, stretching in N. lat. from 26° 21' to 27° 9', and in E. long. from 78° 46' to 79° 49', and containing 1691 square miles, and (1871) 668,641 inhabitants. The district was at one time famous for the murderous fanaticism of the Thugs, 67 corpses of their strangled victims having been found in the wells during a single year.

ETCHING. See ENGRAVING.

ETCHING UPON GLASS. See GLASS.

ETHELBERT, king of Kent, and fourth in direct descent from the great Hengist, was born in the year 552, and succeeded to the throne in about the eighth year of his age. The representative of the first Saxon king who ruled in England, and envious on that account of the title of Bretwalda, then enjoyed by Ceatwin of Wessex, E. rashly undertook an expedition against that king in 568, a venture which, had he known the extent of country covered by the West Saxons, he would probably never have made. The rival kings met at Wibbandune, now Wimbledon, in Surrey, where a great battle took place, resulting in the defeat of Ethelbert. This is recorded as being the first battle that ever occurred between Anglo-Saxon sovereigns. Taught by disaster and danger, E. became more prudent. His subsequent schemes were more successful, and, about the year 590, he was acknowledged as Bret-

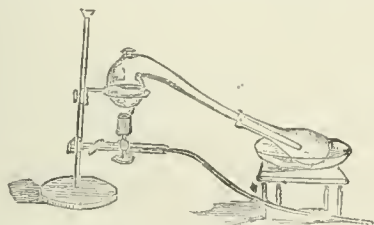
walda of the Saxon octarchy, a dignity which he maintained to the close of his reign and life. In 570, E. married Bertha, a Frankish princess. The lady was a Christian, and it is said had stipulated, as a condition of her marriage, that she should be allowed, after her arrival in Kent, to practise her own religion. Her amiable piety had completely disarmed E. of all violence against the Christian religion long before the most important event of his life took place, viz., the formal introduction of Christianity into his kingdom. This was effected by means of the ministrations of St. Augustine, who was sent to Britain by Pope Gregory, and who landed in Kent in 596. In the following year the king himself was converted, and Christianity established among the hitherto pagan Saxons. After his conversion and baptism, he founded the bishopric of Rochester, and in concert with his nephew Sebert, king of Essex—who also had been converted—erected the church of St. Paul's in London. He died in 616.

E. is also distinguished as the author of the first written Saxon laws. These are the *Dooms*, as they are called by Bede, 'which he established with the consent of his Witan in the days of St. Augustine.' They are in the Saxon language, and are the earliest written laws that exist in any modern tongue.

ETHELRE'DA, ST., a daughter of the king of the East Angles, in the 7th c. canonized for her saintly virtues, and whose festival in the calendar is October 17. Her name was popularly abbreviated or corrupted into St. Audrey. At a fair in the Isle of Ely, called after her St. Audrey's Fair, it was customary to sell a common kind of lace, which came to be known as St. Audrey's lace. *Tawdry*, as applied to any inferior kind of frippery, is believed to be a corrupt use of the term St. Audrey.

ETHER (otherwise called ETHYLIC ETHER, VINIC ETHER, and SULPHURIC ETHER) is prepared from alcohol by the action of sulphuric acid at an elevated temperature. On a small scale, the apparatus which may be employed for the purpose is the retort and receiver, into which a mixture of equal weights of spirits of wine, or rectified spirit and oil of vitriol, or, by volume, 2 of alcohol and 1 of sulphuric acid, are placed, and heat being cautiously applied, a liquid distils over, which consists of ether and water. In a short time, the contents of the retort begin to blacken, and the operation must be stopped, or the distillate will become contaminated with sulphurous acid. On the large scale, a modification of the process is carried on, which renders it theoretically a 'continuous process,' though, practically, there is a limit to the amount of ether distilled over.

The conversion of alcohol ($C_4H_{10}O$) into ether ($C_4H_{10}O$) and water (H_2O) by oil of vitriol (H_2SO_4), was at one time considered to be due simply to the strong affinity of the oil of vitriol for water, which enabled it to take possession of the one atom of water,



the elements of which form the only difference in the ultimate composition of alcohol and ether. This simple mode of explaining the process of etherification, however, does not acknowledge that the atom of water is not retained by the oil of vitriol, but is given off side by side with the ether in mechanical solution therewith. The theory of the process now generally accepted is too complex for introduction here.

Ether is a colorless, transparent, volatile liquid of great mobility and high refractive power, and possessing a fragrant odor, and a fiery, passing to a cooling, taste. When pure, it has the specific gravity 720 (water = 1000) at 60° F., though the commercial specimens are never free from water and alcohol, and have the density 740. It boils at 94.8° F. (the commercial at 96°), and yields a very dense vapor, the specific gravity of which is 2586, as compared with air 1000. When reduced to a temperature of -24° F.; ether freezes. It volatilizes spontaneously when placed in an unconfined position, as in the palm of the hand, and vaporizes so quickly as to produce intense cold. Indeed, when water is covered with ether, and the latter assisted in its evaporation by being blown upon, it escapes so readily as to reduce the temperature of the water to 32° F., when it freezes. It is very inflammable, burning with a yellow-white flame; and mixed with air or oxygen, it gives rise to a dangerous explosive mixture, and hence great care requires to be taken in its distillation to keep all lights and fires out of the room where the vapors are condensing. When ether is added to its own bulk of water, briskly agitated, and allowed to settle, the two liquids appear to separate again;

but it is found that the ether has taken up one-eighth of its volume of the water, whilst the latter has dissolved the same quantity of ether. It is readily miscible with alcohol in all proportions. Ether is one of the best solvents for the oils and fats, and hence is employed in analysis for the solution and separation of the oils from other organic matters, as in the analysis of oil-cakes, &c. It is also a good solvent of iodine, sulphur, phosphorus, and of strychnine, and other alkaloids, as well as of corrosive sublimate, and other salts.

Ether is useful in the preparation of freezing mixtures, and the mixture of ether and solid carbonic acid gives rise to the lowest temperature which has as yet been attained. When inhaled by man and the lower animals, ether first produces stimulating and intoxicating effects, but afterwards it gives rise to drowsiness, accompanied by complete insensibility, which entitles ether to be regarded as an important anæsthetic agent; and, indeed, for some time it was the only agent used for producing Anæsthesia (q. v.) in operations, but has been entirely superseded by the employment of chloroform.

Ether enters into combination with many acids, forming compound ethers, possessing great fragrant, the more important of which are given in the following table:

Acetic Ether, . . .	$C_4H_8O.C_2H_3O_2$	
Butyric Ether, . . .	$C_4H_8O.C_4H_7O_2$	Pine-apple Oil.
Caproic Ether, . . .	$C_4H_8O.C_6H_{11}O_2$	
Rutic Ether, . . .	$C_4H_8O.C_{10}H_{19}O_2$	Essence of Melons.
Pelargonic Ether, . . .	$C_4H_8O.C_{18}H_{37}O_2$	Essence of Quinces.
Ceanthie Ether, . . .	$C_4H_8O.C_{14}H_{29}O_2$	Wine Oil.

There are other ethers, in which ordinary ether is not one of the members, as

Amyl Acetic Ether, . . .	$C_{10}H_{22}O.C_4H_7O_2$	Jargonelle Pear Oil.
Amyl Valerianic Ether, . . .	$C_{10}H_{22}O.C_{10}H_{19}O_2$	Apple Oil.
Methyl Salicylic Ether, . . .	$C_2H_5O.C_7H_7O_2$	Oil of Winter Greens.

ETHER, sometimes ÆTHER, the name given to the medium which is assumed in astronomy and physics as filling all space. It was shown by Newton, that if light consisted of material particles projected from luminous bodies, these must move *faster* in solids and liquids than in air, in order that the laws of refraction might be satisfied in their motions. Huyghens, on the other hand, showed, that to account for the same laws on the supposition that light consisted in the undulatory motions of an elastic medium, it must move more *slowly* in solids and fluids than in gases. Fizeau and Foucault have lately, by different methods, measured these velocities relatively, and have found Huyghens's prediction to be correct. Light, then, consists in the vibratory motion of a medium, which must, of course, fill all space. This is called Ether. As yet, we have no idea as to its ultimate nature; some of our greatest philosophers, even, have supposed that it may be of the class of ordinary gases, and that our atmosphere, for instance, is not finite in extent, but pervades, with greatly reduced density, all interplanetary and interstellar space. Many objections, however, may easily be raised against this supposition. Meanwhile, we may remark that the mathematical theory of light, on the hypothesis of undulations, requires that the vibrating medium should possess properties more nearly allied to those of an elastic *solid* than those of a liquid or a gas. The ether being *required* for the explanation of the existence and the propagation of light, it becomes a matter of importance to inquire how many more of the physical forces may be referred to the same cause or medium. Radiant heat most certainly may, and in all probability, gravitation, molecular actions, magnetic, electric, and electro-dynamic attractions and repulsions, are also to be thus explained. As to sensible and latent heat, electricity and magnetism themselves, the necessity is not so clear; but even these have been of late *almost* satisfactorily explained by the hypothesis of the all-prevailing ether. See FORCE. In the article just referred to, a good deal more will be found with reference to this subject, and especially with reference to the impossibility of the ether's consisting of air or other gases, which are made up of distinct and separated particles.

ETHICS, a word of Greek origin, meaning nearly the same thing as the more familiar term *Morals*. The science, treating of the nature and grounds of Moral Obligation, and expounding our various duties, is called sometimes by the one term, and sometimes by the other. This is a subject wherein opinions so different from each other have been, and are still held, that a writer's task must lie first in explaining what are the chief points in dispute, and next in giving an account of the positions taken up by the opposing schools.

There are two distinct questions connected with the Theory of *Morals*. The first is the properly ethical question, and is, what is the *criterion of a moral act*? otherwise expressed as the *moral standard*—the circumstance determining an action to be *right*, and not *wrong*, nor simply indifferent as regards right and wrong. What determines us to single out some conduct as the subject of *moral approbation*, and other conduct as the subject of *moral dis-*

approbation? We consider murder, theft, breach of promises or contracts, resistance to authority, cruelty, ingratitude, slander, holding of slaves, polygamy, to be wrong, or immoral; and the science of ethics is called upon to assign the reason, or reasons, why these various actions are so accounted.

The other question is properly psychological, in other words, relates to the constitution of the human mind. It is, by what faculty of our nature do we recognize this difference in actions? Is it by one of our ordinary intellectual faculties, such as Reason? or by some of our emotional susceptibilities, as Love and Hatred? or by a mixed faculty like Prudence? or by something peculiar and distinct, relating to this one object and no other, as the eye is formed for recognizing color, and the ear for sound? This question has been often improperly mixed up with the other, although there are certain theories wherein the answer to the first depends on the answer to the second.

As regards the Standard of Morals, it should be premised that Punishment for neglect is what shows an action to be obligatory. We may dislike a man's conduct; but if we do not consider it deserving of punishment, it is not immoral in our eyes. People's imprudences, whereby they hurt themselves alone, are disapproved of; but there is seldom any disposition to step in by way of penalty in order to prevent such conduct; the disapprobation, therefore, is not of the moral kind. The punishment inflicted by society is partly legal, or through the civil government, and partly by public opinion, which, by attaching a stigma to certain conduct, is able to inspire no less dread than the civil authority. The punishment, by society acting in this way, is sometimes called the popular sanction, to distinguish it from the legal sanction. *Dishonor* is another name for the same thing. Many kinds of conduct tolerated by law, are still punished by the loss of public esteem and the infliction of disgrace. Cowardice, eccentricity, heterodoxy beyond certain limits, expose the individual to public censure. Many kinds of inhumanity, as maltreating dependents, have no other check than expressed disapprobation.

There have been various theories to account for the singling out of some actions to be authoritatively forbidden by Law and Society—that is, forbidden by the sanction of punishment. Some have said that the will of the Deity, or divine revelation, has indicated what we are not to do, and that there is nothing left to us but to conform to what is thus prescribed; others, as Cudworth, maintain, on the contrary, that what the Deity commands must be such as our own conscience approves, otherwise we could not give Him the character of being independently good and just. It has been said that Right Reason shows us the difference between right and wrong; this was Cudworth's own view. Samuel Clark conceived that there was an eternal and intrinsic fitness in the things considered as right, and an unfitness in the wrong, 'with a regard to which the will of God always chooses, and which ought likewise to determine the wills of all subordinate rational beings.' Both these writers aimed at replying to Hobbes, who had maintained that the Civil Magistrate is supreme in Morality as well as in Politics; meaning, however, in all probability, that the magistrate himself ought to frame his dictates in one, as in the other, with a view to the public good, which would be a Utilitarian view. The phrase, 'the Moral Sense,' which now represents perhaps the most prevalent moral theory, occurs first in Lord Shaftesbury's *Inquiry Concerning Virtue*, from whom it was adopted by Hutcheson, and has since passed into general currency. Sometimes it has been maintained that a regard to Self-interest is the only ultimate rule of right, which has a very different meaning, according as we look at self exclusive, or inclusive, of other men's well-being. The most enlarged benevolence, in one view, is but an aspect of self. Adam Smith, in his *Theory of Moral Sentiments*, laid down as the criterion of right, the 'sympathetic feelings of the impartial and well-informed spectator.' But although this theory acknowledges our bias in the capacity of agents, it presumes us to be infallible when acting as judges or critics, a position by no means self-evident. The spectator has his own failings as well as the actor, unless specially qualified by nature and education to play the part of a moral judge. But to pass on, Jeremy Bentham is known as the most distinguished propounder of the principle of Utility as the basis of morals, a principle explained by him as in contrast, first to Asceticism, and next to 'Sympathy and Antipathy,' by which he meant to describe all those systems, such as the Moral Sense theory, that are grounded in internal feeling, instead of a regard to outward consequences. In opposing Utility to Asceticism, he intended to imply that there was no merit attaching to self-denial as such, and that the infliction of pain, or the surrender of pleasure, could only be justified by being the means of procuring a greater amount of happiness than was lost. Paley also repudiated the doctrine of a Moral Sense, and held that virtue is 'the doing good to mankind, in obedience to the will of God, and for the sake of everlasting happiness.' The utilitarian theory of Bentham, with various modifications, has been defended and expounded by James Mill, in his

Analysis of the Human Mind, and in his anonymous *Fragment on Mackintosh*; by John Austin, in his *Province of Jurisprudence Determined*; and by Mr. John Stuart Mill in his *Dissertations and Discussions*, and in *Fraser's Magazine* (Oct. to Dec. 1861).

The great controversy may be said to lie between the adherents of the Moral Sense in some form or other, and those that deny both the existence of a separate faculty in the mind for perceiving moral distinctions, and the validity of the determinations of the individual conscience; maintaining that morality ought to be founded on a regard to the wellbeing of mankind, and that exclusively; and that rules of morality grounded on any other motives are indefensible. In short, the question is, Is morality an intuition of the mind, or is it like the government of the state, a positive institution, on which different societies may differ, and which may be set up or be abrogated at the pleasure of the society?

The theory of Intuitive Morality was vigorously assailed by Locke in his *Essay on the Understanding* (book i. chap. 3); and we may venture to say that his objections to what he called 'Innate Practical Principles' have never been answered. These objections have been given in a condensed form by Paley (*Moral Philosophy*, book i.). Locke urged that, in point of fact, there are no principles universally received among men; that moral rules require a reason to be given for them, which ought not to be necessary, if they are innate; that virtue is generally approved of, not because innate, but because profitable; that innumerable enormities have been practised in various countries without even causing remorse; that the moral rules of some nations are flatly contradicted by others; that no one has ever been able to tell what the innate rules are; that we do not find children possessed of any moral rules, &c. It has been attempted to reply to the objection, founded on the great variety and opposition of moral rules in different places and times, by saying that although the substance of the moral codes differ—one part of the world being monogamous and chaste, while other nations allow promiscuous intercourse of the sexes—all agree in enjoining some moral rules; nowhere is there an absence of social and moral obligations. But this is to depart from the original question, which was to assign the standard of morals, the criterion for determining which of two opposite courses—monogamy or polygamy—is the correct or moral course. The intuitive moralists say that human nature is endowed with an instinct which at once approves the right and disapproves of the wrong, and that we need go no further than our own conscience to settle the point. Now, when the existence of contradictory consciences is pointed out, it is not to the purpose to say that these are still consciences, and indicate something as obligatory; this all admit: what we desire is, to determine which we are to follow.

Dr. Whewell, in his *Elements of Morality* has proposed a way out of this serious difficulty by setting up a supreme or Standard Conscience, by which the individual conscience may be squared and corrected; but he has not told us who are the men whose conscience is the standard; it being obvious that the human race, as a whole, do not recognize any such, although each separate community might consent to take some of its most estimable citizens, or the interpreters of its religious code, as models to conform to.

The following is one view of the nature and origin of our moral principles which would seem free from the grave objections above alluded to. If we set aside for the present the question as to the proper standard of morals, the criterion that we should consider the right criterion, if we had to enact a code of morals for the first time, and if we look at the moral principles that have prevailed in different nations and times, we shall find that they have been dictated from two distinct kinds of motives. The one is Utility, in the sense of common safety of men living in society. The prohibitions against manslaughter, theft, breach of bargain, rebellion, are necessary, wherever men have formed themselves into communities; and it is the agreement in such matters as these—although subject still to very great varieties—that makes up the amount of uniformity actually observed in the moral codes of nations. If the society did not agree to protect life and property, by punishing the murderer and the thief, nothing would be gained by coming under the sway of Government, and human beings would not be got to associate themselves in tribes or nations. The common end gives a common character to the means, without supposing a special instinct to suggest that stealing is wrong. But, in the second place, there have been, in the moral codes of all countries, prohibitions not connected with any public utility, but prompted by strong sentimental likings or aversions, which have acquired the force of law, and are made the foundation of compulsory enactments. Of this kind is the antipathy of the Jew and the Mohammedan to the pig, the Hindu repugnance to animal food generally, and the usages of a merely ceremonial kind prevailing among many nations, which are as stringently enforced by law and public opinion as the sacredness of life and property. For a woman, among the Mussulmans, to expose her face in public, is as great an offence as going naked would be with us; while,

among savage tribes, in warm climates, where clothing is little required, it is no shame to expose the whole person. For these practices, no reason can be given; the public sentiment has determined some things to be right and others wrong, without reference to any public or private utility; and it is in these enactments, founded on liking or disliking, that nations having differed most widely, the difference often amounting to contrariety. The ancient Greeks held it as a sacred obligation to drink wine in honor of Dionysus (Bacchus); the Nazarenes among the Jews and the Mohammedans entertained an opposite view. A legislator for the North American Indians might prohibit alcoholic liquors on the ground of public utility, the natives not being able to control themselves under stimulants; but the prohibition of wine in those other instances is probably a species of asceticism, or an aversion to human pleasures as such which belongs to the domain of sentiment, and not to the consideration of utility.

Looking at the many capricious injunctions that owe their origin to fancies such as these, it may be doubted whether the human race can ever gain anything by departing from the principle of utility as the sole criterion of good morality; and there is an increasing tendency to recognize the supremacy of this principle both in Morals and in Legislation. Justice, truth, purity, although sometimes viewed sentimentally, or as being ends themselves, are in men's practice looked upon more and more as of the nature of *means*, the promotion of human happiness being the end.

A great number of the existing moral rules can be traced to a distinct historical origin, proving still more decisively that they are not the suggestions of a universal instinct of the human mind. The Mohammedan code of morals came from Mohammed; Confucius was the moral legislator of one large section of the Chinese. The making of the marriage tie irrevocable in Christendom was an exercise of papal authority in the 13th c., and has since been repealed in some Protestant countries, although retained in Catholic states. See DIVORCE, MARRIAGE. The sentiment which forbids the holding of human beings as slaves is chiefly the growth of the last two or three centuries.

Although the doctrine of intuitive morality is, in this view, denied, it is still admitted that there is such a power in the mind as Conscience, which warns us when we are doing wrong, and is to a certain extent a force to make us do right. But it cannot be shown that we are born with any such principle, combining both enlightenment and motive power. Conscience is a *growth*. There are in our constitution certain primitive impulses that so far coincide with what is our duty, and therefore contribute to the formation of the Conscience; these are principally Self-preservation, or a regard to ourselves, and Sympathy, or a regard to others. There are many duties that we are prompted to for our own interest, such as telling the truth, in order that people may confide in us; obeying the laws, to avoid punishment, &c. But we cannot perform all our social duties if we look merely to ourselves. We must, in addition to prudence, have a source of *disinterested* action, inducing us both to avoid injuring our fellow-beings in the promotion of our own selfishness, and occasionally to sacrifice ourselves for the sake of others. Such a principle exists in our mental nature, although not of equal strength in all minds. Being provided with these two primitive springs of action, we are susceptible of being educated to the sense of moral obligation. The child is first taught obedience by penalties, and is made to associate pain with forbidden actions. This is the germ of conscience. Habits of avoiding what is prohibited under penalties are gradually formed, and the sense of Authority and Law is thereby acquired. When the powers of observation and reason come to maturity, the individual sees why the restrictions of duty have been imposed, and is then ready of his own accord, and apart from the fear of punishment, to behave rightly. The Conscience, grounded on Fear, then becomes the Conscience grounded on spontaneous approval.

Conscience thus follows, and does not precede, the experience of human authority. Authority, sanctioned by punishment, is the type and the starting-point, even when the conscience takes an independent flight, and adopts rules for itself different from those that entered into its education. The great mass of human beings have nothing more than the slavish conscience, or the habits imparted by the exercise of the parental and public authority, which shows what is the most natural foundation of moral sentiment. The persons that judge of right for themselves, instead of implicitly receiving the maxims peculiar to the society where they grow up, are so few as to be the exception everywhere; their conscience does not prove what is the usual endowment of human nature in this respect.

Inquiries of the nature of those above sketched, proceed upon the assumption that moral distinctions have their ground in the constitution of the world and of man's nature, and may be discovered by the exercise of human reason, as the other laws of the universe are. But practically, the rules of morality have, in almost all communities, been more or less dependent upon a belief in divine laws supernaturally revealed. The relation of these to scientific ethics will be considered under REVELATION.

ETHIOPIA, the biblical *Kush*. Originally, all the nations inhabiting the southern part of the globe, as known to the ancients; or rather, all men, of dark-brown or black color, were called Ethiopians (Gr. *aitlio—ops*, sunburned). Later, this name was given more particularly to the inhabitants of the countries south of Libya and Egypt, or the Upper Nile, extending from 10°—25° N. lat., 45°—58° E. long.—the present Nubia, Sennaar, Kordofan, Abyssinia. The accounts which the ancients have left us with respect to this people are, even where they are not of an entirely fabulous nature, extremely scanty and untrustworthy, as both Greeks and Romans never got beyond Napata, 19° N. lat. We will just mention that from the Homeric age down to Ptolemy—who is somewhat better informed—these regions were peopled by Pygmies, Troglodytes (dwellers in caverns), Blemmyes (hideous men), Macrobii (long-lived men), &c., besides being divided into the lands of cinnamon, myrrh, of elephant-eaters, fish-eaters, tortoise-eaters, serpent-eaters, &c. The only portion of ancient records which does contain something akin to historical accounts, is that which refers to Meroë, an island formed by the rivers Astaphus and Astaboras, tributaries of the Nile. There stood, from times immemorial, an oracle of Jupiter Ammon. This, and the central portion of the island, together with the extraordinary fertility of its soil, the abundance of animals, metals, &c., made it not only the chief place of resort for all the inhabitants of the adjacent parts, especially the numerous nomad tribes, but also the emporium for India, Arabia, Ethiopia, Egypt, Libya, and Carthage. Thus it grew so rapidly, that about 1000 B. C. it counted among the most powerful states of the ancient world; and about 760, having ever since Sesostris been tributary to Egypt, it succeeded, under Sabacus, in shaking off the Egyptian yoke, and continued, in its turn, to hold Egypt for about sixty years.

During the reign of Psammetichus, 240,000 Egyptians settled in Meroë, which, the greater part of the immigrants being artisans, traders, &c., rose still higher. Many new cities were built, and the state was in the most flourishing condition, when it was conquered by Cambyses, about 530 B. C. He fortified the capital town, and called it Meroë. After the destruction of Thebes by Cambyses, most of the inhabitants of that city took refuge there, and made the country still more Egyptian. Ergamenes transformed its theocracy into a military monarchy, in the 3d century. Under Augustus, Meroë was conquered, and a Queen Candace is mentioned as his vassal. Under Nero, nothing but ruins marked the place of this once powerful and highly civilized state. Up to this day, remnants of mighty buildings, covered with sculptures—representations of priestly ceremonies, battles, &c.—and half-defaced inscriptions hewn in rocks, besides rows of broken sphinxes and colossi, are frequently met with in those parts.

Their religion, art, form of government, and civilization, generally being—in their chief features at least—so identical with the Egyptian as to have given rise to the question, which of the two nations imparted their knowledge to the other, we will refer the reader for these points to the article EGYPT; and will proceed now to say a few words on the history of the descendants of the ancient Ethiopians—the inhabitants of the present Habesch, or Abyssinia—as we derive it from their very poor and scanty native chronicles.

According to these, the son of Solomon and the Queen of Sheba (Makeda as they, Balkis as the Arabian historians call her), named Menilehek, was the first king of the Ethiopians. Few kings' names occur up to the time of Christ, when Bazen occupied the throne. The missionary Frumentius (330) found two brothers (Christians) reigning—Abreha and Azbeha. During the time of the Greek emperor Justin (522), King Elezbaas destroyed the state of the Homerites in Asia, in order to revenge their persecutions of Christians; and was canonized. From 960 to 1300, another dynasty, the Zagoean, held the chief power, all the members of the Solomonic dynasty, save one, having been murdered by Esal, who made her son king. In 1300, Ikon-Amlak, a descendant of this one scion of the house of David, who had fled to Sheba, regained possession of the country, and made Sheba, instead of Axum, the seat of government. To this day, his family rules the country. Frequent revolutions within, more especially brought about by the religious squabbles imported by the Portuguese towards the end of the 15th c., and a host of enemies all around—the most formidable of whom were wild nomad tribes of the desert—forced the kings more than once to apply for foreign help; amongst others, that of the Turks in 1508; and the affairs of the modern state have at all times been anything but prosperous.

Special mention is made of King Zara-Jakob (Constantine), 1434—1468, who sent an embassy to the church-council at Florence; of Aznaf-Saged (Claudius), 1540—1559, during whose reign Christoph. de Gama from Portugal lived in Ethiopia, and made common cause with him against his enemies. This king also wrote a confession of faith, in which he defended his church both against Jesuits and the charge of leaning towards Judaism. Socinios (1605—1632) openly professed Roman views; but his son Facilides

soon expelled the Jesuits and their friends from the country, and put an end to the Roman influence. Among these friends was also Abba Gregorius, later the friend of the great Ethnologist Ludolf, who, having made his acquaintance at Rome, induced him to migrate to Gotha, where he also remained until his death. Under Joas (1753—1769), the Gallas, a nomad tribe, hitherto the mightiest and most dangerous enemies of the Ethiopians, not only gained admission to all the offices in the state, but acquired almost absolute power. One of them (Susul Michael), holding the place of Râsh, or prime-minister and chief-commander of the troops, proved a very great friend to Bruce, to whom he also intrusted the government of a province. The several provinces remained practically independent, each chief striving to subdue his neighbors, till in 1855 the chieftain afterwards known as Theodore (q.v.) attained supremacy. See also art. ABYSSINIA. The king resided but rarely in the city, and for the most part remained with his soldiers in the camp. His official name was Negus, or, in full, Negus Nagass Za-itiopja, King of the Kings of Ethiopia—alluding to the chiefs of the towns and provinces. The soldiers receive no pay, but rely on plunder; and have proved themselves able to fight bravely.

Emigrants, as were beyond doubt the earliest settlers in Ethiopia, from the other side of the Arabian isthmus, it is but natural that the structure of their language, as well as that of their own bodies, should bear traces of their Shemitic origin. The reason of this emigration is contained in the very name of this language, which is called *Geez*—free, affording a most striking parallel to the designation *Franc*—French. Free places of habitation were what they came in search of. The name Ethiopian, or, as they call it, Ithiopjawan, they adopted from the Greeks at a very late period. This their oldest language, *Leshana Geez*, was suppressed by a royal decree of Ikon-Amlak, in the 14th c., and the Amharic adopted as the court language. Ever since, it has, with exception of the province of Tigre, where it is still spoken (with slight idiomatic changes), remained the *Leshanu Mazhaf*, the language of books and of the church. It is exclusively used in writing, even of ordinary letters, and the educated alone understand it. Its general structure comes as close to that of the Arabic as a dialect can and must. A great many of its words are still classical Arabic; others resemble more the Hebrew and its two Chaldee dialects, the Aramaic and Syriac; others, again, belong to African dialects; and many, as the names of the months, are Greek. It has 26 letters, 22 of which bear the ancient Shemitic stamp, and exhibit the greatest likeness to the Phœnician, the common original alphabet; and seven vowels, including a very short *e*, which sounds precisely like the Hebrew *Schewa*.

These vowels are represented by little hooks, and remain inseparably attached to their respective letters; and as the *Geez*, unlike all its sister-languages is never without vowels, the alphabet becomes a syllabary with 182 characters. Another difference exists in its being written from left to right—a circumstance from which some have concluded that the Greeks introduced writing in Ethiopia; forgetting, in the first place, that Greek itself was frequently written from right to left, and that Zend, certain cuneiforms, hieroglyphs, &c., are likewise written from left to right. We cannot enter here into the grammatical minutiae of the language; we will only mention that out of the ten conjugations, eight are Arabic; that there is a double infinitive, but no participle and no dual; that the formation of the so-called plural, and of declension generally, point to that very remote period when the Hebrew and Arabic made use of the same grammatical processes. There are no diacritical marks employed in writing; the letters are not combined, and the words are separated by two dots.

Although there can be no doubt of the existence of a rich literature in a flourishing country like Ethiopia anterior to Christ, still, owing both to frequent internal convulsions, and the misguided zeal of the early Christian missionaries, who here and elsewhere considered it their first duty to destroy all the ancient records of which they could get hold, nothing but a few half-erased inscriptions have survived. The earliest existing document of post-Christian literature is a complete translation of the Bible, probably by Frumentius. See FRUMENTIUS. The Old Testament, probably a translation from the Alexandrine version of the LXX., consists of four parts: 1, the Law or Octateuchos (five books of Moses, Joshua, Judges, Ruth); 2, Kings; 3, Solomon; 4, Prophets, and two books of the Maccabees. The New Testament consists of—1, Gospels; 2, Acts; 3, Paulus; 4, Apostolus. A very peculiar book, Henoch, belongs also to the literature of the Old Testament. See ENOCH. The New Testament comprises likewise another book, Senodas, containing the pseudo-Clementine or apostolical constitutions. The Ethiopians have a liturgy (*Kanon Kedas*—Holy Canon) and a symbolico-dogmatical work (*Haima nota Abau*—Belief of the Fathers), containing portions of homilies of the Greek Fathers, Athanasius, Basil the Great, Chrysostom, Cyril, Gregory of Nyssa and Nazianzen. Besides these, they have martyrologies, called Synaxar. They employ in this their sacred literature a peculiar kind of rhythm without a distinct metre. Any

number of rhyming lines forms a stanza, without reference to the number of words constituting the verse, or of verses constituting the stanza. They also use certain phrases as a refrain—not unlike the manner of the mediæval Hebrew Pizmon. See JEWISH LITURGY. As to general literature, they have neither a written book of laws, nor a grammar of their own language, nor, in fact, anything worth mentioning, except a *Chronicle of Arum* and *Chronicles of Abyssinia*. They are very fond, however, of riddles, wise saws, and the like, so fascinating to the Eastern mind. They have a Dictionary, but most of its explanations and translations are utterly wrong.

No wonder the learned in Europe should have been sorely puzzled by such a language, and that they should, after long consideration, have pronounced it to be either 'Chaldee' or 'Indian,' while Bruce held it to be the language of Adam and Eve. Potgen, a Cologne church-provost, happening to be at Rome at the beginning of the 16th c., there made the acquaintance of native Ethiopians, and became the first to enlighten the world on the nature of this occult language. After him came the Carmelite Jacob Marianus Victorinus from Reate, who wrote *Institutiones Linguae Chaldae S. Ethiop.* (Rome, 1548), an entirely worthless book; then Wemmers, who in 1683 published an Ethiopian grammar and dictionary. The principal investigator, however, is Hiob Ludolf from Gotha, who, aided by the Abba Gregorius before mentioned, and supported by his own extraordinary linguistic talents and indomitable energy, acquired such a power over this language, that notwithstanding the number of eminent Orientalists, such as Platt, Lawrence, Dorn, Hupfeld, Hoffmann, Roediger, Ewald, Isenberg, Blumenbach, &c., who have since worked in this field, his books, as re-edited by Dillmann, still hold the first place. It is hardly necessary to add, that the Ethiopian is one of the most important and indispensable languages to the Shemitic scholar, containing as it does a great many words and forms of a date anterior to the separation of the different Shemitic dialects. Among the most important Ethiopian books printed in Europe are the Psalms, edited with a Latin translation by Ludolf (Frankfort, 1701); the New Testament, in two volumes (Rome, 1548); the book of *Henoch* (Lond. 1840); *Ascensio Isaiæ Vatis*, with a Latin translation by Lawrence (Oxford, 1819); *Didascalia*, or apostolical constitution of the Abyssinian Church (Lond. 1834).—Ludolf's works are—*Grammatica Ethiopica* (Lond. 1661; new ed. by Dillmann, 1857); *Lexicon Ethiopicum* (Frankfort, 1699; new ed. 1862); *Historia Ethiopica* (1681). Since the English expedition to Abyssinia, the British Museum possesses a larger number of Ethiopic MSS. than any other library.

E'THIOPS, or A'THIOPS (Gr. *aitho*, I burn, and *ops*, countenance; being of a black or burned countenance), is a term applied by the ancient chemists to certain oxides and sulphides of the metals which possessed a dull, dingy, or black appearance. Thus, *Ethiops Martialis* was the mixture of protoxide and peroxide of iron, known as the black oxide; *Ethiops Mineral*, or *Ethiops Narcoticus*, the black gray sulphuret of mercury procured by trituration in a mortar a mixture of mercury and sulphur; and *Ethiops per se*, was obtained by agitating commercial mercury for weeks or months, when the oxygen of the air slowly formed the black oxide of mercury.

ETHMOI'D BONE. THE (so called from *ethmos*, a sieve), is one of the eight bones which collectively form the cavity of the cranium. It is of a somewhat cubical form, and is situated between the two orbits of the eye, at the root of the nose. Its upper surface is perforated by a number of small openings (whence its name), through which the filaments of the olfactory nerve pass downwards from the interior of the skull to the seat of the sense or smell, in the upper part of the nose. It consists of a perpendicular central plate or lamella, which articulates with the vomer and with the central fibro-cartilage, and thus assists in forming the septum or partition between the two nostrils. The lateral masses present a very complicated arrangement, and are so planned as to give in a small space a very large amount of surface, on which the filaments of the olfactory nerve are spread. In comparative anatomy, we find a direct ratio between the development of these masses and the acuteness of the sense of smell. See NOSE AND THE SENSE OF SMELL.

ETHNO'LOGY (Gr. *ethnos*, nation or race, and *logos*, discourse), a term applied to the science that treats of the persistent modifications of the human family or group; their most marked physical, mental, and moral characteristics when compared one with the other; their present geographical distribution on the globe; their history traced backwards to the earliest attainable point; and finally, the languages of the various nations and tribes of mankind, existing or extinct, classified and compared, with the view, by their means, of determining the chief points of resemblance or dissimilarity among the nations of the earth. This science has gradually outgrown its name. It has therefore been deemed expedient to apply to it a term of wider and more neutral significance—namely, Anthropology—derived from the Greek *anthropos*,

man, and *logos*, a discourse. The term *Ethnology* has this inconvenience, that it means no more than the 'science of races,' and many authorities not only deny the existence of *racæ* of mankind, affirming that what are called races are in reality distinct species, but others argue that the term is as applicable to any races—e. g., races of dogs, or cats, or pigeons—as to the races of mankind. Hence the more exact and less sectarian term *Anthropology* has been applied to denote the science that treats of the natural history of man. The science is divided into three branches—(1.) *Zoological Anthropology*, which treats of the relations of man to the brute creation; (2.) *Descriptive Anthropology*, or *Ethnography*, which classifies and describes the various divisions and subdivisions of mankind, and marks out their geographical distribution; (3.) *General Anthropology*, which M. Broca calls 'the biology of the human race,' which, says a recent writer on the subject, 'borrows and collates from all sciences facts and phenomena usually investigated in men as individuals, but which relate to men as groups of individuals,' and compares these with other facts relating to other groups of individuals. The study and bare description of a single Negro's skull is mere human anatomy; the study of a group of Negroes' skulls, and the description and comparison of their peculiarities with those of groups of skulls belonging to other races, would be a specimen of the work done by General Anthropology.

No one can look at an Englishman, a Red Indian, and a Negro, without at once noticing the differences between the three, not only as regards the color of their skin, but the shape of the skull, the texture of the hair, and the character of the several features, as eyes, lips, nose, and cheek-bones. What strikes the ordinary observer chiefly is, of course, the difference of complexion; but the anatomist is fully as much interested in the shape of the skull. The first thoroughly scientific writer who endeavored to lay down a method of distinguishing between the different races of mankind by a comparison of the shape and size of the skull was Peter Camper, a distinguished Dutch anatomist of last century. He laid down a technical rule for ascertaining the *facial line*, and determining the amount of the *facial angle*, which he has thus described: 'The basis on which the distinction of nations is founded may be displayed by two straight lines, one of which is to be drawn through the *meatus auditorius* to the base of the nose, and the other touching the prominent center of the forehead, and falling thence on the most advancing part of the upper jaw-bone, the head being viewed in profile. In the angle produced by these two lines may be said to consist not only the distinctions between the skulls of the several species of animals, but also those which are found to exist between different nations.' The heads of birds display the smallest angle, and it apparently becomes of greater extent 'in proportion as the animal approaches more nearly to the human figure. Thus, there is one species of the ape-tribe in which the head has a facial angle of 42 degrees; in another animal of the same family, which is one of those *Simiæ* most approximating in figure to mankind, the facial angle contains exactly 50 degrees. Next to this is the head of the African Negro, which, as well as that of the *Kalmuk*, forms an angle of 70 degrees; while the angle discovered in the heads of Europeans contains 80 degrees. On this difference of 10 degrees in the facial angle, the superior beauty of the European depends; while that high character of sublime beauty which is so striking in some works of ancient statuary, as in the head of *Apollo*, and in the *Medusa* of *Sisoeles*, is given by an angle which amounts to 100 degrees.' The nearer the facial angle approached a right angle, the greater was held to be the intellectual development of the race. But M. Jaquet, of the Natural History Museum in Paris, showed that the facial angle in stupid people very often approached closely a right angle, and that, in the homogeneous population of Paris, the facial angle varied within wider limits than those Camper stated as a criterion of distinct species.

Camper's method was abandoned for the vertical method, or *norma verticalis*, invented by Blumenbach. The object being to collect the greatest number of characteristics—'The best way,' says Blumenbach, 'of obtaining this end is to place a series of skulls with the cheek-bones on the same horizontal line resting on the lower jaws; and then viewing them from behind, and fixing the eye on the vertex of each, to mark all the varieties in the shape of parts that contribute most to the national character, whether they consist in the direction of the maxillary and malar bones, in the breadth or narrowness of the oval figure presented by the vertex, or in the flattened or vaulted form of the frontal bone.' Founding upon this mode of admeasurement applied to a large collection of skulls of different nations, accumulated by himself, Blumenbach classified the human family into the following five varieties—viz., the Caucasian, Mongolian, Ethiopian, Malay, and American. In the first of these—which he made to include the Caucasians or Circassians Proper, the Celts, the Teutons, the Shemites, the Libyan family, the Nilotic family, and the Hindustanic family—the skull is large and oval, the forehead expanded, the nasal bones arched, the chin full, and the teeth vertical. In

the second—which embraces the Chinese and the Indo-Chinese, the natives of the polar regions, the Mongol Tartars, and the Turks—the skull is oblong, but flattened at the sides, the forehead low and receding, the nose broad and short, and the cheek-bones broad and flat, with salient zygomatic arches. In the third—embracing the Negroes, Kafirs, Hottentots, Australians, Afrikaners, and Oceanic Negroes—the skull is long and narrow, the forehead low, the nose broad and flat, the cheek-bones prominent, the jaws projecting like a muzzle, the lips thick, and the chin small. In the fourth—embracing the Malays and Polynesians generally—the skull is high and square, the forehead low, the nose short and broad, and the jaws projecting. In the fifth—embracing the American family and the Toltec family—the skull is small, with the apex high, and the back part flat, the forehead receding, the cheek-bones high, the nose aquiline, the mouth large, and the lips tumid.

This classification of the human family, with the added characteristics under each class, of complexion, hair, and eyes, is, upon the whole, the most popular, Blumenbach having taken considerable pains to elaborate it, and present it to the world in a form acceptable to scientific inquirers. Later researches, however, have proved it to be not quite tenable. Thus Cuvier reduced the five classes of Blumenbach to three—viz., the Caucasian, Mongolian, and Ethiopian, treating the Malay and American as subdivisions of the Mongolian. Jaquetot does the same. Dr. Prichard, who brought to the study of ethnology not only a large acquaintance with physiology, but a considerable knowledge of languages, admits a greater number of varieties than Blumenbach, but divides his Caucasian class into two independent groups, which he calls the Syro-Arabian or Semitic and the Aryan or Indo-Germanic. Moreover, he objects to the term Caucasian, as representing the notion that mankind had their origin on mountain heights.

For himself, Prichard holds with the view that it was rather on the banks of large rivers and their estuaries that the primitive nations developed themselves. 'The cradles or nurseries of the first nations, of those at least who became populous, and have left a name celebrated in later times, appear to have been extensive plains or valleys, traversed by navigable channels, and irrigated by perennial and fertilizing streams. Three such regions were the scenes of the earliest civilization of the human race, of the first foundation of cities, of the earliest political institutions, and of the invention of the arts which embellish human life. In one of these the Semitic or Syro-Arabian nations exchanged the simple habits of wandering shepherds for the splendor and luxury of Nineveh and Babylon. In a second, the Indo-European or Japetic people brought to perfection the most elaborate of human dialects, destined to become in after-times, and under different modifications, the mother-tongue of the nations of Europe. In a third, the land of Ham, watered by the Nile, were invented hieroglyphical literature, and the arts in which Egypt far surpassed all the rest of the world in the earlier ages of history.' Dr. Prichard, in his well-known *Natural History of Man*, commences with a description of these three divisions of the human race, not as discriminated one from the other by the form of the skull, but as comprising nearly all the civilized communities, and indeed most of the tribes of people known to antiquity. 'They were neither nomades nor savages, nor do they display in their crania either of the forms principally belonging to races in those different states of existence. They had all heads of an oval or ellipso-spherical form, which are observed to prevail chiefly among nations who have their faculties developed by civilization.' As they cannot, however, by any means be made to comprehend all the types of man, after the Egyptians, he describes the great body of the nations of Africa, embracing tribes sunk in the lowest state of degradation; and after the Aryans, or Indo-Europeans, the people of High Asia, chiefly nomades, inhabiting vast steppes, and never rising in the scale of civilization beyond the condition of wandering shepherds, though in this capacity possessing some wealth, and acquainted with the use of clothing, tents, and wagons. 'These classes of nations,' he observes, 'have different physical characters. Among the African savages we find the *prognathous* form of the head and all its accompaniments; and these traits display themselves in proportion to the moral and physical degradation of the race. In Northern Asia, most of the inhabitants have the pyramidal and broad-faced skulls.' Referring our readers to the articles *ARYAN RACE*, *EGYPT*, and *SHEMITIC NATIONS* respectively, for more detailed information on the subject of these three grand divisions of mankind, we shall here only notice Dr. Prichard's subdivisions of one of them, namely, the Aryan race.

The great Aryan or Indo-European race, which extends itself from the mouth of the Ganges to the British Islands and the northern extremities of Scandinavia, divides itself, according to Prichard, into two branches—viz., the parent stock in Asia, and the colonies that it successively sent forth into Europe. The Asian branch comprises: 1. Hindus; 2. Persians; 3. Afghans; 4. Baluchi and Brahui; 5. Kurds; 6. Armenians; and 7. Ossetines.

The collective body of the European nations are now generally regarded as a series of colonies from Asia. The proof turns mainly on a comparison of languages; the ancient Sanscrit being regarded by the most competent judges as the parent not only of the Greek and Latin languages, but of the Teutonic, with its several ramifications of the Slavonic, Lettish, Lithuanian, and even Celtic. Dr. Prichard himself was the first to point out the affinity of the Celtic with the Sanscrit, Greek, Latin, and Teutonic, in a memoir published by him in 1831, on the *Eastern Origin of the Celtic Nations*. Later philologists have confirmed the view taken by him, and he is perhaps correct also in the conclusion, that they were the first great immigration of the Aryans into Europe, who were afterwards conquered, and their numbers considerably reduced by fresh advancing colonies from the same parent hive. But there are other nations or tribes of Europe which no efforts of the philologists have succeeded in tracing to the Aryan stock; such are the Lapps, Finns, Tschudes, and Ugrians of the North, and the Euskaldunes, now principally represented by the Basques in the West. To these, Dr. Prichard has given the appellation of Allophylian (Gr. *allos*, another, and *phyle*, tribe), thereby signifying their independence of the Aryan stock. The progenitors of these tribes were probably the inhabitants of Europe, prior to the first Aryan immigration.

After these several races, Dr. Prichard treats of the native tribes of the austral seas and the great Southern Ocean, and finally, of the native inhabitants of America. In every case, he carefully describes the physical appearance or structure, the geographical *habitat*, history, and migrations (if any), the language, and the moral and psychical attributes of the nation or tribe immediately brought under notice. His information has generally been obtained from the best sources, and hence his works may be regarded as a storehouse of knowledge upon the subject of ethnology.

But both before and since Blumenbach and Prichard, there have been several classifications of the human race proposed, the simplest of which is perhaps that of Dr. Latham, into 1. Mongolidae; 2. Atlantidae; 3. Japetidae. This writer was long properly regarded as the chief exponent of the science of ethnology in this country. Following in the track of Prichard, and possessing, like him, a considerable acquaintance with physiology and history, he distances him altogether in the department of comparative philology. His contributions to the science of ethnology, borrowed from this particular branch of study, are consequently of the highest value. But there is one important question, with respect to which the suffrages of the best philologists are rather with Prichard than with Latham—viz., the origin of the Aryan or Indo-European race. Prichard, as we have seen, refers it to Asia, while Latham claims it for Europe.

Retzius's classification is based on the idea that the psychical individuality of a race is expressed by brain-development as indicated by the shape of the skull. He divides races into—1. Dolichocephalic, or long-skulled races, where the length of the skull is due to a lengthening of the posterior lobes of the brain; and 2. Brachycephalic, or short, broad-skulled races, in whom the comparative shortness of these lobes causes them to be more developed in breadth. These are subdivided, according to the form of the face, into (1) Orthognathous, or straight-faced peoples, e. g., Europeans; and (2) Prognathous, or races with projecting jaws, e. g., Negroes. This classification laid the foundation of ethnographic craniology. Zeune divides mankind into—(1) Races with high skulls, e. g., Indo-Europeans; (2) Races with broad skulls, e. g., Mongols and some Malay tribes; (3) Races with long skulls, e. g., Negroes. Such classifications err in grouping under the same division races between which it is otherwise impossible to establish any consanguinity. Passing over the wild speculative classifications of the modern German materialistic school, a specimen of which is that of Carl Vogt, who, assuming the ape origin of mankind to be an indubitable fact, describes three great divisions of the human race in correspondence with the three species of anthropomorphic apes found in Asia, Africa, and America, the only other very recent classification with pretensions to scientific reasonableness, is that of Professor Huxley, which is founded on the hair as a race-character. He describes two primary divisions—1. Ulotrichi, crisp or woolly-haired people, with skulls longer than they are broad (Dolichocephalic), and with the skin-color varying from yellow to black. Negroes, Bushmen, and Malays are sub-divisions of this great group. 2. Leiotrichi, or smooth-haired people, subdivided into (1) the Australoid group, with 'dark eyes, wavy black hair, and eminently long, prognathous skulls, with well-developed brow ridges'; (2) The Mongoloid group, e. g., Chinese, Tartars, Polynesians, and American aborigines; (3) The Xanthocroic group, fair, blue-eyed people, e. g., Slavs, Teutons, Scandinavians, and fair, Celtic-speaking nations; (4) The Melanocroic group, or pale-skinned people, with dark hair and eyes, e. g., the Iberians or 'black Celts' of Europe, the inhabitants of the Mediterranean coast and of Western Asia—a group resulting probably from in-

termixture of the Australoid and Xanthocroic races. Under the Australoid group is classed such apparently unrelated races as the Australians, the Dekhan tribes in India, and the ancient Egyptians; and curiously enough, Colonel Lane Fox has since shown that, from resemblances in the weapons, implements, &c., in use amongst these very races, Professor Huxley's apparently startling views as to their affinity are not at all improbable.

A more important question is, what do classifications classify—species or varieties? Prichard held that mankind sprung from one stock, and constituted one species. Existing diversities in form and physique in races he accounted for by the influence of food, climate, and other circumstances operating through a long series of years. Mr. Darwin's recent work on *Animals and Plants under Domestication* powerfully corroborates this view, for it demonstrates that within the limits of one admitted species of animal there may be produced, by the operation merely of artificial selection and hereditary transmission of peculiarities, diversities infinitely greater than those existing between the highest and lowest races of mankind. Then, again, the highest and lowest human races interbreed, and their offspring is fertile, which would hardly be the case if the parents were of different species. Some have held that the difficulties of migration from an original center of creation were too great to be compatible with the wide geographical distribution of mankind. Yet even the South Sea Islanders—and in their case the difficulties alluded to must have been greater than in most others—may have come to their present abodes by migration; for Japanese mariners have sometimes by stress of weather been driven from their course, and cast on the shores of islands in the South Seas. This doctrine of monogeny, or original unity of the human race, is supported by Dr. Latham with arguments drawn from philology. Dr. Latham, taking it as a matter of fact that all the languages of mankind have had a common origin, argues from it in favor of an original unity of race. This common origin of languages, however, is a thing by no means proved. 'The idea of an original language of the whole human race,' says Dr. Waitz (*Introduct. Anthropologie, Naturvölker*), 'is by science now regarded as a chimera.' Admitting that Klaproth, Fürst, and Delitzsch have taken great pains to establish an affinity between the Sanscrit and the Hebrew, M. Renan and other excellent authorities regard the attempt as unsuccessful, and, even were it otherwise, 'the Chinese,' says a late writer (Farrar, *Essay on the Origin of Language*), 'must always remain a stumbling-block in the way of all theories respecting a primitive language. Radical as is the dissimilarity between Aryan and Semitic languages, and wide as is the abyss between their grammatical systems, yet they almost appear like sisters when compared with the Chinese, which has nothing like the organic principle of grammar at all. Indeed, so wide is the difference between Chinese and Sanscrit, that the richness of human intelligence in the formation of language receives no more striking illustration than the fact, that these languages have absolutely *nothing* in common except the end at which they aim. This end is in both cases the expression of thought, and it is attained as well in Chinese as in the grammatical languages, although the means are wholly different.'

Having thus made the reader in some degree acquainted with the views of Drs. Prichard and Latham on the subject of ethnology, we now proceed to inform him of the totally different views and conclusions of the American school of ethnology. This school was founded by the late Dr. Morton of Philadelphia, an erudite and active man of science, who labored for many years in forming a collection of human crania of all nations, and of ancient as well as modern ages, with the design of still further carrying out Blumenbach's researches into the varieties of mankind by a comparison of crania, according to the method he had proposed. This collection of crania was begun in 1830, and at the time of Morton's death in 1851, amounted to the large number of 918 human crania, to which were afterwards added 51; and it, besides, included 278 crania of mammals, 271 of birds, and 88 of reptiles—in all, 1606 skulls, being the largest collection of the kind ever formed, and which, fortunately for the purposes of science, is now deposited in the Museum of the Academy of Natural Sciences at Philadelphia. Simultaneously with this accumulation of crania, Dr. Morton carried on his researches in ethnology, not, however, in the restricted sense in which he began, following Blumenbach's classification, but availing himself of the latest discoveries of Prichard, and the other English and continental writers. One of the results of his labors was the publication, in 1839, of a handsome work, entitled *Crania Americana*, which was followed in 1844 by the *Crania Egyptiaca*, in the collection of which he had been much aided by Mr. G. R. Gliddon. 'In this work,' says his biographer, Dr. Patterson, 'Morton found himself compelled to differ in opinion from the majority of scholars, in regard to certain points of primary importance.' The great question of the unity or diversity of mankind in their origin was one that early forced itself upon his attention, and the conclusion at which he arrived, after much patient investigation, was in favor

of the latter view. He was slow to publish any opinion on the subject, probably reserving it for a work upon which he was engaged, to be entitled the *Elements of Ethnology*. His opinion, however, was well known to his friends. In a note to a paper in *Silliman's Journal* for 1847, he says: 'I may here observe that whenever I have ventured an opinion on this question, it has been in favor of the doctrine of primeval diversities among men; an original adaptation of the several races to those varied circumstances of climate and locality which, while congenial to the one, are destructive to the other; and subsequent investigations have confirmed me in these views.' In a letter to Dr. Nott, dated January 1850, he lays down the following proposition: 'That our species had its origin, not in one, but in several or in many creations, and that these diverging from their primitive centers, met and amalgamated in the progress of time, and have thus given rise to those intermediate links of organization which now connect the extremes together.'

Here is the truth divested of mystery; a system that explains the otherwise unintelligible phenomena so remarkably stamped on the races of men.' His latest utterance upon the subject is contained in a letter written to Mr. G. R. Gliddon, in April 1851, only a fortnight before the writer's decease, which concludes as follows: 'The doctrine of the original diversity of mankind unfolds itself to me more and more with the distinctness of revelation.' His views upon this and other points of dispute among ethnologists have been since embodied in a remarkable work, entitled *Types of Mankind; or, Ethnological Researches based upon the Ancient Monuments, Paintings, Sculptures, and Crania of Races, and upon their Natural, Geographical, Philological, and Biblical History: illustrated by Selections from the unedited Papers of S. G. Morton, M.D., and by additional Contributions from Professor L. Agassiz, W. Usher, M.D. and Professor H. S. Patterson.* By J. C. Nott, M.D., and G. R. Gliddon (Philadelphia, 1854). In this composite work, perhaps the most remarkable feature is the paper contributed by the celebrated naturalist, Professor Agassiz, in support of Dr. Morton's theory as to the original diversity of the human races.

The paper by Agassiz is entitled *Sketch of the Natural Provinces of the Animal World, and their Relation to the Different Types of Man*. It was drawn up by the writer from a conviction that much might be gained in the study of ethnography by observing the natural relations between the different races of man and the plants and animals inhabiting the same regions. The sketch given by him is intended to show, that 'the boundaries within which the different natural combinations of animals are known to be circumscribed upon the surface of our earth coincide with the natural range of distinct types of man. Such natural combinations of animals circumscribed within definite boundaries are called *Faunæ*, whatever be their home—land, sea, or water.' There are eight regions of the earth, according to Agassiz, each containing its own faunæ, and its own peculiar type of man; and his main conclusion from a consideration of these several faunæ is as follows: 'That the diversity among animals is a fact determined by the will of the Creator, and their geographical distribution part of the general plan which unites all organized beings into one great organic conception; whence it follows that what are called human races, down to their specialization as nations, are distinct primordial forms of the type of man.' Messrs. Nott and Gliddon, in their work quoted, appeal triumphantly to this theory of Agassiz in support of their view as to the primitive diversity of the races of mankind; and in a subsequent work, *Indigenous Races of the Earth* (Philadelphia, 1857), have inserted a further communication from the writer, in which, while he reiterates his formerly expressed opinion, that the races of man, so far as concerns their geographical distribution, are subject to the same circumscription as the other members of the animal kingdom, he observes: 'Even if this fact stood isolated, it would show how intimately the plan of the animal creation is linked with that of mankind. But this is not all. There are other features, occurring among animals, which require the most careful consideration, inasmuch, as they bear precisely upon the question at issue, whether mankind originated from one stock or from several stocks, or by nations.'

These features, well known to every zoologist, have led to as conflicting views respecting the unity or plurality of certain types of animals as are prevailing respecting the unity or plurality of the origin of the human races. The controversy which has been carried on among zoologists upon this point, shows that the difficulties respecting the races of men are not peculiar to the question of man, but involve the investigation of the whole animal kingdom—though, strange as it may appear, they have always been considered without the least reference to one another.'

This theory of Agassiz, it must be stated, is very generally controverted, as likewise the opinions generally of Dr. Morton and the American school of ethnology, partly on Biblical, but chiefly on scientific grounds. Indeed, from the conflict of opinions as to the origin of the human race, if the solution of this question were the sole object of anthropology, the science might be said to be

in a very unsatisfactory state. But this is not the case. The question at issue is one that may well be left in abeyance for the present. Without it, the field of inquiry is sufficiently wide, and is well cultivated by skilled laborers, who continually bring the product of their researches in physiology, geography, archaeology, and comparative philology to enrich and fructify the newly turned-up soil.

Subjoined is the classification of Dr. Latham (to which Professor Huxley's is now generally preferred):

I. MONGOLIDÆ.

Physical Characteristics.—Face broad and flat; frontal profile retiring or depressed; maxillary profile moderately prognathic or projecting, rarely orthognathic; eyes often oblique; skin rarely a true white, rarely a jet-black; irides generally dark; hair straight, and lank, and black, rarely light-colored, sometimes curly, rarely woolly. *Languages*—aptotic and agglutinate, rarely with a true amalgamate inflection. See *LANGUAGE*. *Distribution*—Asia, Polynesia, America. *Influence upon the history of the world*, material rather than moral.

A. ALTAIC MONGOLIDÆ.—1. *Seriform stock*, embracing Chinese, Tibetans, Anamese, Siamese, Kambojians, Burmese, the Môn, and numerous unplaced tribes. 2. *Turanian stock*, embracing the Mongolian branch, the Tungusian branch, the Turk branch, and the Ugrian branch.

B. DIOSCURIAN MONGOLIDÆ.—1. Georgians. 2. Lesgians. 3. Mizjeji. 4. Irón. 5. Circassians.

C. OCEANIC MONGOLIDÆ.—1. *Amphelesian stock*, embracing Proto-natives, Polynesians, Malegasi (?). 2. *Kelononesian stock*, embracing the natives of New Guinea, New Ireland, Solomon's Isles, Louisiade, New Caledonia, Australia, and Tasmania.

D. HYPERBOREAN MONGOLIDÆ.—1. Samöeids. 2. Yeniseians. 3. Yukahiri.

E. PENINSULAR MONGOLIDÆ.—1. Koreans. 2. Japanese. 3. The Aino. 4. Koriaks. 5. Kamskadales.

F. AMERICAN MONGOLIDÆ.—Embracing the various native tribes of North and South America.

G. INDIAN MONGOLIDÆ.—1. Tamul. 2. Palinda. 3. Brahui. 4. Indo-Gangetic. 5. Purbutti. 6. Cashmirian. 7. Cingalese. 8. Maldivian.

II. ATLANTIDÆ.

Physical Characteristics.—Maxillary profile projecting; nasal, generally flat; frontal, retiring; cranium, dolichokephalic; the parietal diameter being generally narrow; eyes rarely oblique; skin often jet-black, very rarely approaching a pure white; hair crisp, woolly, rarely straight, still more rarely light-colored. *Languages*, with an agglutinate, rarely an amalgamate inflection. *Distribution*, Africa. *Influence on the history of the world*, inconsiderable.

A. NEGRO ATLANTIDÆ.—Embracing various negro tribes.

B. KAFFRE ATLANTIDÆ.—Kaffre tribes, &c.

C. HOTTENTOT ATLANTIDÆ.—1. Hottentots. 2. Saabs. 3. Dammaras.

D. NILOTIC ATLANTIDÆ.—1. Gallas. 2. Agows and Falasha. 3. Nubian. 4. Bishari. 5. M'Kuafi, &c.

E. AMAZIRGH ATLANTIDÆ.

F. EGYPTIAN ATLANTIDÆ.

G. SEMITIC ATLANTIDÆ.—1. Syrians. 2. Assyrians. 3. Babylonians. 4. Beni Terah (Edomites, Jews, Samaritans, &c.) 5. Arabs. 6. Ethiopians. 7. Canaanites, &c.

III. JAPETIDÆ.

Physical Characteristics.—Maxillary profile but little projecting; nasal often prominent; frontal sometimes nearly vertical; face rarely very flat, moderately broad; skull generally dolichokephalic; eyes rarely oblique; skin white or brunette; hair never woolly, often light-colored; irides black, blue, gray. *Languages*, with amalgamate inflections, or else anaptotic; rarely agglutinate, never aptotic. *Distribution*, Europe. *Influence on the history of the world*, greater than that of either the Mongolidæ or the Atlantidæ, moral as well as material.

A. OCCIDENTAL JAPETIDÆ.—Kelts.

B. INDO-GERMANIC JAPETIDÆ. 1. *European class*, embracing Goths, Teutons (Mæso-Goths, High and Low Germans, Franks), Scandinavians, Sarmatians, Slavonians (Russians, Servians, Illyrians, Bohemians, Poles, Serbs), Mediterranean Indo-Germans (Hellenic branch, Italian branch). 2. *Iranian class*, embracing Persians, Kurds, Beluchi, Parans (Afghans), Tajiks, Simposhi, Lugmani, Dardoh, Wokhan. 3. *Unplaced stocks*, Armenians, Iberians, Albanians. 4. *Extinct stocks*, Pelasgi, Etruscans, populations of Asia Minor.

E'THYL (symbol, C_2H_6) is the starting-point of the family group, of which ordinary ether and alcohol are members.

Ethyl, C_2H_5 .

Ether, $C_4H_{10}O$, Oxide of Ethyl.

Alcohol, C_2H_5O , HIO , Hydrated Oxide of Ethyl.

It may be prepared by acting upon iodide of ethyl by granulated zinc, when the ethyl is liberated, and may be obtained as a colorless, inflammable gas, of an agreeable odor, insoluble in water, but soluble in alcohol.

ETHYLAMINE is a substance strongly resembling ordinary ammonia or hartshorn in odor and other properties. It is found in coal-tar, in the oil obtained during the destructive distillation of bones, in the gases evolved during putrefaction, and may be produced by certain complicated chemical processes. Ethylamine is a mobile liquid of specific gravity 696 (water = 1000), and boils at 66° F. It has a strong ammoniacal odor, has an alkaline action with coloring matters, forms white fumes with strong acids, and in composition is analogous to gaseous ammonia (NH_3 or NHHH), with one of the atoms of hydrogen replaced by ethyl ($\text{C}_2\text{H}_5\text{O}$ or Ae), and is represented by the symbol NHH Ae or NH_2Ae .

ETIENNE, ST., an important manufacturing town of France, in the department of Loire, is situated on both banks of the Furens, an affluent of the Loire, in the center of a valuable and extensive coal-field, 30 miles south-south-west of Lyon by rail, and about 288 miles south-south-east of Paris. It is surrounded by coal-mines, is seated upon coal-deposits, and has galleries driven even beneath its streets. The stream on which the town is built furnishes invaluable water-power to move its machinery, and its waters are also of great use for tempering iron and steel. The old town of St. E. is badly built, and the new town, which has sprung up very quickly, is destitute of architectural harmony. The newer houses are built of a fine white sandstone, and are frequently five and six stories in height; but they rapidly become tarnished and begrimed by the perpetual cloud of coal-smoke which hangs over the town. The most noteworthy building is the Hôtel-de-Ville, which contains the *Musée Industriel*, with specimens of the manufactures of the town, and of the minerals and fossils of the neighborhood. St. E. is famous for its manufactures of ribbons and firearms. The ribbon-manufactories contain 30,000 looms, and the annual value of their produce is estimated at 60,000,000 francs (£2,375,000) in value. They are unrivalled in elegance of design, and in richness and delicacy of color, and are exported to all parts of the world. There are extensive private manufactories of firearms, besides an imperial firearms manufactory, which supplies most of the muskets of the French army. St. E. has also extensive manufactures of bayonets, scythes, nails, saw-blades, foils, anvils, vices, files, and also of silks, velvets, lace, embroidery, muslins, glass, leather, and paper. From the coal-field on which St. E. is situated, about 600,000 tons of coal are raised annually. On the 1st January 1856, St. E. was constituted the capital of the department, in place of the town of Montbrison. St. E. arose originally from a castle built in the 10th c. by the Counts of Forez. It increased greatly in the 15th c., and in 1771 it had 20,000 inhabitants; in 1851 it had 49,614 inhabitants; in 1872 it had 80,526; in 1876, 117,537; and in 1881, 120,120.

ETIQUETTE (Fr. a ticket, supposed to be from the Celtic *tocyn*, a little piece or slip—a token). Originally, etiquette signified a little piece of paper affixed to a bag or other object to signify its contents. The word came probably to possess the secondary meaning which we now attach to it, of the forms or decorums observed in the intercourse of life, more particularly on state occasions, from its having been customary to deliver such tickets, instructing each person who was to take part in the ceremony as to the part which he was expected to play. The cards which are still delivered to the mourners at funerals, and those on which the order of the dances is set forth at balls and evening parties, are of this nature. Popular publications are constantly issuing from the press for the purpose of teaching etiquette, or the rules of behavior in good society. They will, for the most part, be found far less trustworthy than the promptings of nature, where the individual possesses a reasonable amount of reverence for others, and respect for himself. Yet there are certain conventionalities which can only be learned by instruction of some kind, or by observation, and the observation may be attended with unpleasant circumstances.

ETIVE, a sea-loch in the north of Argyshire, running inland from the Firth of Lorn, 20 miles east and north-east, with a breadth of a quarter to three miles. It is bordered by granite in its upper part, and by trap in its lower. Near its mouth, there is a mica-slate on the north side, and Permian strata on the south. The river Awe, the outlet of Loch Awe, falls into the loch at the bend, where also is the ferry of Bunawe, and the small river Etive falls into it at its north-east end. The loch abounds in seals, salmon, porpoises, and cod. The scenery around the upper half of the loch is grand and romantic. To the east rise Ben Cruachan, 3670 feet, and Ben Starive, 2500 feet, and to the north Ben Mahrgage. The loch admits small coasting-vessels. Ardchattan Priory, founded in the 13th c., on the site of a monastery of the 6th or 7th c., is now in ruins. Connel Ferry, in the lower part of the loch, and near a vitrified fort, is only 680 feet broad, and is a very turbulent cataract, three or four feet high at half-

tide, caused by a sunken reef of rocks, partly bare at low water. At the south side of the mouth of Loch E., three miles north of Oban, on a projecting conglomerate rock 10 to 30 feet high, are the ruins of Dunstaffnage Castle, the ancient stronghold of the Macdougals, a building in what is called the Edwardian style of the end of the 13th or beginning of the 14th c., with walls 400 feet in circumference, 30 to 50 feet high, and 10 feet thick, and with three round towers. Dunstaffnage is supposed by some to have been the seat of the Dalriadic Scottish monarchy (see DALRIADA), and from this place the famous slab or Stone of Destiny (Lia Fail), now in the coronation-chair, Westminster Abbey, is said to have been taken in 843 by Kenneth Macalpine to Scone, whence Edward I. removed it to London.

ETNA, or ÆTNA (now MONTE GIBELLO), is the largest volcano in Europe. It is an isolated mountain, situated on the eastern coast of Sicily, and cut off from the chain of mountains which run parallel with the northern shore of the island, by a small valley, through which flows the Alcantara, and from the southern chain by a larger valley, which forms the basin of the Giaretta. Its eastern side rises directly from the Mediterranean, thirty miles of coast being formed by the streams of its lavas. Its base is almost 90 miles in circumference, and from this it rises like an immense cone to the height of 10,874 feet.

The history of E. does not carry us far back geologically; an active volcano in the later portion of the Tertiary period, it continues still to pour forth materials; and the ejected ashes, dust, and lapilli, together with the streams of molten lava, have, in the



Distant View of Etna.

course of untold ages, built up this immense mountain. One central crater has been the prevailing outlet for these materials, and they have consequently arranged themselves into one central and dominant mound—the cone-shaped E.; but innumerable secondary and surrounding craters, each forming, by its ejected matter, an external smaller cone, exist on Etna. Many of these, in the progress of the growth of the mountain, have been covered and hid by the more recent eruptions. Eighty of them may be counted surrounding the upper portion of E., many being hills of considerable altitude, but all of them appearing only as trifling irregularities when viewed at a distance as subordinate points of so imposing and colossal a mountain. Seen from the summit, they present a beautiful aspect; some bare and barren, others covered with the dark and sombre pine, or with the gayer and more varied foliage of the oak, the beech, and the hawthorn, and all arranged in picturesque groups of various heights and sizes. But the most remarkable feature in E. is the Val del Bove, an immense gully excavating the eastern flank of the mountain, five miles across, and surrounded by nearly vertical precipices from 1000 to 5000 feet high, on which are shown sections of innumerable lava-streams and beds of scoræ, traversed by highly inclined dikes. It has a singularly dreary and blasted appearance.

The summit of E. rises considerably above the line of vegetation, and consequently presents, except where covered with snow, a dreary waste of black lava, scoræ, and ashes, in the center of which, in a desolate plain, rises the crater-bearing cone. This is called the Desert region. It is followed by six or seven miles of the Woody region, in which luxuriant forests of pine, oak, beech, poplar, and hawthorn abound, together with rich pasturage for herds and flocks. A varying breadth of from two to eleven miles of cultivated region surrounds the base of Etna. Its great products are corn, oil, wine, fruit, and aromatic herbs.

The first recorded eruption of E. took place 476 B.C. The most remarkable that have occurred since are the following: 1169 A.D., when Catania and 15,000 of its inhabitants were destroyed; 1527, in which two villages and many human beings perished; the eruption which continued at intervals from 1664 to 1673, and destroyed many villages with their inhabitants. Numerous chasms were formed at this time; from one several miles long and four or five feet wide were emitted a bright light and strong sulphurous vapor; from another, black smoke and quantities of stones were

given out; and from others, streams of lava. In 1673, an immense volume of salt (?) water rushed down the mountain: by some, it is supposed to have been ejected from the crater, but it is more probable that it arose from the sudden melting of the snows which covered the summit of the mountain. A very great eruption took place in 1852. Immense clouds of ash-gray dust were ejected. From two new mouths on the eastern flank there issued vast torrents of lava, one of which was two miles broad, and at one time as much as 170 feet deep. The next outbreak, in 1864-65, was of trifling importance. That of May 1879 was much more violent; the clouds of smoke and showers of ashes and scorice being followed by the ejection of a torrent of lava from 200 to 300 feet in width, which desolated a large tract of highly cultivated land.

The minerals peculiar to volcanic rocks occur at E., such as chrysolite, zeolite, selenite, alum, nitre, vitriol, copper, mercury, and spicular iron.

ETOLIA. See *ÆTOLIA*.

ETON, a town in the south of Buckinghamshire, on the left bank of the Thames, 42 miles south-south-east of Buckingham, and 22 miles west-south-west of London, near the Slough station of the Great Western Railway. It lies opposite to Windsor, in Berkshire, with which it is connected by a bridge over the Thames. Though in separate counties, these two towns really form one. E. chiefly consists of one long well-paved street, and is mainly dependent on the college. Pop. (1871) 2806; (1881) 3466, exclusive of the Eton boys.

ETON COLLEGE is one among the most famous educational establishments in England. It was founded in 1440 by Henry VI., under the title of 'The College of the Blessed Mary of Eton beside Windsor.' The original foundation consisted of a provost, 10 priests, 4 clerks, 6 choristers, 25 poor grammar-scholars, a master, and 25 poor infirm men. The king provided for the establishment out of his own demesne lands and the estates of certain alien priories. A supplementary charter was granted in 1441, in which year also the College buildings were commenced. Henry was very solicitous that the work should be of a durable kind. Some of the buildings were finished in 1443, and were handed over by the royal commissioners to the provost, clerks and scholars. Political troubles of various kinds retarded the completion of the buildings till 1523. Bishop Waynflete was the first headmaster, and afterwards a munificent supporter of the college. The institution passed through much peril in the reign of Edward IV., and again in the time of the Commonwealth; but it surmounted the dangers, and the increasing value of its estates brought in a large income.

The original foundation has been greatly modified under the Public Schools Act, 1868. It now consists of a provost and 10 fellows, who constitute the 'governing body,' 2 chaplains or conductors, and 70 scholars. The members of the governing body are nominated by the universities of Oxford and Cambridge, and other learned and responsible electors. Several valuable scholarships at King's College, Cambridge, are filled up every year from among the scholars by competitive examination. There are also other scholarships and prizes open to all the members of the school, such as the Newcastle and Tomline scholarships, and prizes for modern languages, founded by the late Prince Consort. The scholars are lodged within the college walls.

The main portion of the establishment, however, numbering nearly 900, consists of the *oppidans*, students who live out of the college, and whose friends pay liberally for their education. The tuition is the same for them as for the *collegers* or scholars. There are an upper and a lower school, managed by the head master and lower master, with a large staff of assistants. Considerable discussion has taken place within the last few years concerning the kind of education received at Eton, the cost at which it is obtained, and the enormous incomes derived by some of the officials. The course of education is still somewhat of the medieval character, which regards Greek and Latin as the basis of all good education; but mathematics and natural science, under recent regulations of the governing body, receive a large share of attention. There is great prestige connected with the College.

The chief buildings of the College consist of the chapel, the hall, the library, the schools, the provost's and master's apartments, and the lodgings of the fellows, surrounding two quadrangles; together with the boys' library and sleeping apartments, in a cluster called the New Buildings, attached to the northern side of the older group. The chapel is mostly of stone, the other buildings of brick; and the effect of the whole is very picturesque, as seen from the terrace of Windsor Castle, on the other side of the Thames. The chapel is an especially beautiful object. The houses of the masters are generally fitted up for the reception of *oppidans* as boarders.

ETRURIA, TYRRHENIA, TUSCANA, designated, at a period anterior to the foundation of Rome, nearly the whole of Italy; together with some of its most important western islands. Its

northern part, from the Alps to the Apennines, was known under the name of Etruria Circumpadana; its southern, from the Tiber down to the Gulf of Pastum, or, according to some, to the Sicilian Sea, under that of Etruria Campaniana; while the central portion, bounded on the N. by the Apennines and the river Alacra, S. and E. by the Tiber, and W. by the Tyrrhenian Sea, was called Etruria Propria. The first two however, did not long remain Etruscan territory, but were either reconquered by the surrounding tribes to whom they had originally belonged, or fell into the hands of new immigrants. No historical records of that brief period of any moment having yet come to light, they do not claim our attention; while Etruria Proper, scanty though our information about it still be, deserves our interest in the highest degree.

For its physical features, we refer the reader to Tuscany, Lucca, and the Transiberine portion of the present Papal Dominions; and have only to remark, that vast expanses of that country, which now are either covered with deep forest, or are shunned on account of the malaria, were in those times fruitful, densely peopled regions. For political, or rather administrative purposes, Etruria Proper was divided into twelve sovereign cities, or rather cantons, among which the most important were Tarquinii (Corneto), the cradle of the royal family of the Tarquins, who at one time wielded the sceptre of Rome; Caere (Agylla, Cervetri), which, during the war of Rome with the Gauls, offered a refuge to the Roman Flamen Quirinalis and Vestal Virgins; Veii, the greatest and most powerful city of Etruria, with 100,000 inhabitants, which carried on seven wars with Rome; Clusium (Kamars, Chiusi), the chief of which, Porsena, as principal commander of the Etruscan troops, dictated a humiliating peace to Rome after she had expelled the Tarquins; Perugia (Perugia), destroyed in the Perugian civil war (40); Arretium (Arezzo), birthplace of Mæcenas. Of other not sovereign places may be mentioned Lucca (Lucca), Pisa (Pisa), on the Arno, with the Portus Pisanus, now Leghorn, and Florentia (Firenze, Florence), on the Arno.

To what nation the inhabitants—called Etruscans (—*Exteri*, strangers) or Tuscans in the Roman, Tyrrheni or Tyrseni (*Turrenoi*, *Tursenoi*) in the Greek, and Rasena (Tescne Rasne) in their own language—originally belonged, and what country they came from, is a question which was debated many hundred years before Christ, and is not settled yet. All the most ancient writers, save one of the most trustworthy, Dionysius of Halicarnassus, implicitly follow Herodotus, who—confounding them, perhaps, as his wont, with the Lydian *Turrenoi*, or inhabitants of the city of Tyrrha—pronounces them to be Lydians, although there is not the slightest similarity between these two nations, and although Xanthus, the Lydian historian, knows nothing whatever about a fabled famine of eighteen years' duration in Lydia, followed by an emigration to Italy under a Prince Tyrrhenus. Dionysius himself offers no opinion; he calls them an indigenous race—which means nothing; and it is surprising that some modern investigators should, despairing of a rational solution of the old riddle, have fallen back upon this evasive theory of 'autochthons.' Thucydides, in first mixing up the Torthebian pirates with the Pelasgian filibusters, gave rise to the most hopeless confusion about their very name. As to the innumerable theories and hypotheses that have been put forward since his day, we will only mention that while Ciampi and Collar hold them to be of Slavonic origin, Fréret calls them Celts; Micali, Albanese; Lami, Pfitzmaier, and Stieckel, Semites; and others variously make them Goths, Scandinavians, Basques, Assyrians, Phœnicians, Egyptians, and Armenians.

The most rational and generally accepted opinion is that of Niebuhr—modified more or less by Otfried Müller, Lanzi, Leipsius, Steub—of their being, when they first appear in history a mixture of an eastern tribe, which had settled for a while in the Rætian Alps (the Tyrol of to-day), and Pelasgians, whom they had found in their new Italian seats; these latter having, in their turn, since their immigration, mixed with the Umbrians, the oldest historical inhabitants of those parts. But, as we said before, this is only the most rational opinion that rose out of an ocean of wild speculation: so far from any authentic proofs having been brought forward in its support, the question stands to-day precisely where it stood when Dionysius wrote:—'The Etruscans do not resemble any people in language and manners.'

Immense as was their influence on Roman, and, in fact, on European civilization, very little is known with respect to their political history. Chiefly cultivating the arts of peace, they still seem, long after their heroic period, to have been powerful enough to scare away any invader, and this probably is the reason why historians have so little to record of them; but their decline may be said to stand in an inverted ratio to the rise of Rome. The 7th and earlier half of the 6th c. B.C. had been the most powerful and flourishing epoch of the Etruscan state in its widest sense—which then probably had been in existence for four or five hundred years. Whether they had put their Tarquinii as governors over conquered Rome, or whether on the contrary, the reign of this Etruscan family would denote the subjugation of Southern

Etruria by Rome herself, is not quite clear; but the expulsion of the last Roman king, Tarquinius (Tarchon), called Superbus, was followed, about 507 B.C., by a war between the Etruscans, under Porsena of Clusium, and the Romans, which, although ending in a most ignominious peace, dictated within the walls of Rome, did not bring about the restoration of the Tarquinian dynasty. From the wars between Veii and Rome, which began in 486, and ended—interrupted only by an occasional armistice—395 B.C., with the destruction of Veii, dates the gradual but sure extinction of Etruria as an independent state. The Gauls advancing from the north, the Etruscans were forced to conclude a forty years' truce with their adversaries at any price; but these over, and the Romans being engaged with the Samnites, the Etruscans recommenced their hostilities more fiercely than ever.

In the course of this last war, the Romans succeeded, 309 B.C., under Q. Fabius Maximus, in twice defeating them, and Fabius crossed the Ciminian forest—the frontier sacred from time immemorial; and when, 283 B.C., P. Cornelius Dolabella had beaten both them and their Gallic auxiliaries in a decisive and sanguinary battle at the Vadimonian Lake, Etruria became a Roman province; and about two hundred years later, the Lex Julia conferred upon her inhabitants, as a reward for their fidelity, the right of citizenship. Up to that time, they had succeeded in keeping up their own singularly distinct creed, customs, traditions, language—their nationality, in fact; when Sulla, 82 B.C., infuriated by the part they had taken against him, liberally bestowed great portions of their land upon his veterans; and some fifty years later, Octavianus planted his military colonies there. This wrought and completed the transformation of that mysterious conglomeration of heterogeneous races and tribes, hitherto called Etrurians, into Romans. Once more, well-nigh 2000 years after its extinction, the kingdom of Etruria (Etruria) rose before the eyes of the world. The peace of Lunewio re-created it, and conferred it on the hereditary prince, Louis of Parma; after whose death, his widow, the Infanta Louisa of Spain, administered the government for their son, Charles Louis, up to 1807, when it became a French province. From 1809, it again bore the name of the Grand Duchy of Tuscany; and to TUSCANY—which in our days forms a province of the Italian kingdom, as it did of yore—and to ITALY we refer for its modern history.

We have spoken above of twelve cities as forming the confederacy of Etruria Proper. Similar confederacies of twelve cities were established, independently of each other, in the two other Etrurias. The cities themselves, however, cannot be fixed now in all cases. From the fact of more than twelve autonomous ones being recorded in Etruria Proper, it would appear that some among these twelve confederates, or *populi*, possessed more than one capital city, each *populus*, however, being limited to one representative vote in the general council. The members of the confederacy were bound to appear regularly at an annual religious assembly near the temple of Voltumna, a locality which we are as yet unable to point out. Here great fairs were held for the people; common operations of war being discussed by the *principes*, and a general-in-chief for the ensuing year elected from their number. Each city or canton, in the earlier times at least, had a king (*Lucumo*, *Lauchme* = Inspired), chosen for life, who at the same time acted as high-priest; and a hereditary nobility, which alone was eligible to the higher offices of state. Next to them, in the political and social scale, came the people, properly so called—free, not subject personally to the nobility; lowest stood a great number of clients or bondmen, probably the descendants of subjected original inhabitants. On the whole, the federal interdependence between the cities was far from close. Single cities carried on wars in which the others took no part; and when the confederacy resolved on general action, there were always some members which, for some reason or other, stood aloof.

It appears from this that the Etruscan constitution was analogous to the Greek and Roman in their earliest stages: the community develops itself into a *polis* or city, chooses a head, or rather high-priest, and enters into a more or less intimate alliance with its neighboring cities; but, beside that king of its own, recognizes a common chief only in time of war.

The Etruscans were, as a people, less warlike than any of their neighbors, especially the Romans, and conspicuous is their want of anything like cavalry. Theirs was also the un-Italic custom of hiring soldiers, and their energies seem principally to have been directed to the more profitable occupations of trade and agriculture. One of the chief articles of their commerce was amber, which Germans brought from the Baltic to Etruria Circumpadana, whence it was conveyed to Greece by sea. In the western parts of the Mediterranean, they were formidable as pirates; while they were welcomed by the Carthaginians and the Greeks of Magna Græcia, as importers of indigenous products of nature and art, which they exchanged for the wealth of the East and South. That their commerce within Italy must have been very extensive, appears from the fact, that all the states of Central Italy adopted their system of coinage, based, like their tables of

weights and measures, and many of their political institutions, on the duodecimal system.

The striking contrast between the Etruscans and their Italic and Greek neighbors, which appears in the short thickset frames, the large heads and bulky extremities of the former, and the slender limbs and graceful harmony in the whole structure of the latter, and which runs with equal distinctness through the intellectual lives of the three nations, manifests itself nowhere with greater power than in their religions. Equally distant from the abstract, clear rationalism of the Latins, and the plastic joyfulness of Hellenic image-worship, the Etruscans were, as far as their dumb fragments show—for what we find on them of human words we do not understand—chained in a dark and dotard mysticism, such as a blending of a half-forgotten Eastern symbol-service with barbarous religious practices of northern savages, grafted upon archaic Greek notions, might produce. In their Pantheon, the predominance belongs to the evil, mischievous gods; their prisoners are welcome sacrifices to the heavenly powers; they have no silent depths where the 'good spirits' of their departed dwell, but a hell of the most hideous description, and a heaven where permanent intoxication is the bliss that awaits the virtuous. They divide their gods into two classes, and they place them in the most northern, and therefore most immovable point of the world, whence they can best overlook it. The upper section is formed by shrouded, hidden gods (*Involuti*), of uncertain number, who act awfully and mysteriously, and twelve lower gods of both sexes, called *Consentes*, *Complices*. *Tinia* (*Zeus*, *Jupiter*) is the chief of these latter, and stands between the two divisions of the gods, receiving orders for destruction from the upper ones, while the lower ones form his ordinary council, and obey his behests. Nine of these (*Novensiles*) hurl lightnings at various times and with peculiar effects. The three of these deities which seem to have been the principal objects of worship were *Tinia* himself, armed with three different kinds of lightning, *Cupra* (*Hera* or *Juno*) and *Menrfa* (*Minerva*, *Pallas*, *Athene*).

Gods most peculiarly Etruscan are *Veiovis*, an evil *Jupiter*, whose thunderbolts have the power to deafen, and *Nortia*, the goddess of Fate, also called *Lasa* *Mean*. Besides these, they put a host of demons over the different portions of the creation:—the heavens, the earth, and the lower regions (*Penates*, *Lares*, and *Manes*). Their deities have generally wings; and before the Assyrian bulls had come to light, some antiquaries established from this a connection with the Hebrew winged cherubim. Characteristic in the highest degree is their 'disciplina' or art of 'divination.' This had been revealed by *Tages*, a grandson of *Jupiter*, who was dug out near *Tarquini*, in the shape of a child-like dwarf with gray hair—a most striking caricature of these both childish and senile practices—and who died immediately after having communicated these mysteries. They were at first the property of the noble families; but in the course of time, as others were initiated, and schools for priests were founded, these mystical and awe-striking teachings came to be written down. It is saddening to observe here again in what monstrous insanities the spirit of man occasionally revels, and that, too, in the province of what is noblest and highest—religion. The 'disciplina' was developed into an exact science, fully as minutely and casuistically sharpening its points and splitting its hairs as Hindu or Mohammedan theology would. It taught what gods hurled the different kinds of lightning; how, by the color and the peculiar quarter of the sky, the author of the bolt might be recognized; whether the evil denoted was a lasting or a passing one; whether the decree was irrevocable or could be postponed; how the lightning was to be coaxed down, and how it was to be buried. This was the speciality of the *Fulgurales*. The *Haruspices* had as their share the explanation of portents, prodigies, monsters, the flight and cries of birds, the entrails of sacrificial animals; while others ministered in the holy rites at the foundation of cities, the building of gates, houses, &c. Their ceremonies (a word derived from their town *Cære*) were endless and silly, but the show and pomp with which their priests knew how to surround these juggleries, and from which the Romans largely borrowed, made them acceptable in the eyes of the herd; and although Rome herself, with all her augurs, called Etruria 'the mother of superstition,' there was a certain odor of tithes and fees about these rites which made many anxious to 'preserve religion in its primeval purity.'

In the entire absence of anything like a genuine Etruscan account, even the outlines of the relation between their religion and that of the Greeks on the one hand, and the Romans on the other, are exceedingly difficult to trace; so much, however, is certain, that they adopted and assimilated many points of archaic Greek theology, and clothed them in a garb of their own, and that this process was gone through and repeated still more completely by the Romans, in their turn, with respect to the religious notions of the Etruscans. The articles on Greek and Roman religion will furnish further information on this point.

The high degree of civilization which the Etruscans possessed

long before Rome was heard of, is testified by innumerable works of masonry and art. The Etruscans were of an eminently practical turn of mind, and domestic, like the north. Trusting to their priests for reconciliation with the gods, who always seemed irate, but whose angry decrees could easily be foreseen and averted, they set to work in developing the inner resources of the country, and in making the best use of their intercourse with foreign countries. They thus became eminent in agriculture, navigation, military tactics, medicine, astronomy, and the like; and in all these, as well as in some of the very minutiae of their dress and furniture, the Romans became their ready disciples and imitators. The division of the year into twelve months, of the months into kalends and nones and ides, the designation of the numerals, were Etruscan; from the same source were derived the *toga prætecta* as well as the pomp of triumphs, the *lictors* and *apparitors*, down to the ivory curule chairs. The towns of the Etruscans were clean and healthy, owing to their perfect system of drainage and

sisted mostly of rituals, religious hymns, and some historical works. Whether the Fescennines, certain mocking-songs, sung in alternate verses, with musical accompaniment, at nuptials, originated with them or not, is not decided.

We have alluded to the high proficiency of this people in architecture; they were, in fact, so renowned in this craft throughout the antique world, that, as Solomon called Phoenicians to Jerusalem to build his temple, so the Romans sought in Etruria the framers of their grandest masonic structures, such as the Cloaca Maxima, the Temple of Jupiter on the Capitol, &c. The peculiarly fantastic, and, withal, powerful mind which speaks in all their institutions, equally pervades their architectural productions; but, at the same time, everything they built, they built either for practical or pious purposes. We cannot here enter into a discussion of their manner as it appears in various epochs, but it never reached anything like a distinct national completeness, their eagerness to profit by foreign examples not allowing them to develop it to the full unalloyed. Of their walls and gates, temples and porticoes, theaters and amphitheaters, bridges and sewers, gigantic and, in the earliest times, cyclopean—evidently erected, in Eastern fashion, by hosts of slaves—very little is extant in so complete a form as to give us an exact insight into their mode of construction; and were it not for their tombs, our knowledge would be exceedingly limited. These form one of the most peculiar features in Etruscan antiquities. Hewn in rocks, either below the ground or in the face of a cliff, they were adorned outside with a somewhat Egyptian façade of a temple or a house, which the insides themselves most exactly reproduce, with all their internal decorations, furniture, and utensils. Of the paintings which run round the walls, and which are our safest and most complete guides to the inner life of this nation, we will say more presently. We must not, in conclusion, omit to mention that their temples bore in primitive times, and always retained, in some measure, so far as we can judge, the unfinished character of the wood-buildings of northern mountain tribes—a square, half-house, half-fortification, overloaded with quaint ornamentation.

In their plastic and pictorial arts, Winckelmann has established three distinct styles—to which Dennis has added a fourth—viz., the Egyptian, with Babylonian analogies, the Etruscan or Tyrrhene proper, the Hellenic, and that of the *decadence*. Characteristic of the first style are the prevalence of straight lines, right angles, faces of an oblong, contracted oval, with a pointed chin, eyes mostly drawn upwards, the arms hanging close to the side, the legs close together, the drapery long, in straight parallel lines, the hair disposed in tiers of curls. In this style, the attitude is constrained, the action stiff and cramped. The progress shown by the second style is the greater attention bestowed on the delineation of the muscles, which swell out in disproportionate prominences on the now almost entirely nude body. The two remaining styles explain themselves. Their statuary, as it appears chiefly on sarcophagi and cinerary urns, suggests likewise an Egyptian origin. The figures, are those of their own mystical and awful Hades, instead of the Bacchic processions of Greece and Rome.

The grouping follows rather a pictorial than a plastic principle; the motion is hasty and forced; but the features of the deceased, hewn on the lid, have all the rude accuracy of a spiritless portrait. Statues of deities in wood and stone have indeed been found, but very rarely. Of high renown were their ornaments and utensils in baked clay (*terra cotta*), in the manufacture of which objects the Veientes were especially famous. Rome, at a very early period, possessed of this material a quadriga and the statue of Summius, made by Etruscans. Of the art of working in bronze, the Etruscans were supposed to be the inventors; that they brought it to a very high degree of perfection, is evident from the examples which remain to us. Statues and utensils were manufactured and exported in immense quantities, not only to Rome, but to every part of the known world. Of figures on a large scale still extant, we may mention the renowned She-wolf of the Capitol, the Chimæra in the Museum of Florence, the Warrior of Todi in the Etruscan Museum of the Vatican; a portrait-statue of an Orator, with the inscription *Anle Meteli*, in Florence; and the Boy with the Goose at Leyden. The various objects of ornament and use, found in great numbers in tombs, such as candelabra, cups, tripods, caldrons, conches, discs; articles of armor, as helmets, cuirasses, &c.; musical instruments, fans, cists or caskets, are most of them models of exquisite finish and artistic skill. Their gems are as numerous as those of Egypt, and, like them, cut into the form of the *scarabæus* or beetle. They were exclusively intaglios, and of cornelian, sardonyx, and agate. On these the Etruscan artists represent groups from the Greek mythology, or the heroic cycle, bereft, as they seem to have been, of heroic legends of their own. They are most frequently found at Chiusi and Vulci, and were worn as charms and amulets. Special mention should be made of the metal *specula*, or mirrors, with figures scratched upon the con-

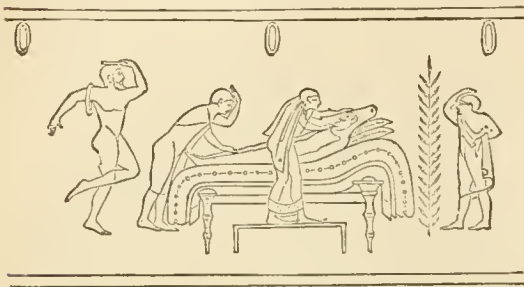
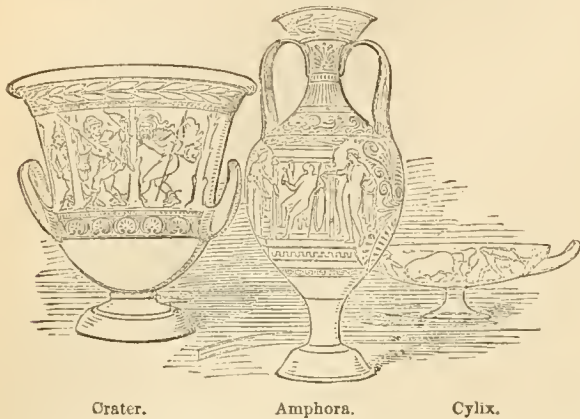


Etruscan Mirror from Vulci, with Phaenops (Bacchus), Semele (Semele), and Apulo (Apollo) Half size. After a drawing by Mr. George Scharf.

sewerage; they tunnelled and excavated, they embanked and irrigated, they turned swamps into cities, changed the course of streams, and excelled in all kinds of useful public and private works. Their ideal was not the beautiful or the spiritual, but a comfortable, and, if possible, luxurious existence. As a special proof of their love for their own hearth, a quality probably imported from the north, we might adduce their invention of the atrium, the common sitting-room of the family, where the master of the house sat surrounded by his penates and the figures of his ancestors, while the wife and her handmaidens plied the labors of the loom or the distaff. As in the Germanic nations, woman stood in high estimation. She was the companion, not the slave of the husband, and thus had certainly not a little share in the softening of their primitive wildness, and in counteracting the sombreness of their creed. That we find them even in their tomb-paintings engaged in convivial carousings, dancing, races, athletic games, and that they liked their very worship accompanied by the sound of flutes, horns, and trumpets, only shows that that glorious sky of theirs, their intercourse with the nations, their wealth and culture, had gradually caused their antique and gloomy austerity to wear off, even as it wore off with the Romans and other peoples; for to assume with some that the boisterous scenes to which we allude were caused more or less by the despair arising from the loss of their independence, would be going somewhat too far. Licentiousness is the sure forerunner of the fall of a nation, but a whole people does not take refuge in enjoyment when their all is lost. We know little of Etruscan literature; it seems to have con-

cave side, the front or convex side being highly polished. These ranged over all the phases of Etruscan art, and are especially and peculiarly Etruscan. None but Etruscan inscriptions have ever been found upon them. They will, no doubt, prove eventually of the highest importance, not only by enabling us to follow the gradations of artistic development step by step, but by furnishing us with lists of names of gods and persons, and, it may be, of objects.

Of the vases and urns which are found in innumerable quanti-



ties in Etruscan tombs, we cannot treat here, as they are admitted on all hands to be, with very few exceptions, Greek, both in design and workmanship; we must refer the reader to the special article on VASES; but a few words may be added on the before-mentioned tomb-paintings. They are found chiefly in the cemeteries of Tarquinii and Clusium; and they are all the more important, as they lead us with minute accuracy from the very cradle of the individual, through the various scenes of his entire life, to its close; and this throughout the existence of the nation itself, beginning before the foundation of Rome, and ending in the Empire; while we follow the style in its gradual development from the Egyptian to Græco-Roman perfection. One of the annexed specimens, taken from a tomb at Corneto, represents a death-bed scene; but most of the other paintings, especially at Tarquinii, are of a very different description, as the other specimens show. Life in its merriest aspects gleams in the most vivid of colors all round—dancing, feasting, loving, hunting. The Etruscans of later times had learned in the school of the Hellenes to dread death less, and to think of the other world as one of continued joyfulness.

The Etruscan language is preserved in more than 3000 inscriptions, and this number will no doubt be doubled by the opening of new sepulchral chambers, with which the soil of ancient Etruria is teeming. These inscriptions are found on sarcophagi, urns, vases, columns, statues, and looking-glasses in bronze. The latter article was a favorite object for the representation of scenes from Greek mythology, and from this source we learn the names of the principal native deities. *Tinia* was Jupiter; *Usil*, the sun;

Efufuns, Bacchus; *Sethlans*, Vulcanus; *Thurms*, Mercurius; *Turan*, Venus; *Thalna*, Juno; *Thesan*, Aurora. Some of the minor female deities are called *Lasa*, *Maris*, *Mean*, *Vanth*. The inscriptions are of two kinds—the archaic and more recent. The former, generally beginning with the syllable *MI*, are distinguished not merely by a more ancient form of the alphabet, but also by a more refined condition of the language. In the older inscriptions consonants and vowels are evenly balanced. But in the documents of a later date, short vowels are generally omitted, and, in consequence, combinations of consonants appear which remind us strongly of the cacophonous forms of some of the Slavonic languages.

Compare the following specimens: 1. *Mi Tesantia Tarchumenaia*. 2. *Laris Sestna Lumsial*.

With regard to the grammar, the following points may be considered as established. In the singular of nouns, the nominative ends in *s*; the genitive, according to the class of declension, in *a-s*, *e-s*, *i-s*, *u-s*; the dative in *si* or *s*. But these terminations are very often dropped, just as in early Latin. In the Cippus Perusinus, both the largest and best preserved inscription of all now in existence, we find of the proper names *Velthina* and *Afuna* the cases: *Velthina*, *Velthinam*, *Velthinas*; *Afuna*, *Afunam*, *Afunas*. The suffix *al* serves mostly, but not exclusively, for the expression of a metronymic. *Thana Scianti Latinial*, for example, is *Thana Sciantia*, the daughter of *Latinia*. Another very common suffix—*asa*, *esa*, *isa*, *usa*—designates the matrimonial relation of women. *Thana Aulnei Canzasa* is *Thana Aulneia*, the wife of *Canza*; *Tha Setumnei Pumponisa* is *Thana Setumneia*, the wife of *Pomponius*. It is clear that this suffix consists of the genitives in *as*, *es*, *is*, *us*, with the addition of an *a*, so that grammatically and logically the wife is defined as part and parcel of her husband. Verbal forms do not occur often, but it is certain that the preterite is formed from the root by the addition of the syllable *ce*, like *tur-ce*, *the-ce*, *lupu-ce*, *sval-ce*. The numerals sound rather strange. *Much*, *thu*, *zal*, *huth*, *ki*, *sa*, are 1–6; but as yet the individual meaning of each of these is unknown. The same must be said of *sesphs*, *esal*, *mu* or *muv*, the numerals for 7–9. Decades are expressed by *alch(a)l*, e. g., *sespalchal*, *muvalchl*, *cealchl*. Ninety was probably *zathrum*. The meaning of about 10 or 12 words, such as *clan*, son; *sech*, wife; *avil*, age; *vril*, year; *huthial*, spirit; *fleses*, statue, can be clearly established; but as yet no affinity has been discovered between these and the corresponding expression in languages, whether Arian or otherwise. The following two inscriptions are given with a translation which in one or two points is conjectural:

Vipia Alsina turce Versenas Caia.
Vibia Alsinae dedit Versenae, Caiæ filiae.

The second is found on the celebrated bronze statue of the orator, now preserved in the museum of Florence:

Aulesi Metelis Fe Vesial clensi cen fleses tece
Aulo Metello Velie Vesiae filio hoc signum posuit
sansl tenine tuthines chisulies.
jussu concilii publici magistratus (?).

The few bilingual inscriptions (altogether 15) throw no light on the language, as they contain only proper names. The so-called Tyrrhenian glosses, preserved in the lexicon of Hesychius, are worse than useless for critical purposes.

ETSCH. See ADIGÉ.

ETTMÜLLER, ERNST MORITZ LUDWIG, an able writer on German antiquities, was born 5th October 1802, at Gersdorf, in Upper Lusatia, and studied medicine at Leipzig from 1823 to 1826, but subsequently the language and history of his native country. In 1830, having taken his degree of Ph.D. at Jena, he began to deliver lectures there on the German poets of the middle ages; in 1833 he was called to the Zürich Academy, and in 1863 to the university there, as professor of German literature. E.'s literary activity has been exhibited chiefly in the editing of the literary remains of the Middle High-German, and older Low-German dialects. To the former belong his *Sant Oswalds Leben* (Zürich, 1835); *Hadeloubes Lieder und Sprüche* (Zürich, 1840); *Heinrich's Von Meissen des Frauenlobes Lieder, Leiche, und Sprüche* (Quedlinb. 1843); *Frouen Helchen Süne* (Zürich, 1846); *Heinrich's Von Veldecke Enide* (Zürich, 1852). Of poems composed in Low German he published, among others, *Theophilus* (Quedlinb. 1849); and *Wizlances IV., des Fürsten Von Rügen, Lieder und Sprüche* (Quedlinb. 1852). In 1850 appeared under his editorship, an Anglo-Saxon chrestomathy; in the following year his much-valued *Lexicon Anglo-Saxonum*. E. also studied old Norse literature, as is shown by an edition of the *Völuspá*, translations, and a Norse reading-book. E., who died in April 1877, wrote several original poems: his *Deutsche Stammkönige* appeared at Zürich in 1844, his *Kaiser Karl d. Gr. und das Fränkische Jungfrauenheer* in 1847, and his *Karl d. Gr. und der Heilige Goar* in 1852. *Herbst-*

abende und Sommernächte are essays on his favorite subjects (3 vols., 1865-67).

ETTRICK, a pastoral vale in the south of Selkirkshire, watered by the Ettrick river, which rises amid bleak hills in the south-west corner of this county near Ettrick Pen, 2258 feet high, and runs 28 miles north-east, and falls into the Tweed. Its chief affluent is the Yarrow, which runs 25 miles from the west, through one of the loveliest of Scotch vales, and the scene of many a plaintive song. Ettrick Forest, a royal hunting tract, swarming with deer till the time of James V., included Selkirkshire and some tracts to the north. In Ettrick Vale, at Tushielaw, dwelt the celebrated freebooter or king of the Border, Adam Scot, who was summarily executed by James V. The district derives some note from two persons in modern times—Thomas Boston (q. v.), a Scottish divine, who was minister of the parish of Ettrick; and James Hogg, the Scottish poet, who, having been originally a shepherd in this part of the country, became known as 'the Ettrick Shepherd.'

ETTY, WILLIAM, R.A. This distinguished artist was born at York, March 10, 1787. His father was a miller and spice-maker. Before he was twelve years of age, he was apprenticed to a printer, and served out his dreary term of seven years, the irksome drudgery of which he himself often afterwards was in the habit of narrating, occasionally soothed by dreams of, on some future day, being an artist. Freed at last, and assisted by some relatives, in 1805, at the age of 18, he entered on the study of art, and, after a year's probation, was admitted as a Royal Academy student. His career is very interesting and instructive. It exhibits one gifted with enthusiasm for art, high resolutions, and great industry and perseverance, for a series of years invariably surpassed by many of his fellow-students, and, as has been recorded, 'looked on by his companions as a worthy plodding person, with no chance of ever becoming a good painter.' Neither prizes nor medals fell to his share as a student; and for several years his pictures were rejected at the Royal Academy and British Institution Exhibitions. It was only after six years of hard study that he obtained a place for a picture in the Exhibition of the Royal Academy; and his works only began to attract notice in 1820, when the artist was 33 years of age, and as he himself has said, 'having exhibited nine years to no purpose.' But the circumstance of E.'s genius being so long unappreciated, did not so much arise from his works evincing no talent, as from his class of subjects, and those technical qualities for which his works are remarkable, not being appreciated at the time; for long before his pictures were saleable, his powers were highly appreciated by his professional brethren. On his return from Italy in 1822, where he had been studying the great Venetian colorists, he was elected an Associate of the Academy. In 1824, his *chef-d'œuvre*, 'The Combat—Woman pleading for the Vanquished,' was purchased by an artist, John Martin. In 1828, he was elected Academician by the members of the Royal Academy; while in the same year the Royal Scottish Academy testified its high appreciation of his talents by purchasing the most important of his efforts, the historical work illustrating the history of Judith and Holofernes. Testimonials so high soon had their effect; E.'s pictures came into great request, and brought large prices, and he was enabled amply to repay those who, trusting to his energies, had assisted him when he entered on the contest, in which, after so arduous a struggle, he gained so much honor. He always cherished a love and reverence for York, his native city, and had retired there some time previous to his death, which took place on November 30, 1849.

E. had an exquisite feeling for color, which he most assiduously cultivated by studying the works of the great Venetian masters, and constantly painting from the life; and though, in his drawing, carelessness and incorrectness may often be observed, it is never vulgar, and often possesses much elevation and largeness of style. He generally chose subjects that afforded scope for color, in which the nude and rich draperies were displayed. He executed nine pictures on a very large scale, viz.: 'The Combat,' series of three pictures illustrating the delivery of Betulia by Judith; 'Benaiiah slaying two Lion-like Men of Moab'—these five, which are the best of his large works, were purchased by the Royal Scottish Academy, and are now in the Scottish National Gallery—'The Syrens,' now in the Manchester Institution; and three pictures illustrating the history of Joan of Arc. His smaller works are numerous. Besides his large works above referred to, he sent for exhibition to the Royal Academy and British Institution, between 1811 and 1849 inclusive, no less than 230 pictures, many of them composed of numerous figures, and all remarkable for exquisite color. The following may be particularly noted: 'The Coral-finders,' 'Venus and her youthful Satellites arriving at the Isle of Paphos,' 'Cleopatra's Arrival in Cilicia,' a composition from the eleventh book of *Paradise Lost* ('Bevy of fair women'); 'The Storm,' 'Sabrina,' 'The Warrior Arming,' 'Youth at the Prow, and Pleasure at the Helm,' 'The Dance,' from Homer's descrip-

tion of Achilles's Shield; 'Britomart redeems Fair Amoret,' 'Dance on the Sands, and yet no Footing seen,' 'Amoret Chained.'—Compare E.'s Life by Gilchrist (Bogue, London, 1855).

ETYMOLOGY (Gr.) is that part of grammar that treats of the derivation of words. It embraces the consideration of the elements of words, or letters and syllables, the different kinds of words, their forms, and the notions they convey; and lastly, the modes of their formation by derivation and composition. Etymological inquiries have formed a favorite pursuit from the earliest times. In the book of Genesis, numerous indications are given of the derivation of proper names. Homer also attempts etymologies of the names of gods and men, which, however, can only be looked upon as more or less ingenious fancies. The grammarians of Alexandria and Varro among the Romans tried to base their etymologies on something like principle; but the wildest conjectures continued to be indulged in, and the results were little better than guess-work down to a very recent period. As philology extended its sphere, and became acquainted with the languages and grammarians of the East, who far excelled those of the West in this particular, etymology took on a new form. It no longer sought the relations of the words of a single language exclusively within itself, but extended its view to a whole group, e. g., the Teutonic, or wider still, to a whole family, as the Indo-European, or Aryan (q. v.), and became a new science under the name of Comparative Grammar. See PHILOLOGY.

Etymologicum Magnum is the name of a Greek lexicon, the oldest of the kind, professing to give the roots of the words. It appears to belong to the 10th c.; the author's name is unknown. The etymologies are mere guesses, sometimes right, often wildly absurd; but the book is valuable, as containing many traditions and notices of the meanings of old and unusual words. There is an edition by Schäfer (Leip. 1816); one by Sturz, called *Etymologicum Gudianum* (Leip. 1818); and another by Gaisford (Oxf. 1849).

EU, a tolerably well-built town of France, in the department of the Lower Seine in Normandy, situated near the mouth of the Bresle, 93 miles north-north-west of Paris. It is remarkable for its fine Gothic church, and for the Château d'Eu, a low building of red brick, with high tent-shaped roofs of slate. E. manufactures sail-cloth, ropes, soap, lace, and silk. Pop. (1876) 4169. In the 11th and 12th centuries, E. was in the possession of the counts of the same name, a collateral branch of the Norman royal family. After various vicissitudes, it was purchased by Mademoiselle de Montpensier in 1675, whose fanciful taste has perpetuated itself in the architecture and decoration of the château. At a later period, it came into the possession of the Duke of Maine, from whom it passed to the Duke of Penthièvre, the maternal grandfather of Louis Philippe, who succeeded to it in 1821. Louis Philippe expended large sums on the embellishment of the château, and especially on its magnificent park and the unique portrait-gallery. It has besides acquired a new historical association through the visits of the queen of England in 1843 and 1845. The eldest son of the Duke of Nemours (born 29th April 1842) received from his royal grandfather the title of Count d'Eu. Compare Vatout, *Le Château d'Eu, Notices Historiques* (5 vols., Paris, 1836), his *Résidences Royales* (Paris, 1839).

EUBŌA (ancient, *Eubœa*; Turkish, *Egribo*; Ital. *Negroponte*), the largest island in the Aegean Sea, forms a portion of the present kingdom of Greece. Until recently, it was called Negropont. It is bounded on the N. by the Trikeri Channel, and on the W. by those of Talanta and Egribo. It extends in a direction parallel to the mainland; is 105 English statute miles long, and 30 miles in extreme breadth, although in one part its breadth is scarcely four miles. At the narrowest part, it is connected with the mainland by a bridge. The island is intersected by a chain of mountains, running north-west and south-east, and attaining in the center, in the range of Mount Delphi, an elevation of about 4500 feet. Copper and other metals are obtained in the island, which also contains numerous hot springs. The pastures are excellent, and the declivities of the mountains covered with forests of fir-trees. The climate is salubrious, the valleys well watered and very fertile, but little cultivated. The chief products are cotton, oil, wine, wheat, fruit, and honey. The inhabitants are chiefly engaged in the breeding of cattle; they export wool, hides, and cheese, as well as oil and grain. The chief towns are Chalcis (q. v.) on the north, and Carystos on the south coast, the latter having a population of 3000. E. was peopled in the early historic times chiefly by Ionic Greeks, and afterwards by colonists from Athens, who formed a number of independent cities or states. These were at first monarchical in their constitution, but at a later period democratic. They soon rose to power and prosperity. After the Persian wars, however, E. was subjugated by the Athenians, under whose rule it continued till they, in their turn, were subdued by Philip of Macedon. By the Romans, it was finally united with the province of Achaia under Vespasian.

In 1204, it came into the possession of the Venetians, and re-

ceived the name of Negroponte. In the year 1470, the island was taken by the Turks, in whose hands it remained till 1821, when the inhabitants rose to vindicate their independence at the call of the beautiful Modona Maurogenia. It now forms a portion of the modern kingdom of Greece, and has a population of (1879) 95,136.

EUCALYPTUS, a genus of trees of the natural order *Myrtaceæ*, sub-order *Leptospermæ*, containing a large number of species, mostly natives of Australia, and which, along with trees of nearly allied genera, form one of the most characteristic features of the vegetation of that part of the world. The genus occurs also, although much more sparingly, in the Malayan Archipelago. The trees of this genus have entire and leathery leaves, in which a notable quantity of a volatile aromatic oil is usually present. The leaves, instead of having one of their surfaces towards the sky, and the other towards the earth, are often placed with their edges in these directions, so that each side is equally exposed to the light. Many of the species abound in resinous secretions, and are therefore called GUM-TREES in Australia. Some of them attain a great size; some are found with trunks from eight to sixteen feet in diameter; a plank of 148 feet in length was exhibited at the Great Exhibition of 1851. They are of very rapid growth; and their timber, when green, is soft, so that they are easily felled, split, or sawn up; but when dry, it becomes very hard. It is used for a great variety of purposes, amongst which may be mentioned ship-building. The bark of many of the species abounds in tannin, and has become to some extent an article of commerce. Some kinds of it are said to be twice as strong as oak-bark. The bark of some is remarkable for its hardness; whilst some throw off their outer bark in longitudinal strips or ribbons, which, hanging down from their stems and branches, have a very singular appearance.—Among the resinous secretions of this genus is the substance called BOTANY BAY KINO, which is used in medicine as a substitute for Kino (q. v.). It is the produce of *E. resinifera*, a species with ovato-lanceolate leaves, known in Australia as the RED GUM TREE and IRON BARK TREE, a very lofty tree, attaining a height of 150–200 feet. When the bark is wounded, a red juice flows very freely, and hardens in the air into masses of irregular form, inodorous, transparent, almost black when large, but of a beautiful ruby red in small and thin fragments. Botany Bay Kino is said to consist chiefly of a peculiar principle called *Eucalyptin*, analogous to tannin. About sixty gallons of juice may sometimes be obtained from a single tree, or, in the course of a year, as much as five hundred pounds of kino.—*E. robusta*, STRINGY BARK TREE, also a lofty tree, yields a most beautiful red gum, which is found filling large cavities in its stem, between the concentric circles of wood.—*E. mannifera* yields, from its leaves, an exudation resembling manna, less nauseous, and of similar medicinal properties. It contains a saccharine substance, different from mannite, from glucose, and from all previously known kinds of sugar.

Another similar exudation, from the leaves of *E. dumosa*, is sometimes seen spread over large districts like snow, and used by the natives as food.—The Tasmanian Blue Gum Tree, which is one of the Eucalypti, has recently acquired great reputation for its effects in drying marshy soils, and in preventing malarious diseases. It is extremely rapid in its growth, which may account for its drying powers; and this, in its turn, may partly account for its salubrious effects; although its camphor-like odor may also have to do with it. It has been tried with decidedly beneficial effects in the Cape of Good Hope, Algeria, the Roman Campagna, and elsewhere. Unfortunately, it does not bear a severe winter.

EUCHARIST. See LORD'S SUPPER.

EUCHLORINE is a very explosive green-colored gas, possessing bleaching properties, and is prepared by heating gently a mixture of 2 parts hydrochloric acid, 2 of water, and 1 of chlorate of potash. It explodes when merely touched with a hot wire, and is most likely composed of a mixture of chlorine and chlorochloric acid ($2\text{ClO}_2, \text{ClO}_2$).

EUCLID, sometimes called the father of Mathematics, was born at Alexandria, about 300 B.C. We know little more of his history than that he belonged to the Platonic school of philosophy, and taught mathematics in the famous school of Alexandria, during the reign of Ptolemy Soter. Though he did not create the science of mathematics, as is sometimes represented, he made prodigious advances, especially by his vigorous method and arrangement. In this respect he has perhaps never been excelled, and his *Elements of Geometry* continue to the present day to hold their place as a text-book of that science. Besides the Elements, there are extant treatises on music, optics, data, &c., ascribed to E., the authenticity of some of which is doubtful. The best editions of the whole reputed works of E. are those of David Gregory (Oxf. 1703) and Peyrard (3 vols., Par. 1814–1818). The oldest Greek edition of the Elements appeared at Basel, 1533; the best is that of August (2 vols., Berlin, 1826). Of English editions of E.'s Elements, those of Simpson and Playfair are considered the best.

There is a full account of everything connected with E. and his works in Smith's *Dictionary of Greek and Roman Biography*.

EUCLID, of Megara, a Greek philosopher, has often been confounded with the mathematician of the same name. He was one of the earliest disciples of Socrates. Although Megara lay at a considerable distance from Athens, and all Megarians were forbidden to enter the Athenian territories under pain of death, E. came into the city in the evening in female disguise, to enjoy the instructions of Socrates. After the death of his master, he established a school of his own, which received the name of the Megaric School. His death took place about 424 B.C. The basis of his system was the Eleatic dogma of a one, only, universal, substance or existence. Blending with this the Socratic idea of the predominance of the moral element, E. held this one real existence to be *the good*, though it receives various names under its special manifestations.

EUDIO'METER (Gr. *eudios*, good, and *metron*, measurer) is an instrument originally introduced as a measurer of the goodness of air in any locality, but which is now employed generally in the analysis of gases for the determination of the nature and proportions of the constituents of any gaseous mixture. The instrument is now made of glass in the form of a tube, which is hermetically sealed at one end, and open at the other. The tube may be straight, or bent in the shape of the letter U. In either case, the tube is graduated or marked off in equal-sized divisions from the closed end onwards, so as to admit of the volume of gas placed within being accurately measured; and two platinum wires are inserted through the glass near the shut end of the tube, and closely approach, but not to touch, each other. These wires are intended for the conveyance of electric sparks through any mixture of gases, so as to cause the combustion of certain of them. For the modes of manipulating with the eudiometer, see GAS, ANALYSIS OF.

EUDO'CIA, the name of several Byzantine princesses, of whom the most important is the wife of the Emperor Theodosius II. She was the daughter of the sophist Leontius or Leon, and was educated by her father, who instructed her in the literature of Greece and Rome, in rhetoric, geometry, arithmetic, and astronomy. Her accomplishments and her singular beauty were reckoned by Leontius a sufficient fortune, for at his death he left all his property to her two brothers. E. appealed to the emperor at Constantinople. Pulcheria, the sister of Theodosius, was interested in the maiden, and thought she would make a suitable wife for the emperor. But as E. (or, more properly, Athenais, for this was her name until her baptism) had been brought up a pagan, it was necessary first to convert her. This was easily accomplished. E. was married to the emperor in 421 A.D. For many years, however, Pulcheria ruled in the imperial household and councils, E., according to Nicephorus, 'submitting to her as mother and Augusta;' but in 447, a quarrel broke out between them in regard to the Eutychian heresy, of which E. had become a supporter. At first, E. was triumphant, and Pulcheria was banished; but in a short time the emperor was reconciled to his sister, and treated E. so sharply that she retired to Jerusalem, where she died 460–461 A.D. Her latter days were spent in works of piety and charity. She enriched churches, rebuilt the walls of the Holy City, and founded many monasteries and hospitals. Through the influence of the famous Symeon Stylites, she was induced to renounce Eutychianism, and become an orthodox Catholic Christian. E. was a poetess of considerable merit. She wrote a poem in heroic verse on the victory obtained by the troops of Theodosius over the Persians, 421 or 422 A.D.; a paraphrase of eight books of Scripture, a paraphrase of Daniel and Zechariah, and a poem in three books on the history and martyrdom of Cyprian and Justina. The authorship of *Homero-Centones* has also (but without sufficient reason) been attributed to her. This is a work composed of verses taken from Homer, and so arranged as to appear a history of the fall of man and of his redemption by Christ. It has been often published.

EUDOXUS, of Cnidus, called by Cicero the prince of astronomers, flourished about 366 B.C. He studied under Plato for some time, and afterwards went to Egypt, where he resided for thirteen years, and had much intercourse with the Egyptian priesthood, from whom he is supposed to have derived his superior knowledge. His last years are said to have been spent on the summit of a high hill, that he might have the starry heavens ever before his eyes. There is little reason for believing that E. deserves any great admiration for his attainments in astronomy. He probably introduced the sphere into Greece, and may have corrected the length of the year, upon Egyptian information, but he appears to have been but an indifferent observer of heavenly phenomena, and Delambre considers that he was ignorant of geometry. E.'s works are entirely lost, and our only reliable sources of information regarding him are the poem of Aratus and the commentary of Hipparchus.

EUGENE, FRANÇOIS, (le Prince François-Eugene de Savoie-Carignan), better known as Prince Eugene, equally distinguished as a general and as a statesman, was born at Paris, 18th October 1663. He was the son of Eugene Maurice, Count of Soissons, and of Olympia Mancini, a niece of Cardinal Mazarin. He was intended for the church; but the banishment of his mother to the Low Countries, by the orders of Louis XIV., was so deeply resented by him, that he indignantly renounced his country, and entered the service of the Emperor Leopold as a volunteer against the Turks. Subsequently, the French government made him the most flattering offers, but he never returned to the service of his native country. He displayed extraordinary military talent in the Turkish war, especially at the famous siege of Vienna in 1683, and soon rose to a high position in the army. In the Coalition War against Louis XIV. in Italy, he took an active part; and in 1691, he was raised to the command of the imperial army in Piedmont. On his return to Vienna, he was placed at the head of the army of Hungary, and defeated the Turks, with immense slaughter, in the famous battle of Zenta, September 11, 1697. The booty obtained was almost incredible, amounting to several millions sterling. In 1701 broke out the Spanish War of Succession. E. for two years commanded the army of Italy, but his forces were too small for him to accomplish anything of importance. In the year 1703, being appointed president of the council of war, he became thenceforth the prime mover of every undertaking. He first took the command of the imperial army in Germany, and along with Marlborough gained a brilliant victory at the battle of Blenheim, 13th August 1704, when the two commanders defeated the French and Bavarian army. E. afterwards saved Turin, and expelled the French from Italy in the year 1706. He shared, too, with Marlborough the glory of the fields of Oudenarde (in 1708) and Malplaquet (in 1709); but being crippled in his resources by the retirement of Holland and England from the contest, he was unable to withstand the enemy on the Rhine, and his defeat by Villars at Denain, 24th July 1712, was followed by other disasters, until the peace of Rastadt put an end to the war.

In 1716, on the recommencement of the war against the Turks, E. defeated an army of 180,000 men at Peterwardein, took Temeswar, and in the year 1717, after a bloody battle, gained possession of Belgrade. After the peace of Passarowitz, which was concluded in the following year, he returned covered with glory to Vienna, where, during the succeeding years of peace, he labored with unwearied energy in the cabinet. When the question of the succession to the throne of Poland brought on a new war with France, E. appeared again on the Rhine; but being now advanced in years, and destitute of sufficient resources, he was unable to accomplish anything of importance. After the peace, he returned to Vienna, where he died, 21st April 1736. E. was small in stature, with thin face, and long nose; he was simple in dress and manner, and indulged profusely in snuff. An enthusiast in his profession, and a strict disciplinarian, he was also kind-hearted and sympathetic, and always carefully attended to the wants of his men. He introduced no new tactics in the art of war, and was deficient in the guidance and command of masses; but by his rapidity of perception and decisions, and faculty for making the best of existing circumstances, which was his *forte*, he raised the *prestige* of the Austrian arms to an eminence unequalled before or since his time. He successively served under three emperors, of whom he was wont to say, that in Leopold I. he had a father, in Joseph I. a brother, and in Charles VI. a master. E.'s political writings, published by Sartori, are important for the light they throw upon the history and manners of the time. Compare Dumont, *Histoire Militaire du Prince Eugene*; Ferrari, *De Rebus Gestis Eugenii* (Rome, 1747); Campbell's *Military History of Prince Eugene and the Duke of Marlborough*; and the monographs of Kausler (1838), Arneth (1858), and Von Sybel (1861).

EUGE'NIA, a genus of plants of the natural order *Myrtaceæ*, nearly allied to *Myrtus* (see MYRTLE), and different only in having a 4-parted instead of a 5-cleft calyx, four instead of five petals, and a 1—2-celled berry, with one seed in each cell. The species are trees and shrubs, natives chiefly of tropical and sub-tropical countries. The dried fruit of *E. Pimento* and *E. aeris* forms the spice well known as allspice, Jamaica pepper, or PIMENTO (q. v.). The seeds of *E. Tabasco* are also used as a condiment. Other species yield some of the finest fruits of tropical regions, remarkable for their delicious balsamic odors. Among these is the MALAY APPLE (*E. Malaccensis*), a native of the Malayan archipelago and of the South Sea Islands, a low tree, with ovate-oblong smooth leathery leaves, and fruit in size and shape resembling a small apple, of a beautiful red color, and with a white juicy pulp. The fruit has an agreeable odor, like that of the rose, whence it is sometimes called ROSE APPLE; a name which, on the same account, is often extended to the fruits of allied species, as *E. aqua*, and which is very often given to the JAMBOS or JAMROSADE, (*E. Jambos* or *Jambosa vulgaris*), an East Indian

fruit, now cultivated in all tropical countries. This fruit is pear-shaped, about the size of a hen's egg, white or red.

The tree is about 20 or 30 feet high, much branched, with leaves somewhat like those of the peach, and greenish-yellow flowers in terminal bunches. *E. cauliflora*, a Brazilian species, cultivated in most of the gardens of the diamond and gold districts of the south of Brazil, yields a very fine fruit of a black color, about the size of a greengage plum, called the JABUTICABA or JABOTICABUROS. Similar fruits are produced by other Brazilian species, particularly *E. dysenterica*, *E. inoarpa*, and *E. Braziliensis*. The BASTARD GUAVA (*B. pseudopodium*) and the CAYENNE CHERRY (*E. cotinifolia* and *E. Michellii*) produce fruits which are held in considerable esteem in the West Indies. One species only, the UGNI (*E. Ugni*), a native of Chili, appears to be sufficiently hardy for the climate of Britain; it endures at least that of the south of England; it has been recently introduced, and much extolled as a fruit shrub. Its flowers are very fragrant, and its fruit pleasant. It is much cultivated in Chili, and a very refreshing beverage, with an agreeable balsamic odor, is made of the expressed juice mixed with water. The fruit is of the size of a black current, somewhat flattened, and of a brownish-red color.—The bark of many species of *E.* is very rich in tannin. Some produce good timber.



Cayenne Cherry (*Eugenia Michellii*).

EUGENIE-MARIE DE GUZMAN, formerly empress of the French, was born at Granada in Spain, 5th May 1826, and is the second daughter of the Count of Montijo and of Marie Manuela Kirkpatrick. She is descended, on the father's side, from an old and noble Spanish family, which, by marriages, at various times, acquired the right to assume the names of Guzman, Fernandez, Cordova, Le Cerda, and Levia, and contracted alliances with the noble families of Téba, Banos, and Mora. By her mother—also born in Spain, and the daughter of Mr. Kirkpatrick, who was for some time English consul at the Spanish seaport of Malaga—she is connected with an ancient Scottish family—the Kirkpatricks of Closeburn—which still exist, but no longer in possession of their original property. She was educated principally at Madrid, and spent a great portion of her youth in traveling with her mother, under the name of the Countess de Téba.

In 1851, she appeared at the *fêtes d'Élysée* in Paris, where her beauty and graceful demeanor attracted the notice and excited the admiration of the emperor of the French, who married her on the 30th January 1853, at Notre Dame. On that occasion an amnesty was granted to 4312 political prisoners. In 1859, E. filled with ability the office of regent. During the war in 1870, E. was again regent, but had to flee to England after the Emperor became a captive. Her only son, the Prince Imperial, born 16th March 1856, completed his military education in England, and was killed in 1879 while serving as a volunteer in the Zulu war.

EUGE'NIUS is the name of four popes, of whom the last is the most important. Eugenius IV., a native of Venice, became pope in 1431. The great event in his career was the schism created in the church by the proceedings of the Council of Basel, which had been convoked by E.'s predecessor, Martin V., and showed a strong tendency to ecclesiastical reform. E. was kept in perpetual trouble by this council, and at last, having been compelled to flee from Rome, opened a new council at Ferrara in 1438, and issued a bull of excommunication against the bishops assembled at Basel, whom he pronounced to be 'a satanic conclave, which was spreading the abomination of desolation into the bosom of the church.' The result was, that the council of Basel formally deposed him from his pontifical office in 1439, and elected in his stead Amadeus VIII., Duke of Savoy, under the title of Felix V. The conduct of France and Germany seemed to warrant this bold step, for Charles VII. had introduced into the former country the decrees of the Council of Basel, with some modifications, through the Pragmatic Sanction (1438), and the same thing happened in Germany by means of the Deed of Acceptance (1439). At the Council of Ferrara, John Palæologus II., emperor of Constantinople, and upwards of twenty Greek bishops, presented themselves, and a union between the two great divisions of Christendom—the Greek and Latin Church—was for a moment effected in July 1439. Discord, however, broke out almost immediately, and the two have ever since remained separate. E.'s rival, Felix, did not obtain much recognition, and after the death of the former at Rome, in 1447

he had to give way in favor of Nicholas V. E.'s pontificate was stormy and unhappy, and in his old age he is said to have regretted that he ever left his monastery.

EUGUBINE TABLES (Lat. *Tabulæ Eugubinae*), the name given to seven bronze tablets, the inscriptions on which present a comprehensive and very remarkable memorial of the Umbrian language. They were discovered in 1444 at Gubbio (the ancient Iguvium or Eugubium), where they are still preserved. The characters on four of the tablets are Umbrian, on two Latin, and on one partly Latin and partly Umbrian. The language employed, however, is in all cases the same, and differs both from Etruscan and Latin, but resembles somewhat the older forms of the latter, and also the Oscan dialects, so far as we know them.

The subjects of the inscriptions are directions concerning sacrificial usages and forms of prayer, and they seem to have been inscribed three or four centuries before the Christian era. Philip Bonarota first published them in a complete form in *Dempster's Etruria Regalis* (2 vols., Florence, 1723—1724). The first really judicious attempt at interpretation was that of Lanzi, in his *Saggio di Lingua Etrusca* (3 vols., Rome, 1789), who points out the important fact that they related to sacrificial usages, &c. His views have been carried out by Ottfried Müller in his work *Die Etrusker*; Lepsius, *De Tabulis Eugubinis*, &c. The most accurate copy of the inscriptions is that given by Lepsius in his *Inscriptiones Umbrae et Osce* (Leip. 1841); the best and most complete work on the language and contents of the tablets is that of Aufrecht and Kirchhoff, entitled *Die Umbrischen Sprach. Denkmäler* (1849—1851).

EUHEMERISM. See MYTH.

EU'LER, LEONARD, one of the greatest of mathematicians, was born at Basel, April 15, 1797, and received his first instructions in the science, for which he afterwards did so much, from his father, who was pastor of the neighboring village of Riehen. At the university of Basel, he studied under John Bernoulli, and was the friend of Daniel and Nicholas Bernoulli. At the age of 19, he was second in the contest for a prize offered by the Academy of Paris for the best treatise on the masting of ships. His friends, the Bernoullis, had been called to St. Petersburg by Catharine I., when she founded the Academy, and they now induced E. to settle in that capital, in 1730, as Professor of Physics. Three years later, he exchanged his professorship for a place in the Academy. From that time, he continued to labor in the field of mathematics with an ardor really astonishing. More than half the mathematical treatises in the 46 quarto volumes published by the St. Petersburg Academy from 1727 to 1783 are by E., and at his death he left more than 200 treatises in MS., which were afterwards published by the Academy. The Paris Academy of Science awarded him the prize on ten several occasions, one of which was his treatise on Tides, 1740. In 1741, he accepted the invitation of Frederick the Great to Berlin. He afterwards, 1766, returned to St. Petersburg, where he was made director of the mathematical department of the Academy, and died September 7, 1783. The last years of his life were spent in total blindness.

E. was of an amiable and religious character, always cheerful and good humored; in society, he was distinguished for his agreeable wit. It was doubtless his residence in St. Petersburg that led him to the application of mathematics to the building and management of ships, as embodied in his *Théorie de la Construction et de la Manœuvre des Vaisseaux* (Petersb. 1773). The great problems left by Newton to his successors were the objects of his unceasing research. On physical subjects, E. often adopted extremely untenable hypotheses.

He occupied himself also with philosophy in the proper sense of the word. He undertook to prove the immateriality of the soul, and to defend revelation against freethinkers. In his *Lettres à une Princesse d'Allemagne sur quelques Sujets de Physique et de Philosophie* (3 vols., Berl. 1768; new ed., Par. 1812; and which have also been translated into English), he attacked Leibnitz's system of monads and of a pre-established harmony. But this was not the field in which he was best calculated to shine; his proper domain was the abstruser parts of pure mathematics. His most important works of this class are his *Theory of Planetary Motion*, *Introduction to the Analysis of Infinites*, *Institutions of the Differential and of the Integral Calculus*, and *Dioptries*, which are all, as well as his *Opuscula Analytica*, in Latin. His *Introduction to Algebra* is well known.

EUMENIDES (literally, the well-minded or benign goddesses) was the euphemistic name of certain fearful beings, whose true name of Erinnyes (from *erino*, I hunt up, or *erino*, I am angry) it was considered unlawful to utter. Their Latin name was *Furæ* or *Dire*. We find them mentioned by the earliest poets, and they play a prominent part in the writings of the tragedians, where their sphere of action is much extended. In the earliest times, Homer and Hesiod represent them as avenging and punishing perjury and murder, as also the violation of filial duty and of the rite of hospitality; they were also regarded as goddesses of Fate (like the Paræ), and had a share in the grim Providence which

led the doomed ones into the way of calamity. A part of their function was also to hinder man from acquiring too much knowledge of the future. In these poets, their number is sometimes undefined; sometimes they appear as one. The limitation to the number three, as well as their names Alecto, Megæra, and Tisiphone, is of a later period, a whole chorus of Erinnyes appearing in the writings of Æschylus. According to Homer, they dwell in Erebus, and with this the duration after death of the punishments which they inflict is connected. Hesiod calls them the daughters of Ge and Uranus. Æschylus describes them as having the features of gorgons and harpies, their bodies covered with black, serpents twined in their hair, and blood dripping from their eyes. The later poets and sculptors represented them in the more pleasing form of winged virgins, attired in the garb of huntresses, bearing torches in their hands, and with a wreath of serpents round their heads. Gradually, they came to be considered goddesses of the infernal regions, who punished crimes after death, but seldom appeared on earth. In Athens, their worship, which, like that of the other infernal deities, was conducted in silence, was held in great honor. The sacrifices offered to them were black sheep and libations of *nephelia*—i. e., honey mixed with water. The turtle-dove and the narcissus were sacred to them. They had a sanctuary in the vicinity of the Areopagus, and one at Colonus.

EUMOLPUS (the 'sweet singer') was, in the later mythology of Greece, the son of Poseidon and Chione. He was brought up in Ethiopia, whence he went to Thrace and afterwards passed into Attica, at the head of a body of Thracians, to assist the Eleusinians in their war against Erechtheus, king of Athens. E. and his sons are said to have been slain in battle. He is spoken of as the founder of the Eleusinian mysteries. A distinction is made by some of the ancient writers between this E. and a son of Musæus bearing the same name. The latter is represented as a scholar of Orpheus, and the instructor of Hercules; but E.'s history, like all mythological stories, is involved in great obscurity and confusion. The name of E. is one of the series of those old priestly singers who by the institution of religious ceremonies, spread culture and morality among the rude inhabitants of Hellas. An illustrious Athenian family, the *Eumolpidae*, derived their descent from E., and held the office of priests of Demeter in Eleusis.

EUNOMIUS, the founder of the Arian sect of Eumoniads, was born in the village of Dacora, in Cappadocia, and was first a lawyer, then a soldier, and ultimately took holy orders. In 360, he was appointed Bishop of Cyzicum. In the great controversy regarding the nature of the Trinity which raged during the 4th c., E. was conspicuous by his advocacy of the view that the Father alone was eternal and supreme; that the Son was generated of Him; and the Holy Spirit, again, of the Son. His doctrine of the Trinity is sometimes called the *Anomoian* ('dissimilar'), to distinguish it, on the one hand, from the *Homoioussian* ('similar'), held by the semi-Arians, and, on the other, from the *Homoioussian* ('identical') held by the Athanasian or Trinitarian party. It was thus the extreme of Arianism. In defence of his peculiar views, E. is said to have shown superior ability, although his opponents also accuse him of being verbose and inflated in his style. His life was much chequered. He was banished from one place to another, until at length he obtained permission to retire to his native village, where he died in 394. His writings have entirely perished, with the exception of a fragment here and there preserved in the writings of his adversaries.

EU'NUCH. The original signification of this word (Gr. *eunuchos*, one who has charge of a bed) points to the office that this class of persons fulfilled, and still fulfil in the East—that, namely, of taking charge of the women's apartments or harems. The barbarous practice of employing castrated males as guardians of the other sex, is an accompaniment of polygamy, and is therefore chiefly met with in the East and in North Africa. If it has appeared in countries where monogamy was the law, it was in consequence of the introduction of Oriental luxury, as was the case under the Roman emperors. The practice is of great antiquity, and seems to have originated in Libya, and from that to have spread to Egypt and the East. Syria and Asia Minor were the most notorious in this respect.

In Greece, it never obtained any great footing; for although Greek women were kept in seclusion, polygamy itself never prevailed. The later Romans kept eunuchs, but they were mostly imported. In the Byzantine empire, on the contrary, castration and keeping of eunuchs were very prevalent. This class played a very prominent part in the court of the Eastern Empire, and the word eunuch came to be the title of an office similar to that of chamberlain. In modern times, the practice is mostly confined to Mohammedan countries, and the eunuchs are chiefly brought as slaves from the interior of Africa.

EUOMPHALUS, a large genus of fossil gasteropodous shells, characterized by its depressed and discoidal shell, with angled or coronated whorls, five-sided mouth, and very large umbilicus.

The operculum was shelly, round, and multi-spiral. The genus seems related to *Trochus*. It appears among the earliest tenants of the globe, and keeps its place till the Triassic period. No less



Euomphalus Discors.

than eighty species have been described. Our figure represents one from the Wenlock limestone.

EUONYMUS. See SPINDLE TREE.

EUPATO'RIA (formerly *Koslov*), a thriving maritime town of Russia, in the government of Taurida, is situated on a bay in the west coast of the Crimea, 15 miles north-west of Old Fort, and 38 miles north-west of Simferopol. The town stands on the border of a monotonous pastoral steppe, and is surrounded by low hills. Seen from the sea, it presents, with its occasional minarets and its houses roofed with red tiles, a somewhat picturesque appearance. The principal building is the Tartar mosque, built by Devlet-Ghiri Khan in 1552, and reckoned the finest in the Crimea. E. exports corn, wool, and salt. Its harbor is shallow, and is sheltered only from the north and north-east winds. Pop. (1878) 8294, mostly Crim-Tartars and Jews, who are engaged chiefly as farmers and shepherds, and possess an immense number of oxen and sheep, and a large area of badly cultivated land.

On the 14th September 1854, a portion of the Anglo-French invading army landed here, and occupied and fortified the town. It was also the scene of a battle between the Russians and Turks, 17th February 1855, in which the latter were victorious.

EUPATO'RIMUM, a genus of plants of the natural order *Compositæ*, sub-order *Corymbifere*, having small flowers (heads of flowers) in corymbs, florets all tubular and hermaphrodite, club-shaped stigmas, imbricated bracts, a naked receptacle, and a hairy pappus. The species are numerous, and mostly American.

One only is British, the common **HEMP AGRIMONY** (*E. cannabinum*), a slightly aromatic perennial plant, growing mostly in marshy places, and on the banks of streams. The root was formerly employed as a purgative, and the plant was also used as a diuretic and as a vulnerary.—**THOROUGH-WORT** (*E. perfoliatum*), a species having the opposite leaves joined at the base, is very common in low grounds in North America, and is a popular medicine, much esteemed and used in that country. It is often administered in intermittent fevers. It acts powerfully as a sudorific, and is often very beneficial in catarrh, and influenza. It is also emetic and purgative, and, in small doses, tonic. The whole plant is very bitter.—Other North American species possess similar properties, and the root of one, known as **GRAVEL-ROOT** (*E. purpureum*), is employed as a diuretic for relief of the disease from which it derives its name.—The **AYAPANA** (*E. Ayapana*), a half-shrubby species, native of the north of Brazil, has a high reputa-



Hemp Agrimony (*Eupatorium cannabinum*):
a, a floret.

tion in that country as a cure for snake-bites, and has been introduced into the East Indies. It is a very powerful sudorific, and is

also diuretic.—The famous Peruvian vulnerary, **MATICO**, has been referred, but uncertainly, to a shrubby species of this genus, *E. glutinosum*.—**GRACO** or **HUACO**, much valued in Peru as a cure for snake-bites, is supposed to belong to the allied genus *Mikania*.

EUP'EN, a flourishing manufacturing town of Rhenish Prussia, is situated in a beautiful valley on the Weeze, within 2 miles of the Belgian frontier, and 9 miles south-south-west of Aix-la-Chapelle. It is well built and open, including within its limits several gardens and meadows. There are four churches in the town—three Roman Catholic and one Protestant, also a convent, a high school, and an orphan-house. E. has the most flourishing woollen manufactures of any town in Prussia, and has also dye-works, machine-making, and other manufactures. It owes the prosperity of its manufactures chiefly to a number of French refugees, who settled here after the peace of Lunéville. Pop. (1880) 15,033.

EUP'HEMISM (Gr. *eu*, well, and *phemi*, I speak) is a figure of rhetoric by which an unpleasant or offensive matter is designated in indirect and milder terms. Thus, instead of directly calling up an unpleasant image by the word *died*, we say, 'he was gathered to his fathers.' The ancients used a multitude of euphemisms, to avoid words that were thought to be ominous of evil, or offensive to the unseen powers. They spoke, for example, of the Eumenides, or 'benign goddesses,' instead of the Furies; just as the elves and fairies of modern superstition are spoken of as 'good neighbors.'

EUP'HON, or **EUP'HONON**, a musical instrument invented by Chladni in 1790. It is similar in tone to the harmonica, and, like it, the tone is produced from the sounding body by the finger direct, without mechanism, and is regulated in quality and effect by the taste and feelings of the performer, who can produce tones from the most delicate pianissimo to fortissimo. In 1822, Chladni exhibited an improved euphon, of which a detailed description is given by himself in the *Leipsic Musik-zeitung* of that year, page 805.

EUPHO'R'BIA, **OIL OF**, or **OIL OF CAPER SPURGE**, an ex-



Caper Spurge (*Euphorbia Lathyris*).

trremely acrid fixed oil, obtained by expression, or by the aid of alcohol or ether, from the seeds of the Caper Spurge (*Euphorbia Lathyris*), a plant common in many parts of Europe, and naturalized in some places in Britain. See **SPURGE**. Oil of euphorbia has much resemblance to croton oil in its properties, although less powerful, and is sometimes used as a substitute for it, in doses of from three to ten drops. It is good for use only when recently extracted.

EUPHOR'BIA'CEÆ, a very extensive natural order of exogenous plants, containing upwards of 2500 known species—trees, shrubs, and herbaceous plants. They abound chiefly in warm countries, and most of all in tropical America. The few species found in the colder parts of the world are all herbaceous. The common Box reaches a more northern limit than any other shrubby species. The other British species are different kinds of Spurge (*Euphorbia*) and Dog's Mercury (*Mercurialis*). The E. usually abound in an acrid and poisonous milky juice; although there are species of which the juice is bland or becomes bland through the application of heat, so that their leaves may be used as food. The leaves in this order exhibit great diversities. The inflorescence is also various.

Amongst those most remarkable for the acridity of their juice are the **MANCHINEEL** (q. v.) and *Excoecaria agallocha*, an East Indian tree—formerly supposed to yield one of the kinds of aloes-wood—the smoke from the burning of which is extremely danger-

ous to the eyes. The juice of many of the spurges is also very acid. Many of the E. are valued for their medicinal properties, different parts of the plant being in some instances employed, and in some the resins and oils which they yield. Thus the juice of some of the spurges, the roots or bark of others, the bark of different species of *Croton* (Cascarilla Bark, Copalhe Bark), &c., are used in medicine; and to plants of this order we are indebted for euphorbium, oil of euphorbia, castor oil, croton oil, &c. A few of the E. yield balsamic products of exquisite fragrance (see *CROTON*); a few, although their juice is poisonous, yield a wholesome starch in considerable abundance (see *MANIOC*); a few are cultivated and used as pot-herbs, particularly species of *Plukenetia* in the East Indies; a few yield wholesome and agreeable sub-acid fruits, as *Cicca disticha* and *C. racemosa* in the East Indies; the seeds of some are eatable, as those of the Candle-nut (q. v.), of *Omphalea diandra*, a Jamaica tree, and of *Conceveiba Guianensis*, the latter being esteemed particularly delicious; the oil of the seeds is also in some cases used for food, like other bland oils (see *CANDLE-NUT*); but more frequently it is used for burning, as castor oil, candle-nut oil, the oil of *Elaeococca verrucosa* in Japan and Mauritius, and the concrete oil of *Stillingia sebifera*, which is used in China for making candles, and in medical preparations as a substitute for lard.—The dye-stuff called *TURNSOLE* (q. v.), is obtained from a plant of this order; and a bright red is imparted to silk by the roots of *Rottlera tinctoria*, a native of Circassia, and by a red powder with which its seed-vessels are covered. The timber of some of the E. is valuable. African Teak (q. v.) belongs to this order. The red-colored wood of *Stylobiscus trifolius* is used in Java for making masts. Some of the E. are often cultivated in gardens and hothouses, more frequently for their curious appearance than for their beauty; but the large deep crimson bracts of *Poinsettia pulcherrima*, a native of Madagascar, make it a very attractive plant.

EUPHORBIIUM, an extremely acid gum resin, obtained from several species of *Euphorbia* or *SPURGE* (q. v.), as *E. officinarum* and *E. antiquorum*, in the north of Africa, Arabia, and the East Indies, and *E. Canariensis* in the Canary Islands. It is obtained by incisions in the branches, whence issues a corrosive milky juice, which dries in the sun, and becomes a yellowish-gray waxy gum resin. The persons who collect it are obliged to defend their mouths and nostrils by a cloth, as its particles produce incessant sneezing, violent inflammation of the nostrils, and a very painful burning sensation in the mouth. On account of its excessive acidity, it is now less used in medicine than formerly; although it is still occasionally mixed with Burgundy pitch or other substances to make rubefacient plasters for chronic affections of the joints; its alcoholic tincture is used as a caustic in carious ulcers, and its powder, mixed with much starch or flour, as an *errhine* in chronic affections of the eyes, ears, or brain. It was formerly administered as an emetic and drastic purgative, but it is dangerously violent in its action.

EUPHRASIA. See *EYEBRIGHT*.

EUPHRA'TES (in the Oriental languages, *Frat*, *Phrat*, or *Fo-rat*) is the largest river in Western Asia, and, with the Tigris, forms the most important river-system of that quarter of the world. It has its source in the heart of Armenia in two branches—the Kara Su and the Murad, of which the former rises 25 miles north-east of the town of Erzerum, and flows south-west to a point 10 miles north of Keban' Ma'den, where it is met by the Murad, which rises on the southern slope of Alá Tagh, and flows west-south-west to the point of confluence. From Keban' Ma'den, the E. flows in a general southern direction, with a tendency, however, to struggle westward towards the Mediterranean. In this part of its course, it breaks through the Taurus, and flows among the mountains for 45 miles, emerging at Sumeisat, whence it continues navigable to the sea—a distance of 1195 miles—and passing Bir, at which point it is 628 feet above the level of the Mediterranean, and 100 miles distant from its nearest shore. After passing Samosta, it changes its direction, and flowing south, separates for a considerable distance Mesopotamia from Syria and the deserts of Syrian Arabia. Curving to the south-east, it flows on without receiving almost any tributaries for about 700 miles, until it is joined at Kurnah or Kornah by the waters of the Tigris. From Kurnah, the river, taking the name of the Shatt-el-Arab, continues to flow in a south-east direction, until, after being united by a canal with the Karun from the mountains of Persia, it empties itself, by several arms, into the Persian Gulf, 90 miles below Kurnah. The total length of the E. is 1600 miles; the area drained by all the waters which enter the Persian Gulf by the Shatt-el-Arab, is 108,000 miles. The average width of the Shatt-el-Arab is upwards of 600 feet; it is navigable in mid-stream for vessels of 500 tons.—Various schemes have been proposed for an E. Valley Railway, from the Mediterranean to the Persian Gulf, as an alternative route to India besides that of Suez.

The water of the E., although muddy, is not unwholesome. Its inundations, caused by the melting of the snows, take place chiefly

from the beginning of March till the end of May; and in ancient times, when canals and embankments regulated these inundations, exercised the same beneficial effect on the country as those of the Nile on Egypt. See *BABYLONIA*.

EUPHRO'SYNE (i. e., the joyous one), one of the Graces (q. v.).

EUPHUISM (Gr. *euphuos*, of vigorous growth; eloquent), a term used in English literature to denote an affected and bombastic style of language, fashionable for a short period at the court of Queen Elizabeth. The word was formed from the title of the book which brought the style in vogue, the *Euphuos* of John Lyly (q. v.).

EUPHIONE (Gr. *eu*, good, and *pion*, oil) is an extremely mobile oil, obtained from the lighter portions of the liquid products of the destructive distillation of wood (wood-tar), coal (coal-tar), and animal matter, and in the distillation of rape-seed oil. It may be obtained in a sufficient state of purity by action upon the crude tars and oils by concentrated sulphuric acid, or a mixture of sulphuric acid and nitre, which removes the majority of the other ingredients; and on the distillation of the portion which resisted the action of the acid, the first part which passes over is the euphione.

When pure, it has the composition C_8H_8 , and is therefore a hydro-carbon. It is the lightest liquid known, having the density of 655 (water = 1000), and is thin, colorless, and tasteless, whilst it possesses a pleasant aromatic odor. It boils at $160^{\circ} F.$, and distills readily; whilst, when set fire to, it is very inflammable, burning with a white flame of considerable luminosity and penetrating power. It makes a greasy stain on paper, is insoluble in water, very slightly soluble in alcohol, but readily miscible with ethers and oils in general.

EUPODA, a family of coleopterous insects of the tetramerous section of the order, deriving their name (Gr. well-footed) from the great size of the hinder thighs of many of the species. They feed on the stems and leaves of plants, some of them on aquatic plants, the roots of which afford food to their larvæ. The body is oblong; the antennæ filiform. Some of the eupoda are among the most splendid of tropical insects. Britain produces a number of small species.

EURASIANS is a convenient term for the offspring of Europeans and Asiatics, and is chiefly used in India of the children by European fathers of Hindu mothers, and their descendants.

EURE, a department in the north-west of France, immediately south of the department of Seine Inférieure, contains an area of 2290 square miles. Pop. (1881) 364,291. Its surface is unusually level, as the highest eminences in the department are not more than 300 feet in height. The principal river is the Seine. The Eure, from which this department derives its name, and the Rille, both affluents to the Seine, are the only other important rivers. The climate is mild, moist, and foggy. Great part of the level country is covered with a loamy alluvial soil upon a stratum of limestone; while the remainder is composed of chalk, flint, and tufa. Along the Seine, the soil is in some parts sandy, stony, and barren, but the greater part is very fertile. The chief natural products are corn, hemp, flax, vegetables, and fruit, particularly apples and pears, from which large quantities of cider and perry are made. The breeding of cattle, horses, and sheep, is favored by extensive meadows and pasture lands. Iron is found in considerable quantities. There are extensive iron and copper works and pin manufactories. Cotton goods, cloth, linen, paper, glass and stoneware are likewise manufactured. The department of Eure is divided into five arrondissements—Evreux, Louviers, Les Andelys, Bernay, and Pont-Audemes. The capital is Evreux (q. v.).

EURE, a river in the north-west of France, and a tributary of the Seine, rises in the department of the Orne, flows first south-east into the center of the department of Eure-et-Loir, then north and north-west through the departments of Eure-et-Loir and Eure, and joins the Seine on the left above Pont-de-l'Arche, after a course of about 100 miles. Only that portion of the E. which is in the department of Eure is navigable.

EURE-ET-LOIR, a department of France, formed chiefly from the province of Orléannais, extends between lat. $47^{\circ} 57' - 48^{\circ} 55' N.$, and long. $0^{\circ} 47' - 2^{\circ} E.$ Area, 2260 square miles. Pop. (1881) 280,097. It is watered mainly by the Eure in the north, and the Loir in the south, the two rivers from which it takes its name. This department lies on the water-shed between the Bay of Biscay and the English Channel. It is in general level, the east and south being occupied by high and extensive flats; while in the west, the scenery is finely varied by hill and valley. The soil is fertile, and, especially towards the east and south, is admirably adapted for wheat. Hops grow spontaneously in some quarters. In the forests, the oak and birch are the prevailing trees. The rivers, none

of which is navigable in this department, furnish valuable water-power for the numerous mills of various kinds that are situated on their banks. Iron is the only mineral found and worked to any great extent; but the chief articles of trade are corn, flour, and wool. The department is divided into the four *arrondissements* of Chartres, Châteaun-Dun, Dreux, and Nogent-le-Rotrou, with the town of Chartres for capital.

EURIPIDES, the latest of the three great Greek tragedians, was born at Salamis, 480 B.C., on the very day (23d September), it is said, of the glorious victory gained by the Greeks over the Persians near that island. The Arundel Marble, however, gives as the date of his birth 485 B.C., while Müller, following Eratosthenes, makes it four years later. His education was very good. At first, he was trained to gymnastic exercises (in consequence of the prediction of an oracle that he should be crowned with 'sacred garlands'); he next turned his attention to painting; then studied philosophy under Anaxagoras, and rhetoric under Prodicus, and formed a lasting friendship with Socrates. The first play of E.'s which was performed was the *Peliades* (456 B.C.). In 441 B.C., he gained the first prize for tragedy, and continued to write for the Athenian stage until 408 B.C., when he accepted an invitation to the court of Archelaus, king of Macedonia. Scandal has invented other reasons for E.'s leaving Athens, but they are unworthy of notice. He is said to have been killed (406 B.C.) by dogs, which were set upon him by two brother-poets who envied him his reputation. In E.'s time, Greek tragedy had been brought to its highest perfection by Sophocles, who was fifteen years older than Euripides. The latter, however, was the second favorite author of his time; nay, on more than one occasion, his tragedies were preferred to those of Sophocles; but his liberal and even neologic tendencies in regard to religion, excited the hostility of that witty but scurrilous champion of Greek orthodoxy Aristophanes, who frequently ridiculed E. in cutting parodies. There can be no doubt that E. was systematically abused by the Athenian Tory party, of whom Aristophanes was the literary chief, and to whose unscrupulous opposition it was owing that he gained the prize only five times out of 75 competitions.

But against the censure of Aristophanes, may be set the praise of two much greater men—Aristotle and John Milton. E.'s plays are reckoned by some to have amounted to 75, by others to 92. Only 18 have come down to us. These are—*Alcestis* (438 B.C.), *Medea* (431 B.C.), *Hippolytus* (428 B.C.), *hecuba* (424 B.C.), *Heracleida* (421 B.C.?), *Supplices* (421 B.C.?), *Ion* (date not ascertainable), *Hercules Furens* (date not ascertainable), *Andromache* (420—417 B.C.), *Troades* (415 B.C.), *Electra* (415—413 B.C.), *Helena* (412 B.C.), *Iphigenia in Tauris* (date uncertain), *Orestes* (408 B.C.), *Phenissæ* (probably same year), *Bacchæ* (probably written in Macedonia), *Iphigenia in Aulis* (posthumously represented in Athens); and finally, *Cyclops* (uncertain). *Rhesus*, attributed to E. is probably not genuine. Concerning E., and his tragedies, A. W. Schlegel remarks: 'Of few authors can so much good and evil be predicated with equal truth. He was a man of infinite talent, skilled in the most varied intellectual arts; but although abounding in brilliant and amiable qualities, he wanted sublime earnestness and artistic skill which we admire in Æschylus and Sophocles. He aspires only to please, no matter by what means. For this reason, he is so frequently unequal to himself; producing at times passages of exquisite beauty, and frequently sinking into positive vulgarity.' The main object of E. was to excite emotion, and his works laid open a totally new world (in literature), that of the heart, which, beyond dispute, contributed much to their popularity. On the other hand, his inartistic and careless plots compelling him to a constant use of the *Deus ex machina* solution of difficulties, and occasionally even the subjects of his art themselves, leave ample room for criticism. Archelaus refused to allow his bones to be removed to Athens, and erected a splendid monument to him in Pella, with the inscription: 'Never, O Euripides, will thy memory be forgotten!' Still more honorable was the inscription on the cenotaph erected to him by the Athenians on the way to the Piræus: 'All Greece is the monument of Euripides; Macedonian earth covers but his bones.' Sophocles, who survived him, publicly lamented his loss; and the orator Lycurgus afterwards erected a statue to him in the theater at Athens. The *editio princeps* of E. appeared, it is thought, at Florence, toward the end of the 15th century. The best modern editions are those of Beck (Leip. 1778—1788), Matthiæ (Leip. 1813—1829), Kirchhoff (1855), and Nauck (1871). An English translation in verse, by Potter, appeared at Oxford in 1814.

EUROPE, the smallest, but also the most highly civilized and most populous of the three great divisions of the old continent. It is separated from America on the west and north-west by the Atlantic; from Africa in the south by the Mediterranean; and from Asia by the Archipelago, Sea of Marmora, Black Sea, Caucasian ridge, Caspian Sea, Ural River and Mountains, and the Kara River. It is in the form a huge peninsula, projecting from the north-west of Asia.

Its extent from Cape St. Vincent on the south-west to the mouth of the Kara River on the north-east is 3400 miles; and from Cape Nordkyn, the most northerly point of the Scandinavian mainland, to Cape Matapan, the southernmost point of Greece, 2400 miles. The continent of E., irrespective of islands, lies within lat. 36° 1'—71° 6' N., and long. 9° 30' W.—65° 30' E. Its area is estimated at 3,800,000 square miles, being about a third of that of Africa, and a fourth of that of America. Its indented coast-line is more extensive in proportion to its size than that of any other great natural division of the globe, and is estimated to measure not less than 60,000 miles. This is caused by its great irregularity, and the number of deep inlets and gulfs which penetrate its surface. It has a population of nearly 328,000,000, which gives an average of about 86 for every square mile.

The body of the European continent divides itself naturally into two great portions—the great plain in the north-east, and the Highlands in the south-west, the mountainous peninsula of Scandinavia, lying, as it were, apart from either, being to some extent exceptional. The plain occupies about two-thirds (2,500,000 square miles) of the entire extent of the continent. It reaches from the eastern boundary of E., north to the shores of the Arctic Ocean, south to Mount Caucasus and the Black Sea, and westward over the whole extent of the continent; gradually, however, becoming narrower in its progress west. In shape, this plain resembles a triangle; its base rests on the eastern boundary, and it may be said to reach its apex on the shores of Holland. It separates the two mountain systems of E.—The Scandinavian system (see SCANDINAVIA) on the north, and on the south the system of Southern Europe. The mass of the Alps, covering an area of nearly 100,000 square miles, forms the center of the mountain system of Southern and Western E., and stretches down on four sides towards France, Germany, Hungary, and Italy. The lowland plain, next Asia, lying to the east, is low, and is interspersed with woods and marshes and cultivated land. See ALPS, APENNINES, BALKAN, CARPATHIAN MOUNTAINS, CEVENNES, PYRENEES, &c.

E. is surrounded by water on three sides. The White Sea comes in from the Arctic Ocean; the German Ocean and the Mediterranean from the Atlantic. The most important peninsula in the north is Scandinavia, and in the south we find the Crimea, Turkey and Greece, Italy, and Spain. With the exception of Iceland, the islands cluster closely round the mainland, the chief being Great Britain and Ireland, Iceland, Seeland, Corsica, Sardinia, and Crete (Candia). The lakes of E. are small as compared with those of Africa or America. The Volga and the Danube are the largest rivers of E.

The details of the geography of E. are given under the names of its several political divisions, and of its lakes, rivers, and mountains.

In respect of climate, by far the greater portion of the area of E. belongs to the northern section of the temperate zone, though parts of Norway, Sweden, and Russia lie within the Arctic Circle. The southern parts of Spain, Sicily, and Greece are some twelve degrees from the northern tropic. (See RAINFALL; TERRESTRIAL TEMPERATURE.)

The European races belong in the main to the various branches of the great Aryan stock (see ARYAN; ETHNOLOGY), though in few European countries is there a pure race—the admixture of various being in some cases very great and close. But generally speaking, Celtic blood is most largely found in France (especially in Brittany, where a Celtic tongue is still spoken) and a part of Great Britain and Ireland; Germanic peoples occupy Germany, Switzerland, Netherlands, part of Belgium, part of Austria, Denmark, Norway and Sweden, Iceland, and Great Britain. Slavonic races are found in Austria, Prussia, Turkey, and Russia (see SLAVONIANS). Romanic blood and language are prominent in Italy, France, Spain, and Portugal, and perhaps Roumania—but language is by no means always a true test of race. The Greeks belong to the same Greco-Italian branch as the Italians. Non-Aryan peoples are the Finns, Lapps, and Samojeds of the north and north-east; various Turanian tribes in the east of Russia; the Hungarians and the Turks, and the Basques of the Pyrenees, are also non-Aryan; and a strong element of pre-Aryan blood is also to be traced in other parts of Western Europe, as Ireland and Britain. Fuller information must be sought in the articles on the various races and countries.

The following table gives a comparative view of the states of Europe, their areas, and populations. In almost all except Russia and Turkey, the populations are given according to actual censuses taken between the years 1878 and 1881. For details as to the states composing the German empire, see GERMANY; the constituent parts of the Austro-Hungarian monarchy, and of the joint kingdoms of Sweden and Norway, must be sought for in the several articles. For the relation of Turkey to Bulgaria, Eastern Roumelia, Bosnia, and Herzegovina (the latter three being here included within its boundaries), see those articles.

STATES.	FORM OF GOVERNMENT.	Extent in English sq. miles.	Population.	Number of Inhab. per Eng. sq. m.
Andorra.....	Republic, with a sovereign council.....	175	5,800	33
Austria-Hungary.....	Limited monarchy, two chambers.....	240,450	37,869,954	157
Belgium.....	Limited monarchy, two chambers.....	11,370	5,519,844	485
Bulgaria.....	Principality (under Turkey).....	24,560	1,998,983	82
Denmark.....	Limited monarchy, two chambers.....	13,785	1,969,039	143
France.....	Republic, two chambers.....	204,090	37,672,048	184
Germany.....	Limited monarchy, two chambers.....	207,890	45,334,061	217
Great Britain and Ireland...	Limited monarchy, two houses of parliament.....	121,600	35,262,762	290
Greece.....	Limited monarchy, one chamber.....	25,000	1,979,305	79
Italy.....	Limited monarchy, two chambers.....	114,290	28,459,451	246
Liechtenstein.....	Principality, one chamber.....	60	9,124	152
Luxemburg.....	Grand-duchy (connected with Netherlands).....	990	209,570	212
Monaco.....	Principality.....	8	7,049	881
Montenegro.....	Principality, limited sovereignty.....	3,500	236,000	67
Netherlands.....	Limited monarchy, two chambers.....	12,680	4,060,580	320
Portugal.....	Limited monarchy, two chambers.....	34,600	4,160,315	120
Roumania.....	Kingdom, two chambers.....	50,000	5,376,000	107
Russia in Europe.....	Absolute monarchy.....	2,088,420	83,600,859	40
San Marino.....	Republic, sovereign council.....	32	7,816	237
Servia.....	Kingdom, two chambers.....	18,700	1,700,211	91
Spain.....	Limited monarchy, two chambers.....	192,470	16,342,996	84
Sweden and Norway.....	Limited monarchy, two chambers for each country.....	293,850	6,470,268	22
Switzerland.....	Republican confederation, federal diet.....	15,920	2,846,102	178
Turkey in Europe*.....	Absolute sovereignty.....	100,970	6,632,417	65
*Without Bulgaria.				
Total.....		3,775,410	327,630,554	

Geology.—The geology of E. is considered under the different countries. See also ALPS, PYRENEES, &c.

Natural History.—The natural history of E. very much agrees with that of the corresponding latitudes of Asia. The natural history of the European countries on the Mediterranean Sea is very similar to that of Syria and of Asia Minor. The natural history of the more northern regions of E. resembles that of the great plains of Central Asia and Siberia. The most northern regions have the strictly arctic flora and fauna common in a great measure to all the arctic and subarctic regions; whilst the natural history of the most southern countries assumes a sub-tropical character. The European countries near the Mediterranean produce fewer of the shrubby and odoriferous *Labiata* than the Caucasus and adjoining regions, whilst the *Caryophyllaceæ* are more abundant. The extreme abundance of *Cistaceæ* is a peculiar feature of the flora of Spain and Portugal. The *Primulaceæ* are particularly plentiful in all the alpine regions of the south of E., but this characteristic is in some measure shared by the Himalaya. In no other part of the world do umbelliferous and cruciferous plants form so large a proportion of the flora as in Europe.

The temperature of the western and northern parts of E. being raised by the Gulf-stream and the winds from the great mass of dry and desert land in Africa above what is elsewhere found in similar latitudes, the flora and fauna exhibit a corresponding character, affected, however, by the great amount of moisture derived from the Atlantic Ocean; and also to a still greater degree by the comparative uniformity of temperature which the proximity of the ocean produces. The effect of the last-mentioned causes is so great, that the northern limit of some plants is sooner reached on the shores of the Atlantic than in the more central parts of E., where the winters are much colder, and the average temperature of the year is lower. Of this the vine and maize are notable examples. Plants which require a mild winter will not grow in the north—and scarcely even in the center of E.—but they advance along the western coast under the influence of the maritime climate. Thus the myrtle—although not indigenous—grows even in the south of England. Amongst plants, the date palm, and amongst animals a species of ape, are found in the south of E. (the ape only on the Rock of Gibraltar); whilst some strictly African birds are frequent visitants, and many birds—as the cuckoo, swallow, &c.—are common to E. and Africa, inhabitants in summer even of very northern regions, and returning in winter to the warm south.

Of the plants now most commonly associated in our thoughts with the southern countries of E., many have probably been introduced from Africa, or from the East. This has probably been the case even with the myrtle, and certainly has been the case with the vine, the olive, the orange, lemon, &c., the fig, the peach, the almond, the apricot, &c. Some of the most extensively cultivated fruits are certainly indigenous to E., as the apple, pear, plum, and cherry, although even of these the first improved varieties may have been introduced from the earlier seats of civilization in the East. Among the wild animals of E., at the present day, the aurochs or bison is still reckoned; and the ox existed at no very remote period in a truly wild state. The reindeer in-

habits the extreme north of E.; the elk, the stag, the fallow-deer, and the roebuck, are found in more southern regions; the ibex or bouquetin exists on the high central mountains; two species of antelope—the chamois of the Alps, and the saiga of the Russian plains—connect the European fauna with the Asiatic and African. Of carnivorous animals, the most worthy of notice are the bear, the wolf, the fox, and the lynx.

The abundance of lakes and streams in the northern parts of E. is accompanied with a corresponding abundance of water-fowl (*Anatideæ*) and of fish. Of the latter, the *Salmonideæ* are the most valuable, and the *Cyprinideæ* next to them. The European seas afford valuable fisheries, particularly of herring and of cod in the north, and of tunny, anchovy, &c., in the Mediterranean.

The common hive bee and the Ligurian bee may probably be regarded as natives of Europe. The silk-worm was introduced from the East. Another valuable insect, the cochineal insect was introduced from America; but the *Cantharis*, or Blistering Fly, is truly indigenous to the south of Europe.

EURY'ALE, a genus of plants of the natural order *Nymphaeaceæ*, or Water-lilies, closely allied to VICTORIA (q. v.), although of very different appearance. *E. ferox* is a water-lily with small red or violet-colored flowers, leaves about a foot in diameter, the leaf-stalks and calyces covered with stiff prickles; a native of India and China. The fruit is round, soft, pulpy, and of the size of a small orange, composed of a number of carpels, and containing round black seeds as large as peas, which are full of a nutritious agreeable farina, and are eaten roasted. The root-stock also contains starch, which may be separated and used for food; and the root itself is eaten. The plant is said to have been in cultivation in China for upwards of 3000 years.

EUSEBIUS, of Cæsarea, the father of ecclesiastical history, was born in Palestine about 264 A.D. He took the surname of Pamphilus from his friend Pamphilus, Bishop of Cæsarea, whom he faithfully attended for the two years (307—309) in which he suffered imprisonment during the persecution of Diocletian. He then went to Tyre, and afterwards to Egypt, where he himself was thrown into prison on account of his religion. In 315, he succeeded Agapinus as Bishop of Cæsarea, took a prominent part at the Council of Nice in 327, and died about 340.—E. was the head of the semi-Arian or moderate party in the Council of Nice.

That party were averse to discussing the nature of the Trinity, and would have preferred the simplicity of Scripture language in speaking about the Godhead to the metaphysical distinction of either side. They regarded Trinitarianism, on the one hand, as logically indefensible, but, on the other, they recognized the fact, that Scripture sometimes spoke of the Son in terms not compatible with the views of Arius, and therefore they wished each man to enjoy the utmost freedom in his interpretation of Scripture on this point. E. thought that the great thing was to lay to heart the truth, that 'God so loved the world that he gave his only begotten Son, that whosoever believeth on him should not perish, but have everlasting life.' The promise is to him that *believeth on him*, not, he argues, to him that *knows how he is generated from the Father*. He was very reluctant to accept the term *homousios* (of

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the same substance), devised by Athanasius to describe the equality of the Son with the Father, and retained the kindest feelings towards Arius after the views of the latter were condemned. His moderation and other excellent qualities procured him the favor of Constantine, who declared that he was fit to be the bishop of almost the whole world. E. has the reputation of being the most learned Father of the church after Origen. His chief works are—1. The *Chronicon*, a history of the world down to the celebration of Constantine's *Vicennalia* at Nicomedia and Rome, 327 and 328 A.D. It is valuable as containing extracts from such writers as Berosus, Sanchoniathon, Polyhistor, Cephalion, and Manetho. It was first published in a complete state by Mai and Zohrab, at Milan, in 1818, from an Armenian MS. version discovered at Constantinople. 2. The *Preparatio Evangelica*, in 15 books, a collection of such statements in old heathen authors as were fitted to make the mind regard the evidences of Christianity in a favorable light. It was translated into Latin, and appeared at Treviso in 1480. The Greek text was first published at Paris in 1544. 3. *Demonstratio Evangelica*, in 20 books, a work intended to convince the Jews of the truth of Christianity from the evidence of their own Scriptures. A Latin version of this was printed as early as 1498; the Greek original did not appear till 1544, when it was published along with the *Preparatio* at Paris, by R. Stephens. 4. The *Ecclesiastical History*, in ten books. This relates the principal occurrences which took place in the Christian Church till the year 324, and contains the results of his studies in numerous libraries, and even in the imperial archives, the Emperor Constantine having ordered, at E.'s request, an examination of all documents relative to the history of martyrs. One drawback of the work is, that E., on principle, withholds all account of the wickedness and dissensions of Christians, inasmuch as he did not consider such stories for the edification of the church. A Latin translation of the work by Rufinus was published at Rome in 1474; the Greek text at Paris in 1549, and at Geneva in 1612. Among the more recent editions are those of Heinichen (Leip. 1827) and Burton (Oxford, 1838). The *Ecclesiastical History* has been translated into English, German, French, &c. Besides the foregoing works, may be mentioned the *De Martyribus Palestine*, a book against Hierocles; another against Marcellus; and a *Life of Constantine*. The first edition of all E.'s works appeared at Basel in 1542.

EUSEBIUS, of Emisa, was born at Edessa, studied at Alexandria, and was the pupil of Eusebius Pamphili, and the friend of Eusebius of Nicomedia. Averse to all theological controversies, he declined the bishopric of Alexandria, vacant by the deposition of Athanasius. He was afterwards, however, appointed Bishop of Emisa, but during his ordination, a Christian mob, accusing him of 'mathematics' and magic, created a tumult, and obliged him to flee for his life. Subsequently, he returned to Emisa, where he was 'tolerated,' in spite of his dangerous knowledge! He died at Antioch in 360. The Emperor Constantine was much attached to E., and used to take him with him on his military expeditions. E. was accused of Sabellianism (q. v.), and Jerome calls him 'the ringleader of the Arian party.' Jerome, however, was rash in his epithets, and it is more probable that he belonged to the party of his namesake of Casarea, the Semi-Arians, or peace-party, who wished the doctrine of the Godhead expressed in the language of Scripture, and not of theology. The homilies extant under his name have been published by Augusti (Elberf. 1829). The genuine ones display great eloquence.

EUSEBIUS, of Nicomedia, Patriarch of Constantinople, born towards the end of the 3d c., was first tutor to the Emperor Julian, to whom he was related by the mother's side; then Bishop of Beryta (Beyrout), in Syria, and afterwards of Nicomedia. In order to secure his position, he appeared as the defender of Arius at the Council of Nice, and afterwards placed himself at the head of the Arian party. Under the Emperor Constantine, whom he baptized in 337, he became Patriarch of Constantinople. He died in the year 342, after having, in the previous year, held an assembly of the church for the establishment of Arianism at Antioch. It is not easy to get at his real character. We have no ecclesiastical works by Arian writers, our only sources of information as regards the character and opinions of that party being their enemies—the orthodox party; yet, making the ordinary allowance for partisanship, there would seem to be sufficient reason for concluding that E. was cunning and double-tongued when occasion required, and imperious and violent when he had power in his hand. Athanasius considered him not the disciple, but rather the teacher of Arius. From him the Arians are sometimes styled Eusebians.

EUSKARIAN, now often used for the Basque race (see BASQUE PROVINCES), especially in connection with the now prevalent theory, that peoples of this stock preceded the Aryans in Western Europe, and that even in England the Celts mingled with their Basque predecessors. Many ethnologists hold that

in some parts of England, as South Wales, the blood of the people is still mainly Euskarian.

EUSTACHIAN TUBE. See EAR.

EUSTACHIAN VALVE. See FŒTUS.

EUSTA'CHIUS, BARTOLOMMEO, an Italian anatomist, who was born in the early part of the 16th c., and died in 1574. We learn that in 1562 he was professor of medicine in the Collegio della Sapienza at Rome. His name is indelibly associated with anatomical science, through his discoveries of the tube in the auditory apparatus, and the valvular structure in the heart, which have been called after him. He was the first to give an accurate description of the thoracic duct, and was probably the first to notice and describe the stapes (one of the chain of small bones crossing the tympanic cavity of the ear), a discovery which, however, Fallopius assigns to Ingrassias. He likewise contributed materially to the diffusion of more accurate knowledge regarding the development and evolution of the teeth, and the structure of the kidney. These discoveries are recorded in his *Opuscula Anatomica*, published at Venice in 1563. He was the first anatomical writer who illustrated his works with good engravings on copper. The *Tabula Anatomica*, which he was probably unable to publish in consequence of his poverty of which he complains in the introduction to which we have already referred, did not appear until 1714, when they were edited, with explanatory remarks, by Lancisi. Their value is sufficiently evidenced by the fact, that Albinus published a new edition, with an excellent Latin commentary, in 1743, at Leyden; that Bonn published a Dutch edition in 1798 at Amsterdam; and that a German edition appeared in 1800. Lauth, in his *History of Anatomical Discovery*, remarks that if the *Tabula* had appeared in E.'s lifetime, anatomy would have attained the perfection of the 18th c., nearly 200 years earlier. E., Vesalius, and Fallopius may be regarded as the three great founders of modern anatomy.

EUSTA'THIUS, the celebrated Greek commentator on Homer and the geographer Dionysius, was born at Constantinople. He was at first a monk, then a deacon and teacher of rhetoric in his native city, and, in the year 1155, was appointed Archbishop of Thessalonica, where he died in 1198. E. was profoundly versed in the ancient classic authors, and a man of prodigious acquirements, as is proved by his commentaries. The number of authors whom he quotes is almost incredible, and the value of his quotations is heightened by the consideration, that most of the works from which he extracts are no longer extant. His most important work is his *Commentary on the Iliad and Odyssey of Homer*. The first edition appeared at Rome 1542—1550; the last at Leip. 1825—1829. The work is open to objection on the score of method, and is diffuse and digressive, but it is nevertheless a vast mine of knowledge for students of Homer. Of a similar character is E.'s *Commentary on Dionysius*, first printed by Stephens (Paris, 1547), and lastly in Bernhardt's edition of Dionysius (Leip. 1828). Of his commentary on the hymns of Pindar, only the *Prooimium* has come down to us. It was first published by Tafel in 1832, along with E.'s theological treatises and letters.

EUSTA'TIUS, ST., one of the Dutch West India Islands, lies near the north-east bend of the great arch of the Antilles, about twelve miles to the north-west of St. Christopher. Lat. 17° 31' N., and long. 63° 5' W. Area, 8 square miles. St. E. is a pyramidal rock of volcanic formation, showing two extinct craters, and being still subject to earthquakes. Hurricanes also of intense severity occur, more particularly in August and September. Along its entire circuit of 29 miles, St. E. has only one landing-place, which, besides being difficult of access, is strongly fortified. The whole mountain is fertile, producing in abundance not merely commercial crops, such as sugar, cotton, and tobacco, but also provisions of various kinds, such as maize, hogs, goats, and poultry. Pop. about 2000.

EUTE'RPÉ (i. e., she who delights), one of the nine Muses, was the daughter of Zeus and Mnemosyne. She was the muse of lyric poetry, and is represented in ancient works of art with a flute in her hand. See MUSES.

EUTE'RPE, a genus of palms, having male and female flowers intermingled on the same spadix, the spadices springing from beneath the leaves, the spathe entire, membranaceous, and deciduous. They are very elegant palms; with lofty, slender, smooth, faintly ringed stems; and pinnate leaves, forming a graceful feathery plume; the bases of the leaf-stalks sheathing far down the stem, and so forming a thick column of several feet in length at its summit. To this genus the cabbage palm of the West Indies, and the Assai palm of the banks of the Amazon, are often referred. See ARECA and ASSAI.

EUTRO'PIUS, a Latin historian, concerning whom we only know that he filled the office of secretary to the Emperor Constantine, fought against the Persians under Julian, and was still alive in the reign of Valens. The period of his death is unknown. His *Breviarum Historiæ Romanæ*, giving a short narrative of Roman

history from the foundation of the city to the time of the Emperor Valens, is written in an extremely simple and pure style, and appears to have been originally intended for the use of schools. It became very popular as the taste for original investigation declined, in that dark period between the death of the old world and the birth of the new; and is either copied or followed by the early monkish annalists. An edition with enlargements, however, was published by Paul, son of Warnefrid ud Theodolinda, generally known as Paulus Diaconus. Others continued it down to the year 813. The History existed in three distinct forms at the revival of letters: there was first the genuine work of E. in ten books; second, the expanded editions of Paul; and third, a very complete, but also largely interpolated copy contained in the *Historia Miscella*. The *editio princeps*, printed at Rome in 1471, was from the impure text of Paul. The best editions in modern times are those of Tzschucke (Leip. 1796, improved 1804), and of Grosse (Halle, 1813; Leip. 1825).

EUTYCHES, a Byzantine ecclesiastic of the 5th c., and a zealous but unskilful representative of the dogmatic opinions of Cyril of Alexandria. In opposing the doctrines of Nestorius, he fell into the opposite extreme, and taught that after the union of the two natures in Jesus Christ, the human nature was absorbed in the divine; an opinion which spread extensively through the Alexandrian Church. E. was in consequence summoned before a synod at Constantinople in the year 448, and deposed by Flavianus, Patriarch of that city; but his cause was warmly espoused by the eunuch Chrysaphius, chief minister of the Emperor Theodosius II. and Dioscurus, Bishop of Alexandria, who were both opposed to Flavianus. Chrysaphius induced the emperor to call a general council at Ephesus in the following year, under the presidency of Dioscurus. Measures were taken beforehand to secure a triumph over the anti-Eutychians. Soldiers were admitted to the deliberations of the council, to overawe the party of Flavianus; while a crowd of fierce Egyptian monks, devotedly attached to whatever was popular in Alexandria, or had been countenanced by their old pupil Cyril, drowned by their fanatical outcries the voices of those who ventured to speak against Eutyches. The result was that the judgment of the previous council was reversed; Flavianus and his adherents were deposed, and the doctrine of E. affirmed to be orthodox, and in accordance with the Nicene creed. His triumph, however, lasted only two years; in 451, Eutychianism was pronounced heresy at the Council of Chalcedon, attended by 650 bishops; and in opposition to his views, it was declared that in Christ the two natures were united without confusion or conversion of substance. Nothing further is known concerning E., except that Leo wrote to the Emperor Marcian to banish him from the capital. The sect of Eutychians, however, under the name of Monophysites, continued to exist quietly for a century after his death, in the Armenian, Ethiopian, and Coptic churches, when it awoke to new life under the auspices of Jacob Baradaeus, who died Bishop of Edessa, 588 A. D. His followers were called Jacobites, and have perpetuated the Monophysite doctrine in the Armenian and Coptic churches to the present day. See Neander, *Kirchengeschichte*, vol. iii. p. 1079, &c.

EUXINE (Gr. *Euxinos*, hospitable) is the name applied by the ancients to the Black Sea (q. v.). Before receiving this name it was called *Axenos Pontos*, the inhospitable sea, because of the black and turbulent weather so frequently ascribed to it by the ancient poets, and the reported cannibalism of the Scythian tribes who lined its northern shores. It seems to have been called the *Euxine*, or hospitable sea, after the establishment of Greek colonies on its borders, and when its waters were thrown open to Greek commerce.

EVA'NDER, a semi-mythical Grecian hero of antiquity, was, according to Roman traditions, the son of Hermes, by Carmenta or Tiburtis. About 60 years before the Trojan war, he is said to have led a Pelasgian colony from Pallantium, in Arcadia, to Italy, and to have landed on the banks of the Tiber, and near the foot of the Palatine Hill. Here he built a town, naming it Pallantium, after the one in Arcadia. At a later period, it was incorporated with Rome, and is affirmed to have originated the names Palatinus and Palatium. Tradition represented E. as having done much to introduce the habits of social life among his neighbors; he prescribed for them milder laws, and taught them, among other arts, those of music and writing. To him is also ascribed the introduction of the worship of the Lycean Pan, with that of Demeter, Poseidon, and other deities. Virgil represents him as being still alive when Æneas arrived in Latium after the sack of Troy. E. was worshiped both at Pallantium, in Arcadia, and at Rome.

EVANGELICAL is an adjective derived from the Gr. *euangelion*, 'good news,' or 'the Gospel,' and is applied in general to anything which is marked by the spirit of the gospel of Jesus Christ. Thus, we speak of an evangelical sermon, of evangelical piety, evangelical views, &c., though it is but right to mention that the term 'evangelical' in such a connection is used by a portion of the religious community to denote, not so much a spirit or senti-

ment resembling that of the Saviour, but certain peculiar theological opinions, which are held to constitute the only true and complete expression of Christian belief. In England and Scotland, dissenters have generally laid claim to be considered more 'evangelical' than the national churches—i. e., they conceive that they have borne, and still bear, more decided testimony than their brethren of the Establishment to the truth of such doctrines as the total depravity of human nature, the imputation of Adam's sin to his posterity, the expiatory character of Christ's sufferings, justification by faith in the atoning efficacy of these sufferings, &c. In the Anglican Church, however, the rise of the Puseyite or Tractarian party has brought into prominence an antagonistic party, resembling dissenters very much in their theological tenets. This party calls itself, *par excellence*, 'Evangelical.'—In Germany, all Protestants call themselves Evangelical, in opposition to Catholics, on the ground that the Reformers taught the pure gospel of the grace of God in Christ, cleansing it of all human corruptions. The modern orthodox or pietistic party in the German Protestant churches have of late made exclusive claim to the attribute Evangelical, on the ground that they alone hold to the gospel in its actual historical shape. This claim is naturally disputed by the liberal theologians.

EVANGELICAL ALLIANCE, an association of 'evangelical' Christians belonging to various churches and countries,' formed in 1845, 'to associate and concentrate the strength of an enlightened Protestantism against the encroachments of Popery and Puseyism, and to promote the interests of a scriptural Christianity.' Its origin is to be ascribed to a deep sense of the evil of the divisions existing among Protestants, who nevertheless agree in holding the essential principles of the Reformation. A number of circumstances concurred to direct the attention of Christians both in England and Scotland very strongly to this subject; and a requisition, signed by ministers and others belonging to various denominations in Scotland, was addressed to 'the evangelical churches of England, Wales, and Ireland,' convening a meeting to be held at Liverpool in October 1845. To this requisition a cordial response was given; the meeting was numerously attended by persons of great influence, both in the established and dissenting churches; great harmony prevailed; and the E. A. was then organized. It now has branches in the most important cities and towns of Britain, and of many other parts of the world; it has contributed to the promotion of Christian union, fellowship, and brotherly co-operation, and at least as evidently on the continent of Europe as in Britain; affording at the same time much encouragement to those who in various countries of the continent were struggling in the feebleness of isolation against all the forms of opinion most adverse to the principles of the Reformation, but to whose support the strength of British Protestantism has been in some measure brought. The E. A. seeks by various means, to promote the cause of 'Evangelical Protestantism,' and to oppose 'Infidelity, Popery, and other forms of superstition, error, and profaneness, especially the profanation of the Lord's Day.' It has also ventured to remonstrate, and with some effect, against the persecution still practised in some Protestant countries of the north of Europe both against Protestant dissenters and Roman Catholics, and thus has sought to extend the influence of the principles of toleration. The meetings which have been held under its auspices in continental cities have also led to much temperate and friendly discussion on various important questions. Great meetings of the E. A. were held at Paris in 1855, at Berlin in 1857, and Geneva in 1861, and at New York in 1873. At the Paris exhibition of 1867, the E. A., with the sanction of the French government, erected the *Salle Evangelique*, where meetings for divine worship and united prayer were held daily.

The E. A. adopted as its basis a brief statement of the points of doctrine on which its members must hold 'what are usually understood to be evangelical views.' This gave rise to objections against it on the part of some who would gladly have joined it, but for an apprehension of compromising principles to which they did not think due place was given.

Its basis excludes those who, although otherwise holding evangelical doctrines, deny 'the divine institution of the Christian ministry, and the authority and perpetuity of the ordinances of baptism and the Lord's Supper.' The transactions of the Alliance are reported in a monthly periodical, issued under its auspices, entitled, *Evangelical Christendom*.

EVANGELICAL ASSOCIATION, a religious body which was organized in 1803 among Germans in the United States of North America, and has considerably extended itself both in that country and in Canada, being no longer chiefly confined, as it was at first, to German immigrants and their descendants using the German language. Its doctrines are a modified Calvinism; its church government a modified episcopacy.

EVANGELICAL UNION, the name assumed by a religious body constituted in Scotland in 1843 by the Rev. James Morison of Kilmarnock (now Dr. Morison of Glasgow), and other three

ministers (with their respective adherents), who had been separated from the United Secession Church for doctrinal views, of which the fundamental and determining article was the strict universality of the Saviour's atonement. Coeval with the body is its Theological Academy, presided over by Dr. Morison, and attended by over twenty students annually. They were soon joined by a number of ministers and churches of the Congregational Union of Scotland, and have since extended themselves considerably in Scotland and the north of England. Their church government is independent, but many congregations have ruling elders. Their doctrinal views are exhibited in an authorized publication, entitled *Doctrinal Declaration*, issued in September 1858. See MORISONIANISM.

EVA'NGELIST, literally, a bringer of good tidings. It designates, in the New Testament, a person appointed by an apostle to itinerate among the heathen, and so prepare the way for resident instructors. The evangelist, therefore, had no particular flock assigned to him, and is to be distinguished both from bishops and ordinary pastors. Later in the history of the early church, the evangelist figures, according to Eusebius, as 'a deliverer of the written gospels to those who were ignorant of the faith.' This may possibly imply that he acted as a colporteur, by distributing copies of the gospels, or that he read them to the heathen, and so made them familiar with their contents.—The word evangelist is also used to denote the four writers of the life and gospel of Jesus Christ, these being evangelists ('bringers of good tidings') *par excellence*.

E'VANS, LIEUTENANT-GENERAL SIR DE LACY, G.C.B., born at Moig, in Ireland, 1787; entered the army as ensign in 1807; in 1812, joined the 3d Light Dragoons, with whom he saw much Peninsular service. In 1814, he was present as brevet lieutenant-colonel of an infantry regiment at the capture of Washington, the attack on Baltimore, and the operations before New Orleans. He was next at Waterloo. In 1830—1831, he sat for Rye, and in 1833 was elected on the Liberal interest for Westminster, which he represented until 1841. The cause of the young queen of Spain was believed by the English ministry to be identified with that of freedom and constitutional Government, and an order in council was issued in 1835, authorizing the raising of 10,000 men for service in Spain, and expressing the king's desire that his subjects should take part with the queen of Spain, his ally, by entering the new corps. The command of the British auxiliary legion was offered to E., and he was allowed by his constituents to accept it without vacating his seat for Westminster. E.'s principal military exploits at the head of the British Legion were the storm and capture of the Carlist lines of Ayetta, near St. Sebastian, in 1836; the storm and capture of Irun; and the capture of Oyarzun and Fontarabia. For these services, he received the grand crosses of St. Ferdinand and Charles III. At the general election for 1841, E. was defeated for Westminster, but was re-elected in 1846, and continued to hold his seat, by undisputed tenure, till 1865. He was promoted to the rank of major-general of the British Army in 1846, and obtained the colonelcy of the 21st Foot in 1853. On the declaration of war against Russia, he was appointed to command the second division of the army sent out to the Crimea, with the rank of lieutenant-general. His division was hotly engaged in the battle of the Alma, and E. received a severe contusion of the shoulder. On the 26th October, during the siege of Sebastopol, his division was attacked by a force of 6000 Russians. E. met the enemy with great gallantry, and drove them back into the town. In February 1855, E. attended in his place, and received the public thanks of the House of Commons, through the Speaker, for his services in the Crimea. He was rewarded by the crown with the Grand Cross of the Bath, and by the Emperor of the French with the Grand Cordon of the Legion of Honor. He also received the degree of D.C.L. from the university of Oxford. He took a frequent part in debates on matters of army administration. In politics, he always belonged to the party of 'advanced Liberals.' He died January 9, 1870.

EVANS, MARIAN, one of the greatest of English novelists, and probably the foremost woman of her age, was best known by her *nom de plume*, 'George Eliot.' The youngest daughter of a Warwickshire land-agent, she was born at Griff, near Nuneaton, 22d Nov. 1820. Her education, begun at Coventry, embraced music, French, German, Italian, Greek, and Latin; Spanish and Hebrew were later acquisitions. Her translation of Strauss's *Leben Jesu*, published in 1846, was her first literary effort. Her reading in history, science, speculative philosophy and theology was very extensive; and when in 1851 she settled in London as assistant to Dr. Chapman, editor of the *Westminster Review*, Mr. Herbert Spencer testified that she 'was already distinguished by that breadth of culture and universality of power which have since made her known to all the world.' Her translation of Feuerbach's *Essence of Christianity* appeared in 1853. In 1856, G. H. Lewes forwarded to the Messrs. Blackwood the first instalment of *The Scenes of Cler-*

ical Life, which appeared next year in *Blackwood's Magazine* with the now familiar signature of 'George Eliot.' These seemed to proclaim with great distinctness the advent of a new novelist of fresh and original power. It was from the first sufficiently well understood that the signature was a mere *nom de plume*; and no little curiosity was excited as to the personality of the author unknown. That feeling was much deepened by the publication in 1858 of the novel of *Adam Bede*, which attained an immense success, and at once secured for the writer almost undisputed rank with the most eminent novelists of the day. This was followed, in 1859, by *The Mill on the Floss*, which amply sustained the reputation of the writer; and in 1861 by *Silas Marner, the Weaver of Raveloe*, a tale in one volume. In 1863, *Romola*, an elaborate historical novel of Italian life, illustrating the times of Savonarola, was published in the *Cornhill Magazine*. This work has never had quite the popularity of its predecessors, but was considered by some the greatest effort of the author. It had by this time become certain that Miss E. was the 'George Eliot' of these works; and by not a few competent critics a place had been frankly assigned her at the very summit of this branch of our literature. *Felix Holt, the Radical*, published in 1866, was almost everywhere received with acclamation. *Middlemarch, a Study of English Provincial Life*, published at intervals in 8 divisions during 1871—72, enhanced the author's great reputation. It has sometimes been spoken of as her chief triumph; but the palm is generally assigned to *Adam Bede*. *Daniel Deronda* was published in the same way in 1876. In its chief characters are sympathetically idealized the history, character and aims of the Hebrew race—a unique and daring artistic conception. Of the poems, *The Spanish Gypsy* was published in 1868; *Agatha*, in 1869; *the Legend of Jubal*, in 1870; and *Armstrong*, in 1871. Meanwhile, the distinguished authoress had for years been known to a wide circle of friends as the wife of George Henry Lewes, who died in 1878.

In 1879 she published a volume of essays, *The Impressions of Theophrastus Such*, which in a month or two reached a fourth edition. In 1880 she married Mr. J. W. Cross; on 22d December of the same year she died. A translation of the *Ethics of Spinoza*, finished thirty years before, was left in a complete state at her death. Her poems, though marked by many of the highest qualities of true poetry, have missed success. They and her novels, whether those founded on memories of English life in the Midland Counties, or the romances of pure historic imagination, have many qualities in common. 'George Eliot's' work is remarkable not only for nobility of tone, wealth of pregnant suggestion and subtlety of insight, but for tenderness of feeling, keen sense of humor, delicacy of treatment, and width and variety of sympathy. Earnest purpose is everywhere dominant; but the lighter gifts of the novelist are used with grace and effect. The style is pure and forcible. The interest centers largely in character struggling with circumstance, sometimes succumbing to fate, and generally moulded or modified by surroundings; Egoism is everywhere revealed as the great canker of life. 'George Eliot' had keen sympathy with the ethical elements of the 'Religion of Humanity'; her Positivist beliefs she does not obtrude on her readers. Her example has done more to forward the cause of woman's culture than most of the organized agencies; her personal character was singularly genial.

E'VANVILLE, a flourishing city of Indiana, in the United States, stands on the right bank of the Ohio, about 150 miles south-west of Indianapolis. It is very advantageously situated for trade. From E. downwards, the navigation is seldom interrupted either by drought or by ice; and here terminates the Wabash and Erie Canal, the longest work of the kind in the American republic. Thus, E. connects the Lower Ohio with the inland lakes and with the Gulf of Mexico. Coal and iron ore abound near E. Pop. (1870) 21,830; (1880) 29,280.

EVA'PORATION, the conversion of a fluid or solid into vapor. Steam, vapors of alcohol, camphor, iodine, &c., are familiar instances. All fluids are surrounded by vapor at common temperatures; but for every substance there is a limiting temperature, below which no evaporation takes place. The pressure, or tension of a vapor depends mainly upon the nature of the substance evaporated, and the temperature to which it is raised. The full amount of vapor, however, is not produced instantaneously, and therefore, in general, *time* is an element in the question as well as temperature. See DIFFUSION.

The Boiling-point (q. v.) is the temperature at which vapor is freely given off—i. e., at which the tension of the vapor of a substance is equal to the atmospheric pressure. Dalton gave an empirical law, which, however, is only at all approximate for temperatures near the boiling-point: 'The tension of the vapor of a substance rises in *geometrie*, as the temperature rises in *arithmetical* progression.' It is sufficient for our present purpose to notice, that the tension increases very rapidly with the temperature. Some curious consequences result from this. Thus, water boils at 212° F., under a pressure of 30 inches, or at that temperature

the tension of its vapor is *one* atmosphere. At 162° F., or 50° below its boiling-point, its vapor has a tension of 10 inches of mercury, and it will therefore boil, if placed in the receiver of an air-pump, as soon as two-thirds of the air have been extracted.

If a little water be boiled in an open flask till the steam has displaced a great part of the contained air, and the flask be then tightly corked, the water will gradually cool. If the flask be now dipped in *cold* water, boiling recommences, the cold water having condensed some of the vapor, and so diminished the pressure on the contained liquid. Dip the flask in *hot* water, and the boiling ceases. These appearances may be obtained several times in succession.

A fluid cannot be heated above its boiling-point, at the ordinary pressure of the atmosphere; but if it be heated in a closed vessel, the tension of the vapor produced is to be taken in addition to the former pressure, and the boiling-point rises with it. Thus, when the pressure is equivalent to 2 atmospheres, the boiling-point of water is raised 40° F. At such temperatures, its solvent powers are greatly increased. Many minerals which are found in fine crystals are supposed to have been deposited from water which had dissolved them in large quantities, under the combined influences of pressure and temperature. Papin's Digester (q. v.) depends upon this principle.

The amount of evaporation from a fluid depends upon many circumstances. As, except in the case of actual boiling, it takes place only at the surface, the amount of surface exposed is an important consideration where rapid and copious evaporation is required, as in steam-boilers, salt-pans, &c. When, on the contrary, it is desirable to prevent evaporation as much as possible, a layer of oil, preventing direct contact with the air, is of great use. The rate of evaporation depends also on the pressure, and varies, according to Daniell, nearly inversely as the latter. His experiments, which appear trustworthy, were made in an exhausted receiver, and the vapor was removed as it was formed.

In the conversion of a fluid into vapor, a quantity of heat disappears; i. e., is required to produce and maintain the gaseous state. Thus, the temperature of steam at 30 inches is the same (to the thermometer) as that of the boiling water from which it comes off; but the heat necessary to convert a pound of water at 112° into steam at 212°, would raise nearly 1000 pounds of water from 60° to 61°. See **HEAT**. When, therefore, a fluid evaporates, the vapor carries off heat from the fluid, and thus evaporation produces cold. This, of course, is matter of daily observation. Porous earthenware jars are employed to cool water in summer in this climate; and in India, ice is procured by exposing water in shallow pans, laid on straw, to the combined effects of evaporation and radiation at night.

On the same principle depends Sir John Leslie's method of freezing water. The water is placed in a flat porous dish, over a large surface of strong sulphuric acid, and the whole covered with the receiver of an air-pump. When a good vacuum has been produced, there is, of course, as we have already seen, a rapid evaporation, and the acid eagerly absorbing the vapor as it is formed, the process goes on without further working of the pump, till the residual water has become a solid cake of ice. A most extraordinary example of this production of cold is afforded by the freezing of water on a white hot plate—by no means a difficult experiment. A platinum capsule is heated nearly to whiteness by a lamp placed underneath; a little water, mixed with sulphurous acid, which is an extremely volatile liquid (indeed it is gaseous at ordinary temperatures and pressures), is poured upon the plate. The acid instantly evaporates, and the cold produced freezes the water, which can be dropped from the hot plate on the hand as a lump of ice.

Another remarkable instance of this occurs in the formation of solid carbonic acid. This liquid acid is forced by the pressure of its own vapor in a fine stream into the air from a nozzle in the strong iron vessel in which it is contained. It evaporates so rapidly in the air that a portion of the stream is frozen, and the delicate snowlike mass can be collected by proper apparatus.

Having thus briefly examined some of the circumstances connected with evaporation, we may proceed to mention some of its important bearings on meteorology. In this respect, it is one of the most effective of all the gigantic processes that are continually going on around us. Watery vapor is continually rising invisible in the air; meeting with a colder stratum of the atmosphere, or the cold ridge of a mountain, it becomes condensed into mists or clouds; the fine particles of these unite into larger groups, and fall as rain, hail, or snow—to be again evaporated by heat from the moist ground, or from rivers, lakes, and seas. Even when otherwise invisible, its presence may be detected by its deposition as Dew (q. v.), and, according to Clausius, in the blue of the sky, and the gorgeous tints of sunrise and sunset. There is little doubt of its being also intimately connected with the scintillation of the fixed stars. See **SCINTILLATION**. Atmospheric electricity is largely due to evaporation directly as well as indirectly, on account of the amounts of vapor contained in different currents of

air. It is matter of everyday observation how much the drying of the ground, or evaporation generally, is promoted by a brisk wind. This finds its explanation in the constant removal of the vapor as it is formed, the diffusion of the vapor taking place into comparatively dry air instead of the moist atmosphere into which it would take place in a calm. See **RAIN** and **ATMOSPHERIC ELECTRICITY**.

EVE (Heb. *Chavvah*, i. e. the living), the name, according to the Hebrew narrative, of the wife of the first man, and so the mother of the human race. See **ADAM AND EVE**.

EVE'CTION, a lunar inequality resulting from the combined effect of the irregularity of the motion of the perigee, and alternate increase and decrease of the eccentricity of the moon's orbit. See **LUNAR THEORY**.

EVELYN, JOHN, a well-known writer of the 17th c., was born October 31, 1620, at Wotton, the seat of the Evelyn family, in Surrey. He was educated at the free school of Lewes, and subsequently at Balliol College, Oxford. In 1640, he entered the Middle Temple, and in the following year, prompted by the ominous appearance of public affairs, and after having witnessed the trial of Strafford, he set out for the continent, returning, however, in the autumn of the same year. In 1642, upon offering his services to Charles I., he was accepted as a volunteer in Prince Rupert's troop, but in 1643 he again went to the continent, where he mainly lived during the following eight years. After 1652 he settled in England, where he lived studiously and in private till the Restoration, after which he was much employed by the government. On the organization of the Royal Society, he became one of the first members, and was an industrious contributor to its Transactions. He succeeded in 1699 to the family estate at Wotton, and there, after a long, studious, and highly useful life, he died 27th February 1706.

His pen seems to have been constantly employed, and that upon a great variety of subjects. Art, architecture, gardening, commerce, &c., were all treated of by E., and in such a manner as to produce the most beneficial results on his own time. His principal works are—*Sculptura, or the History and Art of Chalcography and Engraving on Copper*, 1662; *Silex, or a Discourse of Forest Trees, &c.*, 1664; and his *Memoirs* (first published in 1818). It is to the last of these works E. owes the celebrity he now enjoys. The *Memoirs* are written in the form of a diary, by one who had accustomed himself to habits of close observation, and continued during a period of about 70 years—and these the most dramatic in the recent history of England. They are of inestimable value. Sir Walter Scott said that 'he had never seen a mine so rich.' New editions were published in 1850, 1854, and 1870.

EVENING PRIMROSE. See **CENOTHERA**.

EVENING SCHOOLS may be divided into two classes: 1. Those which, either in the form of lectures or lessons, carry further the education received at school; 2. Those which exist to supplement the defects of early training, or, it may be, to give the simplest rudiments of elementary instruction to adults who are under the disadvantage of being pupils for the first time in their lives. The former are found chiefly in connection with mechanics' institutes* (which are now very numerous in Great Britain, and might form one of the most important educational agencies we have), existing day schools, and congregational organizations; while the latter more frequently fall under the head of parochial missionary work, or are connected with factories. These latter constitute the class of evening schools which engage the largest share of interest in the present condition of England, and which present the greatest difficulties in working.

The total number of evening schools of this humbler class (under government inspection) in operation in England and Wales was, in 1880, about 1561; of these 875 were conducted by the National Society or the Church of England, 33 by Wesleyans, 277 are undenominational, 63 by Roman Catholics, and 313 by School-boards. The total number of scholars in attendance was 52,530, of whom 42,938 were male. In Scotland, *primary* evening schools are not so usual as in England; and this is no doubt to be greatly attributed to the more general diffusion of education.

Considering the large proportion of the present adult population unable to read or write, the number of evening schools is miserably inadequate. But the necessity for their institution has not yet been sufficiently felt by the country, to lead to their taking a much more important place in the educational machinery of the nation than they have hitherto done. Her Majesty's inspectors, the Royal Commissioners (1861), and the clergy of all denominations, strongly recommend their greater extension. 'If the education of the country were in a good state,' say the commissioners, 'evening schools would be nearly universal, and would serve to compensate the scantiness of the instruction given in day schools, by giving more advanced instruction to an older class of scholars.'

* The Working-Man's College in London, and the School of Arts in Edinburgh, both belong to this class.

State Aid, and Voluntary and Paid Teachers.—Many educationists have come to the conclusion, that the hope of retaining children in school until they have obtained as much instruction as is requisite for their guidance in life, is a vain one, and consequently look to evening schools as an indispensable part of a national system of education, and consider them entitled to look to the state for encouragement and support to an equal extent with day schools. Bishop Hinds was the first publicly to suggest that evening schools fairly come within the sphere of state action, in a letter to Mr. Senior, printed in 1839. The recent inquiries have brought out that the majority of those who frequent existing evening schools have never received any elementary instruction, or have forgotten what they once knew, and that a large proportion are either adults or adolescent young men and women. They attend for the purpose of learning to read, write, and cipher. Though in many instances, especially where no fee is charged, the irregularity and unpunctuality of the attendance are great, yet in the majority of cases there is an earnest desire on the part of the pupils to benefit by the instruction they receive. It is a question of some national importance how far schools of this supplementary class should be left to the action of private philanthropy. It is also a question to some extent implied in the other, whether the peculiarly delicate work required in evening schools is not more efficiently discharged by voluntary than by paid laborers.

1. As to the first question, it may be safely said, that all would desire to see those wholesome channels of benevolence which connect the poor and the rich free from government interference; but if, in our devotion to a theory, we neglect the work, it becomes the duty of the state to see to it, to the extent of encouragement at least, if not of direction. Since Bishop Hinds' letter, to which we have referred above, the education committee of the privy council have recognized this duty, and have given aid to a small extent to all evening schools complying with certain conditions, and in connection with day schools. By the revised code recently issued by the privy council, evening schools of this class are allowed to claim from the parliamentary grant a considerable sum calculated on the average attendance. The schools must be taught by certified masters, and lay persons are alone recognized. To all those schools frequented for the purpose of confirming or extending previous knowledge, the grants made under the code will be of great assistance, and enable them to secure the services of trained teachers; to those which are chiefly frequented by adults wholly ignorant of the simplest elements, and chiefly conducted by voluntary teachers, it will afford little or no advantage, because the conductors will not be able to claim so large a sum as would suffice to pay the salaries of certificated masters. Nor, perhaps, is it desirable to interfere with this particular class of evening schools; it is of more importance, so far as state aid is concerned, that the education of the primary school should be confirmed by the establishment of evening schools for boys and girls. There is active benevolence enough abroad to overtake the ignorance of the adult population, if properly stimulated by the various religious bodies.

The proposed new arrangements as to payment may also lead to the greater separation of such schools into schools for boys and girls above 13 and under 18, and schools for adults. It is found that boys and men, girls and women, do not work well together.

2. As to the second question: in those evening schools which are only a continuation of the day school, the same method will generally be found to suit as in the primary schools; and therefore it seems advisable that they should be conducted by paid certificated teachers, acting under managers (as in the case of ordinary day schools), and claiming grants from the privy council. Those schools, again, which are frequented by adults, who come to receive the elements of reading, writing, and arithmetic for the first time, require more delicate handling, and a greater consideration of individual character and wants than are requisite in a school attended by boys and girls. In such cases, voluntary effort under the influence of religious or merely philanthropic motives appears to be the best agency. The ignorance of method displayed by such teachers, and the irregular manner in which many of them hang to their work, are no doubt serious difficulties; but they may be overcome by the institution of diocesan or other unions, in imitation of the East Lancashire Union of evening schools under the presidency of Sir J. P. K. Shuttleworth, with each of which might be connected an organizing master, who should itinerate among the schools, giving the benefit of his superior knowledge of method.

Subjects and Method.—As to subjects to be taught, we have little to say to that class of evening schools which continue the work of the day school. It is to be presumed that practical instruction (and what else should be aimed at in such schools?) will embrace the elements of those sciences which bear most directly on life. We refer to social economy and the laws of health. Evening schools of the humbler and more urgent sort will necessarily con-

fine themselves to reading, writing, and arithmetic, inventing such methods of teaching those subjects as will most directly touch the intelligence and engage the interest. The short period of attendance requires that much be done rather than many things. Through a well-constructed course of reading-books (unfortunately, there is no reading series for adults worthy of mention), all the general culture and specific information attainable will best be given. If such reading-books do not furnish adequate information on social economy in its domestic and its wider social relations, and on the laws of health, they sadly misunderstand their position in educational literature. Instruction in writing and arithmetic should be given in such a way as will naturally connect itself with the lives and daily necessities of the learners. But this is not the place to treat of the subject of method.

History.—Although we have directed attention to the fact, that Bishop Hinds was the first in this country to advocate state recognition for evening schools, he was by no means the first to feel the necessity that existed for them. The first school established exclusively for adults was at Bala, in Merionethshire, in 1811, by the Rev. T. Charles. In 1812, a similar school was set on foot in Bristol by William Smith and Stephen Prout, a school which led to the establishment of the 'Bristol Institution for instructing adults to read the Holy Scriptures.' In 1813, writing was included in the school programme; and in 1816, a society of the same kind was founded in London. In the course of a few years, thirty towns possessed similar schools. The first evening school proper for instructing boys and girls who had to work all day for a livelihood, was founded in 1806 at Bristol, by the 'Benevolent Evening Schools' Society. The present statistics of evening schools have been already given.

In other countries of Europe, evening schools, where they exist, have mainly in view the continuance of the education already received in primary schools. In France, however, the wants of untaught adults have been provided for by the establishment by law of evening schools suited to them. In all the states of Germany, provision is made more or less in the country districts, and always in the large towns, for continuing the instruction given in the primary schools. Schools for those who wish to learn reading and writing for the first time seem scarcely to exist, probably because they are not needed. The schools which do exist have a greater affinity to our Mechanics' Institutes than to any other kind of institution in this country. The instruction is given on Sundays and holidays, and in many places also on one or two evenings in the week. But Sunday instruction seems alone to have been originally contemplated. The subjects taught are the ordinary branches, with geography, free-hand and geometrical drawing, geometry, and in some cases the elements of natural science and the laws of health. These institutions are supported by the funds of the commune or district; and in some cases supplemented by the state.

EVERETT, ALEXANDER HILL, an American diplomatist and author, was born at Boston, in Massachusetts, 19th March 1792, and entered Harvard College in 1802. In 1806, although the youngest of the *alumni*, he graduated with the highest honors. After practising for some time as a lawyer, he was appointed United States ambassador at the Hague in 1818; and went in the same capacity to Spain in 1825. Four years afterwards he returned to the United States, where he became proprietor and editor of *The North American Review* (1830—1835), and also occupied a seat in the legislature of Massachusetts. In the winter of 1840, he resided, as a confidential agent of the United States government, in the island of Cuba. He sailed for China as minister-plenipotentiary for that empire in 1845, and died at Canton, June 23, 1847. E. was a man of great versatility of talent and of extensive erudition.

Politics and belles-lettres, political economy and poetry, statistics and æsthetics, alternately engaged his thoughts and pen. His writings are—*Europe, or a General Survey of the Political Situation of the Principal Powers*, &c. (London and Boston, 1822); *New Ideas on Population*, &c. (London and Boston, 1822); *America, or a General Survey of the Political Situation of the several Powers of the Western Continent*, &c. (Phila. 1827), in which he labors to show that Russia and the United States must in the long run share the continent between them; *Critical and Miscellaneous Essays* (two series, Boston, 1845 and 1847). These are on a vast variety of subjects, and are probably the most interesting productions of his pen. E. also published a volume of poems in 1845.

EVERETT, EDWARD, a younger brother of the preceding, was born in 1794 at Dorchester, near Boston, Massachusetts, entered Harvard College in 1807, and took his degree in 1811. He was for some time a Unitarian clergyman in the town of Cambridge, and in this capacity had the reputation of being one of the most eloquent and pathetic preachers in the United States. In 1815, he was elected professor of the Greek Language and Literature in Harvard College; and to qualify himself more thoroughly for his work, he visited Europe, where he resided for four years, and had

a distinguished circle of acquaintance, including Scott, Byron, Jeffrey, Romilly, Davy, &c. M. Cousin, the French philosopher and translator of Plato, pronounced him 'one of the best Grecians he ever knew.' In 1820, E. became editor of *The North American Review*; and in 1824, a member of the United States Congress, sitting in the House of Representatives for ten years. In 1835, he was appointed governor of Massachusetts; and in 1841, minister plenipotentiary to the court of St. James's. While in England, he received from the universities of Oxford, Cambridge, and Dublin the degree of D.C.L. On his return to America in 1845, he was elected president of Harvard College; on the decease of Daniel Webster, he became secretary of state; and in 1853, the legislature of Massachusetts chose him as a member of the senate of the United States. He died Jan. 1865.

E.'s principal works are: *A Defence of Christianity* (1814); *Orations and Speeches on Various Occasions from 1825 to 1836* (1836); and *Orations and Speeches on Various Occasions from 1825 to 1850*. This includes all the previous orations. These *Orations*, as they are called, are upon all subjects, and, like the writings of his brother, indicate a varied, vigorous, and flexible genius.

EVERGREENS are those trees and shrubs of which the leaves do not fall off in autumn, but retain their freshness and verdure throughout the winter, and perform their functions during more than one season. Evergreen leaves are generally of thicker and firmer texture than the leaves of deciduous trees and shrubs. They have also fewer pores or *Stomata* (q. v.), and these confined to their under surface. Evergreen leaves are sometimes very small, as in firs and heaths; sometimes pretty large, as in rhododendrons, laurels, magnolias, &c. E., both trees and shrubs, have always been much sought after by the landscape gardener, and for purposes of ornament and shelter.

Some orders of plants consist exclusively, or nearly so, of E., whilst in others they exist only as exceptional species. Most of the *Coniferae* are E.; and the sombre green of pines, firs, cypresses, &c., is a prevalent characteristic of northern scenery both in summer and winter; whilst the undiminished thickness of the foliage affords winter shelter to animals which could not so well exist in forests composed merely of deciduous trees. Holly and ivy are amongst the finest British E.; the box, privet, and different kinds of bay and laurel, rhododendron, philirea, myrtle, &c., are also familiar to every one. As instances of genera in which some species are evergreen and others deciduous, may be mentioned barberry and cytisus. Many fine new ornamental E. have recently been introduced. As suitable for imparting a lively appearance, boughs of E. are largely employed in Great Britain to decorate the walls of public places of assemblage, triumphal arches, &c., on festive occasions.

EVERLASTING FLOWER, the popular name of certain plants, the flowers of which suffer little change of appearance in drying, and may be kept for years without much diminution of beauty. They are plants of the order *Compositae*, having their flowers (heads of flowers) surrounded with an involucre; the scales of which resemble the petals of a corolla, but are rigid, membranous, and contain little moisture. Some species of Cudweed (q. v.) (*Gnaphalium*) are often called E. F., and the other plants which bear the name belong to nearly allied genera, but particularly to the genus *Helichrysum*, which contains a great number of species, mostly natives of Africa. *H. arenarium* is frequent on dry sandy soils in many parts of Europe and the central latitudes of Asia. It is covered with a gray felted down, and has yellow flowers, which, when rubbed, emit a faint aromatic odor. It is often worn on the continent of Europe as an ornament in the hat, particularly by wagoners. *H. angustifolium* and *H. Stachas*—shrubby species, natives of the south of Europe—have larger yellow flowers. Some of the species have a powerful and pleasant aromatic odor. No species of *Helichrysum* is a native of Britain. Several kinds of E. F. are frequently to be seen in our gardens, others in greenhouses. The French call them *Immortelles*, and in France they are often woven into circular wreaths, and placed beside recent graves, as emblems of immortality.

EVERSLEY, VISCOUNT, ex-Speaker of the House of Commons. CHARLES SHAW LEFEVRE, born in 1794, is descended maternally from the Lefevres, who came to England from Rouen on the revocation of the Edict of Nantes. He was educated at Winchester and Trinity College, Cambridge, called to the bar at Lincoln's Inn in 1819, entered parliament in 1830 as member for Downton, and represented Hants from 1831 to 1857. In 1839 he was chosen Speaker of the House of Commons; and re-elected in the parliaments of 1841, 1847, and 1852. He retired from the office in 1857, with a peerage and a pension of £4000 a year. During the eighteen years of his Speakership, he suggested and carried out many improvements in the forms and procedure of the Lower House, tending to the dispatch of business. Tall, and dignified in person, affable and accessible to the younger members, and profoundly versed in the laws of debate and practice of the House,

he was admirably qualified, by nature and training, to be 'first commoner of England.'

EVESHAM, originally EOvesham, a municipal and parliamentary borough in the south-east of Worcestershire, on the right bank of the navigable Avon, 15 miles south-east of Worcester. It lies in a beautiful and fertile vale, and has some manufactures of agricultural implements. Pop. (1881) 5112. E. sends one member to parliament. An abbey was founded here about 700.

EVICTION, in the law of Scotland, is the dispossessing one of property, whether in land or movables, in virtue of a preferable title in the person of him by whom the eviction is made. The same expression is used in England as to property in land; but where the tenant is merely deprived of possession, it is called Ouster.

EVIDENCE, LEGAL. Evidence is either parole or written, the former consisting of the statements of witnesses appearing personally in court, and which statements must be attested by an oath or solemn declaration; the latter consisting of records, deeds, and other writings.

A distinction—popular rather than legal—is commonly drawn between *direct* and *circumstantial* evidence. Evidence is said to be direct when the proof depends on the testimony of persons who swear to the fact in dispute as matter of personal knowledge; when the witnesses only swear to other facts from which the fact at issue may be inferred, the evidence is called circumstantial. The latter kind of evidence is usually regarded as inferior in value to direct. Yet it is sometimes held that circumstantial evidence may be the more trustworthy; for either the witnesses may be unaccountably mistaken, or may have designed to deceive, whereas, as Paley said, 'circumstances cannot lie.'

The tendency, both in England and Scotland, of late years, has been to abolish all restrictions on the admissibility of witnesses, and to bring the rule practically to what Blackstone stated it to be in theory, viz., 'all witnesses that have the use of their reason are to be received and examined.' The ground on which witnesses were formerly excluded was untrustworthiness, arising either from the character of the witnesses or their interest in the suit. Under the former head fell those who were legally infamous (q. v.); whilst the latter included, first, the party to the suit himself, and then all who were connected with him by the ties of family, or even of business, in any appreciable degree. Gradually, however, it came to be seen that, though witnesses subject to these objections were less valuable than others to the party adducing them, it by no means followed that their testimony was of no value at all, and that the safer course in all cases was to examine them, and then to allow their testimony to be invalidated by proof of their interest in the cause direct or indirect, or of their having been convicted of such crimes as to render it unlikely that they should speak the truth. The objections have thus become objections not to the admissibility or competency, but the credibility of witnesses.

The first of the very important statutes by which these changes were effected was 9 Geo. IV. c. 32, which permitted Quakers and Moravians to substitute a solemn affirmation for an oath; admitted the party whose name had been forged as a witness in prosecutions for forgery; and provided that no misdemeanor (except perjury) shall render a party an incompetent witness after he has undergone the punishment. Then came the Scotch Act 3 and 4 Vict. c. 59, afterwards referred to, and the English Act 6 and 7 Vict. c. 85, which provided that no person offered as a witness shall hereafter be excluded, by reason of incapacity from crime or interest, from giving evidence either in person or by deposition on any issue or inquiry civil or criminal, but shall be admitted notwithstanding he may have an interest in the matter in question, or in the event of the trial or proceeding, and notwithstanding that he may have been previously convicted of any crime or offence. The same principle was extended by 14 and 15 Vict. c. 99 to the parties to a cause, who are not only competent, but compellable to give evidence on behalf of either or any of the parties—subject only to exception where the question tends to criminate the person examined, or where one (now altered) sued for breach of promise of marriage, or any action or proceeding instituted in consequence of adultery. By 16 and 17 Vict. c. 83, the former statute, 14 and 15 Vict. c. 99, was amended to the effect that the husband or wife of the party shall be in the same position with the party himself, subject only to these exceptions—first, that the husband or wife cannot give evidence for or against each other in criminal proceedings (but now they may in suits for adultery), and that they cannot be compelled to disclose matters which they have learned by communications from each other during the marriage. The statutes by which the corresponding changes were effected in Scotland were 3 and 4 Vict. c. 59, 15 and 16 Vict. c. 27, and 16 and 17 Vict. c. 20.

The Oath (q. v.) to 'speak the truth, the whole truth, and nothing but the truth,' is administered to witnesses in England on the New Testament; in Scotland, holding up the right hand.

Quakers and all conscientious persons, of whatever religious denomination, who object to the use of an oath, as formerly observed, make a solemn Affirmation (q. v.); and persons who are foreigners are sworn, or otherwise bound to speak the truth, by such forms as are conceived to be appropriate to their respective creeds. Till of late, belief in a God, and that divine punishment will be the certain consequence of perjury here or hereafter, was required ere one could be sworn; though there was no decision fixing the point definitely. Accordingly, atheists were incompetent to give evidence. But the Act 32 and 33 Vict. c. 48 (1869) provides that if any one object to make oath, and the presiding judge is satisfied that the taking of the oath would have no binding effect on his conscience, the judge shall allow him to make a promise and affirmation. (For the oath in the House of Commons, see OATH.)

It is a general rule of the law of evidence, that a witness is not bound to criminate himself, and he may consequently decline to answer any question that tends to expose him to punishment as a criminal, or to penal liability, or to forfeiture of any kind. If the effect of the question be merely to establish that he owes a debt, or is otherwise subject to a civil suit, the exception will not hold, and he will be bound to answer it (46 Geo. III. c. 37). The rule in England is, that a counsel, attorney, or solicitor is not bound, or even entitled, to divulge the secrets of the cause with which he has been intrusted; and the recent Scottish Act 15 and 16 Vict. c. 27, s. 1, preserves the same exception with reference to agents who shall at the time when so adduced be acting in that capacity. Neither can official persons be called upon to disclose matters of state, the publication of which might be prejudicial to the community. All other professional persons, however—lawyers not engaged in the cause, physicians, surgeons, and divines, must divulge all secrets relevant to the issue with which they have become acquainted, even in the strictest professional confidence. See CONFESSORIAL. Neither will a servant nor private friend be allowed to withhold a relevant act, though of the most delicate nature.

One witness in England is sufficient in law, unless in the case of treason, if juries believe him and in long chains of evidence it is often impossible that more than one witness should be adduced to make out some of the links of it. In general, however, there will be some fact or circumstance which will act as a supplementary adminicle, if the testimony be reliable; and it is this fact which has rendered the practical effect of the opposite rule, which demands two witnesses, in Scotland, not very different. The want of a second witness is usually supplied by a witness to circumstances which are corroborative of the evidence of the first; and where the one witness is not so corroborated in England, he will rarely be believed. It is a rule that none but the best evidence shall be adduced, which means that secondary shall not be substituted for primary evidence where the latter is accessible; a rule founded on the presumption that such a substitution is probably prompted by a sinister motive. This rule applies to written as well as oral testimony, and excludes copies of documents, just as it excludes the 'hearsay' of witnesses. See OATH, JURY, WITNESS, DEED, TESTING, &c. The best works on evidence in English are Taylor (English), Greenleaf (American), and Dickson (Scottish).

EVIL may be generally defined as that which is opposed to the divine order of the universe. It requires only a superficial observation to perceive that there are many apparent exceptions to the pervading harmony and happiness of creation: there are convulsions in the physical world; there are suffering, decay, and death throughout the whole range of organic existence; and the appellation of evil is commonly applied to such phenomena. In the face of the human consciousness, such phenomena appear to be infractions of the general order and good, and it pronounces them *evil*. How far the internal feeling of wrong has been quickened and educated by such outward facts, it would be difficult to say, but, beyond doubt, they have exercised upon it a powerful influence. Every form of religion testifies to the recognition of evil in the external world, and superstition in all its shapes mainly rests upon it.

But it is in the sphere of moral life alone that the conception of evil can be said to hold good. After the light of science has explored the secrets of nature, and shown how all its apparent anomalies are merely manifestations of a comprehensive harmony, the idea of evil is dispelled from the material and merely organic creation. 'Whatever is, is best,' is seen to be everywhere the law of this creation. There remains, however, the ineradicable feeling of evil in human life and manners and history. There is in the moral consciousness of man a sense of violated order, of transgression of divine law, or what is called *sin*, which is *evil* in its essential form. This fact of evil is everywhere appealed to by the Christian religion; it is the aim of this religion to deliver men from its power and misery. Every ethical and judicial code is based upon its recognition, and is designed to protect human

society from its injurious consequences. It cannot be better or more clearly defined than in the language already given, viz., the transgression of the divine law revealed in conscience and in Scripture.

The question of the *origin of evil* has been greatly discussed, and received various answers. The simplest and most direct of these answers is that which maintains a double origin of things, or a system of *dualism*. This conception lies at the bases of many forms of religion; it may be said to be the fundamental conception of all mere nature-religions. Interpreting the obvious appearances of nature, they embody in divine personalities its contending manifestations of light and darkness, benignity and terror. The opposition of Ormuzd and Ahriman in the old Zoroastrian faith is one of the most conspicuous examples of this religious dualism. Manichæism, which spread so widely in the 4th and 5th centuries, and the Syrian gnosticism from which it sprang, are also historical illustrations of the same principle.

The dualistic theory of the origin of evil, however, could not obviously maintain itself with the advance of speculation and the spread of Christian truth. It was no less clearly a postulate of the cultivated reason than a dictate of divine revelation, that the world proceeded from One absolutely Divine Creator, holy and good, of whom, and through whom, and to whom, are all things. It was necessary, therefore, to reconcile the appearance of evil with this fundamental admission.

The doctrine of the Fall, especially in the later form of development which connects it with the existence of a devil or evil spirit, tempting man in the shape of the serpent, was supposed to explain the appearance of evil in human history. Being tempted of the devil, man sinned, and so fell from his obedience to the divine law. This is the doctrine of orthodox Christian theology, and the answer which it gives to the inquiry, how sin came into the world? And many minds never think of carrying the inquiry further. It is clear, however, that this explanation of the historical origin of evil leaves the question of its real and absolute origin unsettled. The devil being assumed as the cause of man's sin, the further question arises, whence the devil? Is he an absolute personality? in which case we are landed in the old theory of dualism; or is he, according to the traditionary Christian conception, a fallen angel? in which case the question just returns, whence the spring of evil in him? There is no real explanation gained by this removal of the question; it is still the same difficulty—whence the origin of evil in the creation of an all-perfect being, almighty as well as all-wise and good?

Speculation may please itself with ingenious answers to this question, but in truth it admits of no satisfactory solution. Some, for example, have argued that evil, like darkness or cold, is an indispensable element of alternation or contrast in human life. All individual reality is only the product of opposite forces working together. Character could only arise from the interaction of opposing ethical influences of good and evil. In nature, we have attraction and repulsion, rest and motion, positive and negative electricity; why should it be different in the sphere of morals? Here, too, there must be polarity. Good can only exist in contradistinction to evil; the one no less than the other is necessary to constitute the drama of human life and history. Others, again, have argued, that evil is the result of what is called metaphysical imperfection. God alone can be perfectly good. The creature, in its very nature, is limited, defective; and evil is nothing else than the evidence of this limitation in man. It is not something real or positive, but only a privation. It is in morals what cold and darkness are in physics, a pure negation. Thus have argued such profound thinkers as Augustine and Leibnitz. But it requires but little penetration to see that such arguments, however ingenious, and so far well founded, do not meet the essential difficulty of the problem. If evil be, according to such views, a necessary element of human life, in the one case, in order to develop its activity, in the other case, as clinging to its creaturely limitations, then plainly it is not, in the orthodox sense of the word, *evil*. It is not, and cannot be a contradiction of the true idea of human life, and at the same time a necessary element of it. Whatever necessarily belongs to life, must help its true development, and not injure and destroy it; must be *good*, in short, and not *evil*. Such theories, therefore, only solve the problem by eliminating the fact. The origin of evil must remain forever inscrutable; nor is it wonderful that it should. It is only in its ultimate sense conceivable as a quality of moral freedom, and moral freedom in man or any created being is a profound mystery. It is something which 'we apprehend, but which we can neither comprehend nor communicate.'

EVIL, KING'S. See SCROFULA.

EVIL EYE. Both in ancient and modern times, the belief that some persons have the power of injuring others by looking upon them, has been widely diffused. The Greeks frequently speak of the *Ophthalmos Baskanos* (or evil eye), which they conceived to be specially dangerous to children; and the Romans

used the verb *fascinare* to express the same fact. Pliny speaks—not on his own authority, however—of 'those among the Triballians and Illyrians, who with their very eyesight can witch (*effascinant*), yea, and kill those whom they look wistly upon any long time;' and Plutarch states, on the authority of Philaretus, that 'the Thybiens who inhabited Pontus were deadly, not only to babes, but to men grown, and that whosoever their eye, speech, or breath would reach, were sure to fall sick, and pine away.' Menalcas, in Virgil (*Ecl.* iii. 102), also complains that some evil eye has fascinated his young lambs—

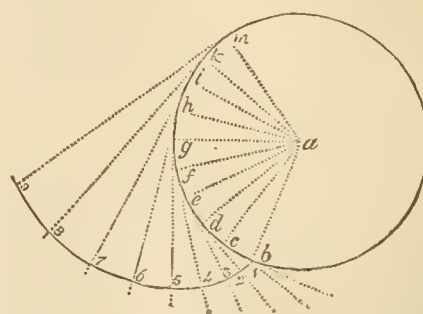
Nescio quis teneros oculus mihi fascinat agnos.

The principal amulet used by the ancients was the *phallus* or *fascinum*, as the Romans called it, which was hung round the neck of children. Of course, this superstition, like all others, flourished in Europe during the middle ages. See Reginald Scot's *Discovery of Witchcraft*; the *Opusculum de Fascino* of John Lazarus Gutierrez, a Spanish physician, published in 1653; and the *Tractatus de Fascinatione* of John Christian Frommann, a physician of Saxe-Coburg, published in 1675. In the British Isles, also, the belief in the power of the evil eye is of old date, and is by no means dead, at least in Ireland and the Highlands of Scotland. In these countries (as elsewhere), it was once a very common superstition that cattle were subject to injury in this way. Witches had the power to a malignant degree; and various charms such as twining mountain-ash among the hair of the cow's tail, were used to avert or destroy their noxious influence. In the East it was and is no less prevalent. The Persians have various methods of discovering the special kind of fascination by which a person is afflicted; and Dallaway, in his *Account of Constantinople* (Lond. 1797), affirms that 'nothing can exceed the superstition of the Turks respecting the evil eye of an enemy or infidel. Passages from the Koran are painted on the outside of the houses, globes of glass are suspended from the ceiling, and a part of the superfluous caparison of their horses is designed to attract attention, and divert a sinister influence.' Hobhouse, in his *Travels*, bears equally conclusive testimony to the prevalence of his superstition in the Turkish empire, not among Mohammedans only, but also among Christians; while Lane, in his *Modern Egyptians* (1836), gives an account of the precautions taken by the Egyptians to avoid the influence of evil eye. The American Indians partake of the same belief; and it is not improbable that if the matter were still more profoundly investigated, it would be found that every nation that exists or has existed, with anything like a developed system of superstition, believes or has believed in the reality of fascination in some form or other.

The universality of this superstition goes far to prove that it has what may be called a *natural* origin; and, indeed, when we consider that the *eye* is the most expressive organ of the soul or mind of man, that through it are shot forth, as it were, into the visible world of the senses, the hidden passions, emotions and desires of our nature, we will not wonder that in the 'times of ignorance,' when men could give no rational or scientific account of almost any physiological phenomena, if connected with psychology, the eye should have been superstitiously imagined to be a center of malignant influence. The eye is, in point of fact, as potent as superstition dreams: the error lay not in the recognition of its power, but in explaining the mode of its operation. The person who felt himself under the spell of a powerful gaze, was too agitated to calmly consider the cause of his terrors, and attributed to another results for which he himself was mainly responsible. It was really he that gave to the eye of his fellow-creature its baleful influence; and he quailed less before the force of character which it indicated, than before the fearful fancies with which his own timidity had invested it. For this disease, wherever it has existed, or does yet exist, there is no cure but that solid culture of the understanding from which comes a true strength of will and brain. See FASCINATION BY SERPENTS.

EVOLUTE AND INVOLUTE. See CURVATURE and OSCULATING CIRCLE. The evolute of any curve is the locus of the center of its osculating circle, and relative to its evolute, the curve is called the involute. This is the simplest definition that can be given of an evolute and involute, which are relative terms. There is another, however, which may represent the relation of the curves more clearly to those who are not mathematicians. If on any curve a string be closely wrapped, and if the string be fastened at one of its ends, and free at the other; and then if we unwind the string from the curve, keeping it constantly stretched, the curve which would be traced out by a pencil fixed to the free end of the string, is called the involute of that from which the string is unwound, and relative to it, the latter is called the evolute. It is clear that the involute might otherwise be described by fastening a string at one extremity of the evolute, and wrapping it thereupon, keeping it always stretched. From either definition, it is clear that a normal to the involute at any point is a tangent to the evolute, and that the difference in length between any two radii of curvature to the involute is

equal to the length of the arc of the evolute intercepted between them. The nature of evolutes was first considered by Huyghens, who showed that the evolute to a common cycloid is another equal cycloid, a property of that curve which he employed in making a pendulum vibrate in a cycloid. To describe the involute of a circle, proceed as follows: Let *a* be the center of the circle, and *b* the extremity of the string to be unwound from its circumference. Divide the circle, or part of the circle, according to the length of curve required, into any number of equal parts, as *c*, *d*,



e, &c.; through these, from *a*, draw radial lines; from the points where these touch the circle, draw, at right angles to the lines *ac*, *ad*, &c., other lines, as in the diagram. With the distance *cb* as radius, from the point *c*, describe an arc *b1*, cutting the line *c1* in 1. From the point *d*, with *d1*, describe an arc 1 2, cutting the line *d2* in 2. From *e*, with *e2*, describe an arc 2 3, cutting the line *e3* in 3. With radius *f3*, from *f*, describe an arc 3 4, cutting *f4* in the point 4. Proceed in this way, describing arcs which pass through the points 5, 6, 7, 8 and 9. The involute will thus be formed.

EVOLUTION AND INVOLUTION. algebraical terms, the former signifying the extraction of roots, and the latter the raising to powers. When any number is multiplied by itself, the product is called its square, or second power. If we multiply the square by the number again, we get the cube, or third power; and so on. This process is called involution. Evolution is the inverse process, by which a number being presented, we may ascertain a particular root of it, say the fourth; or that number which, being multiplied into unity a particular number of times say four times, the product will be the number presented. See EXTRACTION OF ROOTS.

EVOLUTION THEORY, in Biology, the hypothesis according to which the higher forms of life have been developed out of lower organisms. See SPECIES, and DARWINIAN THEORY.

EVOLUTIONS are the movements of troops in order to maintain or sustain a post, to occupy a new post, to improve an attack, or to improve a defence. All such movements as marching, counter-marching, route-marching, changing front, forming line, facing, wheeling, making column or line, making echelon or square, defiling, deploying, &c., come under the general heading of evolutions. More minute descriptions of these and other motions will be given under TACTICS, MILITARY AND NAVAL. Other things being equal, the best evolutions are those which occupy least time and least space. The word evolution equally applies to the movement of ships in a fleet.

EVORA (ancient *Ebora*), a city of Portugal, capital of the province of Alentejo, and, after Coimbra, and perhaps Thomar, the most interesting city in the country, is beautifully situated on a fertile and elevated plain, 48 miles west-south-west of Badajoz, and about 80 miles east of Lisbon. It was once a place of considerable strength; but its ramparts, and the towers which flanked them, its citadel, its forts, and its watch-towers, are now in a hopelessly ruinous condition. The town itself is not well built, its streets are narrow and winding, and its houses old and badly planned. It has a cathedral, a large Gothic edifice, founded in 1186, the choir of which, rebuilt in 1721, is in the Italian style, and is richly adorned with marbles of various colors. E. has been the see of an archbishop since 1541; has an archiepiscopal library, containing upwards of 50,000 volumes; and several pictures of great merit, attributed to Gran Vasco. It has manufactures of ironware and leather, and a well-attended annual fair. Pop. about 12,000.

E. is a very ancient city. Quintus Sertorius took it in 80 B.C. It was also conquered by the Moors in 712, but recovered from them in 1166. The Roman antiquities of E. are unrivaled in the Peninsula. Among these, the temple of Diana, used as a slaughter-house for some time previous to the year 1834, exhibits in its fine Corinthian columns admirable proportion and delicacy of sculpture. There is also an aqueduct, 1200 paces in length, erected by Quintus Sertorius; but the most beautiful Roman relic, and one of the most perfect pieces of architecture in exist-

ence, is the tower which rises in the city at the extremity of the aqueduct. It is 12 feet 6 inches in diameter, and is surrounded by eight columns of the Ionic order. Ionic pilasters decorate the second story, and the top is crowned with a hemispherical dome. It is wholly constructed of brick, and covered with cement of such a durable nature, that, although this delicate structure has existed since 70 B.C., few parts of it seem to have been impaired by time.

EVREMOND, CHARLES MARGOTELLE DE ST. DENIS, SEIGNEUR DE ST., an author and wit of the 17th c., was born at St. Denis-le-Guast, in Normandy, April 1, 1613. He entered the army about the age of 15, became an ensign in less than a year, and in 1637 had the command of a company of foot. About this time, he gained the favor and friendship of Turenne, Grammont, the Prince of Condé, and others of high rank, all of whom were delighted with the wit and cheerfulness of his conversation. Having talked himself into the esteem of these men, it was not long, however, until, by the same means, he brought himself under their displeasure.

In 1661 his unbridled indulgence in raillery compelled him to take refuge in England. Many attempts were made at the French court to induce Louis XIV. to recall St. E., whose accomplishments, gaiety, and wit rendered him the delight of all who had not smarted from his sarcasm; but Louis remained immovable till 1689, when he granted the exile permission to return. It was now, however, too late. St. E. had by this time surrounded himself with an admiring circle of the wits and beauties of the English court, and resolved to remain where he was. He died in his 91st year, in September 1703.

St. E.'s works, comprising comedies, classical essays, &c., were first correctly published by Des Maizeaux, with a life of the author (Lond. 1705). The works are also translated into English by the same editor.

EVREUX (anciently *Mediolanum*, and more recently *Eburovices*), an episcopal city of France, in the department of Eure, of which it is the capital, is pleasantly situated in a valley on the Iton, a feeder of the Eure, 60 miles west-north-west of Paris. It is well built, its streets regular, and the environs prettily laid out in promenades, gardens, and vineyards. The principal building of E. is the cathedral, which dates from the 11th century. The other buildings of note are the abbey church of St. Thaurin, originally built over the tomb of St. Thaurin, the first bishop of E., and having a shrine executed in the 13th c., which once contained his relics; the Bishop's Palace, built in 1484; and the *Tour de l'Horloge* of the same century. E. has extensive manufactures of bed-ticking, woollen stuffs, cotton-yarn, leather, vinegar, and a trade in its manufactures, and in grain, seeds, timber, and liqueurs. Pop. (1876) 11,453.

E. is remarkable for the numerous sieges which it has sustained. It was taken by Clovis from the Romans; was sacked and plundered in 892 by the Northmen, under Rollo; was burned by Henry I. of England in 1119; and in 1194 and 1199 it was twice captured by Philippe Auguste, king of France, into whose hands, after a short time, it permanently came. It was frequently taken and recovered in the wars between France and England during the reigns of Henry V. and Henry VI. of the latter country.

VIEIL EVREUX (*Old Evreux*), a village near E., and the supposed site of the ancient *Mediolanum*, has some ancient remains of a theater, an aqueduct, and fortifications.

EWALD, GEORG HEINRICH AUGUST VON, one of the greatest Orientalists of the 19th c., was born 16th November 1803, at Göttingen, and exhibited a predilection for Oriental literature even in his school-days. He studied at the university of his native place, and while still a student, wrote a work on the Composition of Genesis (*Die Composition der Genesis*, Braunsch. 1823). In 1823, he became a teacher at the Wolfenbüttel gymnasium; in 1827, extraordinary, and in 1831, ordinary, professor of philosophy at Göttingen; and in 1835, was appointed nominal professor of the Oriental languages. Travels in search of Oriental MSS. led him, in 1826, 1829, and 1836, to Berlin, Paris, and Italy.

After the death of Eichhorn, the critical exegesis of the Old Testament was included in his duties as professor of the Oriental tongues. The first, and perhaps the most important fruit of his new labors, was his Critical Grammar of the Hebrew Language (*Kritische Grammatik der Hebr. Sprache*, Leip. 1827), an abridgment of which was published at Leipzig in 1835, under the title of Grammar of the Hebrew Language (*Grammatik der Hebr. Sprache*; 5th edit. 1844); and a still simpler epitome in 1842, entitled Hebrew Grammar for Beginners (*Hebr. Sprachlehre für Anfänger*). Before this, however, E. had acquired a high reputation by his work on Canticles (*Hohe Lied Salomo's*, Gött. 1826); his Commentary on the Apocalypse (*Commentarius in Apocalypsin*, Leip. 1828); his Poetical Books of the Old Testament, in 4 vols. (*Die Poetischen Bücher des Alten Bundes*, Gött. 1835—1837); and his Prophets of the Old Testament, in 2 vols. (*Die Propheten des Alten Bundes*, 2 Bde. Stutt. 1840). Between the years 1843—1850,

E. published an important work in 4 vols., on the History of the People of Israel until the time of Christ (*Geschichte des Volkes Israel bis auf Christus*; Eng. trans. 1869—71), and a subsidiary volume on the Antiquities of the People of Israel (*Die Alterthümer des Volkes Israel*). The *Geschichte des Volkes Israel*, together with its two continuations, The History of Christ and his Time (*Geschichte Christus und seiner Zeit*, 1857), and The History of the Apostolic Age, &c. (*Geschichte des Apostolischen Zeitalters bis zur Zerstörung Jerusalems*, 1858), is regarded as E.'s greatest work. But Jewish history and literature did not limit the sphere of E.'s wonderful activity. His lectures at Göttingen embraced the literature of the Arabic, Persian, Aramaic, and Sanscrit tongues, and gave birth to such works as that on the Metres of the Arabian Songs (*De Metris Carminum Arabicorum*, Leip. 1825); on Some of the Older Sanscrit Metres (*Ueber einige ältere Sanscrit-Metra*, Gött. 1827), an epitome of the Arabic author Wakid's work on Mesopotamia (*De Mesopotamia expugnata Historia*, Gött. 1827), and a Grammar of Arabic, entitled *Grammatica Critica Linguae Arabicæ cum brevî Metrorum Doctrina*, 2 Bde. (Leip. 1831—1833). In 1832, E. published at Göttingen several very important Dissertations on Oriental and Biblical Literature (*Abhandlungen zur orient. und biblischen Literatur*), and planned the well-known periodical, *Journal for the Knowledge of the East* (*Zeitschrift für die Kunde des Morgenlands*). E., however, was not only a scholar and philologist, but a man of strong political convictions. Having, along with six of his colleagues (the others were the brothers Grimm, Dahlmann, Gervinus, Weber, and Albrecht), protested against the abolition of constitutional law and liberty in Hanover by the new sovereign, Ernest Augustus (previously Duke of Cumberland), he was dismissed from his situation, 12th December 1837, and went to England to investigate its public libraries, whence he was called to Tübingen in 1838, as professor of theology. Here he remained for ten years, during which he was involved in many strifes. In 1841, he was ennobled by the king of Württemberg.

In 1848, E. returned to Göttingen, where he established a Year-book of Biblical Science (*Jahrbuch der biblischen Wissenschaft*), in which, as well as in his work on the Synoptic Gospels (*Die drei ersten Evangelien*, Gött. 1850), and works on the Epistles of Paul (*Die Sendschreiben des Apostels Paulus übersetzt und erklärt*, Gött. 1857), he strove to give a firmer basis to New Testament criticism and exegesis. E. also paid great attention to Ethiopic literature, a result of which is his valuable Dissertation on the Book of Enoch (*Ueber des Äthiopischen Buches Henoch Entstehung*, &c., Gött. 1856). Later works were *Das Sendschreiben an die Hebräer und Jacobus' Rundschreiben* (1871); and *Sieben Sendschreiben des Neuen Bundes* (1871). The distinguishing peculiarity of E., as a theologian and critic, was his love for the concrete forms in which divine truths are revealed in history, and his dislike of the abstractions into which they are refined away by over-speculative theologians. He regarded it as the especial glory of the Jewish people, that they never lost sight of the concrete—as the Persians and Hindus, for example, did, with whom the realities of religion vanished into the most intangible dreams—but kept it ever before them until, in the fulness of times, there was born in their midst Jesus of Nazareth, the Perfect and Only One, in whom humanity reached its spiritual consummation. E. refused to class himself or to be classed with any theological party in Germany. He was equally opposed to the extreme left represented in Tübingen, and to the extreme right represented in the modern Lutheran movement headed by Hengstenberg. When Hanover was in 1866 incorporated with Prussia, E. declined to take the new oath of allegiance, and was accordingly required to retire from the functions of the professoriate. He returned to political life; and as the three times elected representative of the town of Hanover in the Reichstag, persistently opposed the new political conditions. He died in May 1875.

EWALD, JOHANNES, one of the best lyric poets of Denmark, was born at Copenhagen on the 18th Nov. 1743, and died in the same city in 1781. In his 16th year, when his friends were about to send him to the university of Copenhagen, the restless impatience of restraint which had always characterized him, led him to make his escape to Germany, where he entered as a private soldier in the army of Frederick the Great of Prussia, from which he soon deserted to the Austrians. His bravery having attracted the notice of his superiors, he was offered a commission, but this he refused to accept, as it would have obliged him to become a Catholic; and having induced his friends to purchase his discharge, he returned to Copenhagen in 1760, after having taken part in the great campaigns of 1759—1760. He now began the study of theology, but a disappointment in love drove him to abandon it, and give his attention solely to poetry. The first production of E. which attracted general notice was the funeral ode which he wrote on the death of Frederick V. of Denmark in 1767, and which exhibited so much original genius, that it at once raised the young poet to the rank of one of the best writers of his country. This successful attempt was rapidly followed by the appearance of

numerous tragedies, operas, and songs, which are remarkable for great lyrical beauty.

In 1770, appeared the prose tragedy of *Rolf Krage*, which give evidence of a careful study of Shakspeare and the English dramatists of the Elizabethan age. Although *Balders Doed* (1773), which breathes the heroic spirit of the ancient bards of the north, and exhibits the specially national tendency of E.'s genius, is regarded by some critics as his *chef-d'œuvre*, *Fiskeerne*, 'The Fishermen' (1780), probably deserves to rank equally high, when considered as a mere lyrical production. His habits of dissipation and the decided opinions which he expressed in reference to politics, brought him into difficulties of every kind, while his infirmities of temper, and irregularities of conduct, estranged the affection of his nearest relatives, and in the latter years of his unhappy life he was often indebted to the charity of strangers for the means of subsistence. Some of his nautical songs have been raised to the dignity of national odes, and many of his occasional pieces rank among the sweetest poems of his country. He was engaged at the time of his death in compiling an autobiography, and in bringing out the complete edition of his writings, which finally appeared in 1792. His works have also been edited by F. L. Liebenberg (Copen. 1850—1855); and a life of E., compiled from hitherto unpublished materials, has recently appeared from the pen of F. C. Olsen, of Copenhagen.

EXAMINATION OF A BANKRUPT. See BANKRUPTCY.

EXAMINATION OF A PRISONER in Scotland. See DECLARATION.

EXAMINATION OF A WITNESS. See EVIDENCE.

EXAMINATIONS FOR THE PUBLIC SERVICE. Up to the year 1855, all the junior appointments in the several branches of the Civil Service were made upon a system which was practically one of simple and unchecked nomination. Examinations nominally existed in a few of the departments, but they had degenerated into an unmeaning form. As a result, inefficient or objectionable persons were not unfrequently admitted to the service; and about 1853, much doubt existing as to the efficiency of the public offices, the Treasury appointed a commission to report upon the best method of making first appointments to them. The commission advised the adoption for this purpose of the competitive examinations, and in 1855 a move was made in the direction pointed out in their report. In May of that year, an Order in Council appointed civil service commissioners, whose duty it was to be to examine into and certify the qualifications of persons nominated to junior situations in the civil service. Before granting their certificate the commissioners were to ascertain that, in respect of age, health, character, knowledge, and ability, the person proposed to be appointed satisfied the conditions prescribed for the department to which he had been nominated—such conditions being previously fixed for each department, with the assistance of the commissioners, according to the discretion of its chiefs. The power given to the commissioners by the order in council was therefore only that of rejecting persons nominated for appointments when found to be unqualified, according to standards laid down for the commissioners. But a limited system of competition was for some departments at once introduced—several persons being nominated to compete for a vacant place, and the commissioners by examination selecting the best qualified.

The rule applicable to junior appointments in the civil service remained as stated above till 1870. Up to that time, by far the greater number of appointments were made after a qualifying or test examination of persons nominated. In the smaller class of cases in which limited competition was admitted, the qualifying or test examination which preceded the competition usually proved fatal to a large proportion of the nominees; and the number of competitors for each place was too small to give the system of competition a real trial. Competition, however, had from 1855 been employed for the selection of members of the civil service of India. It has been introduced in the case of first appointments to both the Indian and the imperial medical services, to the scientific branches of the army, and to the Public Works Department of India. It was inevitable that it should either be carried further or abandoned altogether, and public opinion was in favor of carrying it further. A committee of the House of Commons made a report in favor of competition in 1859; and subsequently a resolution to the same effect was carried in the House of Commons. Session after session, the general adoption of competition was urged upon the government by men of influence and position in parliament. Accordingly, in June 1870, Mr. Lowe being then Chancellor of the Exchequer, an order in council was issued which made success in an open competition the chief portal to the home civil service.

The new order made certificates of qualification necessary for all such persons as might 'be proposed to be appointed, either permanently or temporarily, to any situation or employment in any department of the civil service,' excepting only such as

might be formally excepted in a manner hereafter described. Rules as to the age, health, character, and knowledge and capacity of persons appointed were still to be settled for each department; but under this order they were to be settled by the civil service commissioners and the chief authorities of each department acting together on equal terms, subject to the approval of the Treasury. All appointments to situations included in a schedule appended to the order were to be made by means of competitive examinations, and this schedule embraced nearly all the principal public departments. A second schedule contained a list of appointments to which the order was not to extend; and provision was made for adding situations to, and for withdrawing them from, either of the schedules. It was also provided that examination must be dispensed with where the qualifications requisite for a situation were professional or otherwise peculiar, and not ordinarily to be acquired in the civil service, or where the chief of the department to which it belonged, and the Treasury, agreed in thinking it for the public interest that examination should be omitted; the commissioners in such cases to grant their certificates upon other evidence of fitness, and upon evidence of qualification in respect of age, health, and character. The second schedule excepted from the operation of the order—that is, placed entirely above the control of the commissioners—all situations to which the holder is appointed directly by the crown; all situations included in any order made by the Treasury under section 4 of the Superannuation Act of 1859 (which provides for the superannuation of persons introduced under exceptional circumstances into the civil service); and all situations which are filled in the customary course of promotion by persons previously serving in the same department.

Additions have since been made to it of situations to which, on account of the temporary nature of the employment, or of the qualifications required, examination was not deemed to be applicable. Some additions have also been made to the former schedule. Under the teaching of experience, too, many situations of the humbler sort have been withdrawn from it—e. g., those of boatmen and watermen in the customs, of office-keepers, messengers, porters, in all public offices, of warders and matrons in prisons, of excise preventative men in the inland revenue; and for these a test examination only is now employed.

The examinations established by the commissioners, in pursuance of the order in council of 1870, were adapted to the then existing organization of the public offices; and first appointments to clerkships and similar situations in public offices were divided into two classes—the one intended to be filled by persons of high acquirements, who were to perform the more important parts of official duty, the other to be filled by persons of less extended attainments, whose duties were intended to be more or less mechanical. Candidates for the former class of appointments were to be between 18 and 24 years of age, and had to pass a preliminary test examination in handwriting, orthography, arithmetic, and English composition. The subjects of the competitive examination for this class were English composition, including *précis* writing, English history, English language and literature; language, literature, and history of Greece, Rome, France, Germany, and Italy; natural science, moral science, jurisprudence, and political economy. The competitors might take up all or any of those subjects, but got marks only in subjects of which they showed a competent knowledge; and those who stood highest, up to the number of places to be filled, were the successful candidates. Mathematics and the classics counted heavily in the examination. For the inferior grade of appointments, candidates were to be between 16 and 20 years of age, and had to pass a preliminary examination in handwriting, orthography, and arithmetic. The subjects of the competitive examination were handwriting, orthography, arithmetic, copying manuscript, indexing or docketing, digesting returns into summaries, English composition, geography, English history, and book-keeping. In both classes, the successful candidates were, in order of merit, allowed to choose to which of the situations assigned for competition they should be appointed, provided that they were found qualified under the special regulations applicable to the offices which they respectively selected. For a humbler but very numerous class of appointments in the public service, consisting of second-class (out-door) assistantships of excise and the out-door service of the customs, a third variety of examination was instituted, the subjects being handwriting, spelling, arithmetic, and English composition. Candidates in this case were to be between 19 and 22 years of age; and examinations took place simultaneously in all the chief towns in the United Kingdom.

The examinations for admission to the two grades of clerkships take place in London, Edinburgh, and Dublin only. Besides the examinations above described, special modes of testing comparative fitness were adopted in the case of a few appointments demanding peculiar, e. g., technical qualifications.

An Order in Council of 12th February 1876, introduced important changes as regards the lower division of civil service clerks.

The subjects of examination for this class remaining what they had been, the minimum age of candidates was raised from 16 to 17 years (provision being made, however, for the appointment—by competition in a more limited number of subjects—of boy-clerks between 15 and 17 years of age). Successful candidates were deprived of the right to choose out of the places vacant the office to which they should be appointed, and were made liable to serve in any office to which, not merely at first, but from time to time, the civil service commissioners should appoint them. Under this order, moreover, the number of persons selected at each examination is to exceed the number of places at the time vacant by 10 per cent. And while appointments are to be given, as a rule, in the order of a list made out according to merit, as shown in the examinations, that order may be departed from, if the needs of particular offices seem so to require; and provision is made, that if a candidate remains unplaced at 25 years of age, his name shall be struck off the list. The order has raised the period of probation after appointment from six months to a year; but the civil service commissioners may give a trial in another office to a candidate rejected after probation. The order further prescribed, having in view that the lower division should be strictly confined to duties more or less mechanical, that the salaries of the clerks should rise from a minimum of £80, by a triennial increment of £15, to a maximum of £200 a year—extra pay not to exceed £100, being, however, provided for cases of special merit; and that promotion from the lower to the higher division should take place only exceptionally, on the special recommendation of the head of a department, with the assent of the Treasury, and on a special certificate granted by the civil service commissioners. Substantially, this order carried out the recommendations of a Treasury commission presided over by Mr. Lyon Playfair. These recommendations on appointing to clerkships of the higher division have not yet been adopted save in one or two smaller matters. They involved even a more considerable departure from the principle of the system introduced in 1870 than has been made in the case of the lower division. The commission advised that there should be a preliminary test examination open to persons above 17 years of age, and a subsequent examination (also a test rather than a competitive examination) open to persons between 18 and 23 years of age, in a certain number of subjects selected by each candidate from a list of subjects prepared by the civil service commissioners in consultation with the heads of departments.

All candidates who showed a certain proficiency in the subjects chosen by them would be put on a list made out in alphabetical order, and be eligible for, though having no right to, appointment to the higher division. Appointments would be made from the list of persons eligible by the heads of departments—the candidates getting the right to refuse places offered to them, without forfeiting their eligibility. This scheme, as the commission allowed, would involve a partial return to patronage. The proposal accompanying those recommendations has been acted on, namely, that every member of the higher division should be allowed to rise (from a minimum of £100) to a maximum of £400 a year, and that extra pay, not to exceed £200 a year, should be awarded in case of special merit.

The abolition of the system of purchase in the army has been followed by a great extension of the use of competitive examinations. First appointments to the cavalry and infantry are now given on the results of examinations open to all youths between 17 and 20 who can pass a preliminary examination in elementary mathematics, translation from some modern language, writing English from dictation, geometrical drawing, and geography. The subjects of the competitive examination in this case are so arranged as to give great weight to classics and mathematics, while not excluding such branches of knowledge as English history and literature, the French and German languages, and some of the natural sciences, and offering a special premium for proficiency in drawing. The examinations are held three times a year, and are under the direction of the civil service commissioners. Admission to the Royal Military Academy at Woolwich, the portal to commissions in the Engineers and Artillery, is also obtained by competition in examinations superintended by the commissioners. First appointments to the supply and transport sub-department of the commissariat and ordnance store department of the army are similarly filled up. The civil service commissioners have also under their charge the examinations for the civil service of India (q. v.); for the selection of persons to be trained for service in the Indian Forest Department; and for admission to the Indian Civil Engineering College, in all of which the system of open competition prevails.

EXANTHEMATA (from a Greek verb, to effloresce, or come out in a rash), a class of febrile diseases (see **FEVER**) attended by distinctive eruptions on the skin, appearing at a definite period, and running a recognizable course. To this class belong small-pox, chicken-pox, measles, scarlet fever, and, according to some authorities, plague, typhus, erysipelas, &c.

EXARCH was the title first conferred by Justinian on his commander-in-chief and viceroy in Italy. The conquest of Italy by the Goths in the early part of the 6th c. was a severe blow to the Byzantine pride; and Justinian determined to wipe out the disgrace, and recover the imperial territories. The execution of this project was intrusted at first to Belisarius (q. v.), and afterwards to Narses (q. v.), by whom the reconquest of Italy was effected.

The latter was the first who bore the title of exarch; and the district over which he ruled was called the *Exarchate*. The seat of the exarchs of Ravenna, the different towns and territories belonging to them being governed by subordinate rulers, styled *Duces* or Dukes. The extent of the exarchate, however, was gradually diminished, until it embraced only the country about Ravenna, the present Romagna, and the coasts of Rimini as far as Ancona. This was brought about partly by the conquests of the Longobards, partly by the dukes of Venice and Naples making themselves independent. In the year 728, even this small portion fell, for a short time, into the hands of the Longobards. In 752, Astulf, or Astolphus, king of the Longobards, put an end to the Byzantine rule at Ravenna; but in 755, he was compelled to resign the exarchate to Pepin the Less, king of the Franks, who gave it over to the Bishop of Rome, Stephanus II.—In the Christian Church, exarch was originally a title of the bishops, afterwards of a bishop who presided over several others—a primate. It was borne by the bishops of Alexandria, Antioch, Ephesus, Casarea, and Constantinople, till it was finally exchanged for the title of Patriarch. A superior over several monasteries was also called in ancient times an exarch. The same title is also borne, in the modern Greek Church, by the person who 'visits' officially, as a sort of legate of the patriarch, the clergy and churches in a province.

EXCAMBION, in Scotland, is the legal name for an exchange of lands. Heirs possessing under deeds of entail are empowered by the so-called Montgomery Act (10 Geo. III. c. 51) to exchange or examb certain portions of the entailed lands. The portions exchanged must not include the principal mansion-house or offices, or the garden, park, home-farm, or policy, or more than one-fourth in value of the estate. As to the conditions under which, and the proceedings by which, excambions of entailed lands are effected, see Bell's *Law Dictionary*.

EXCELLENCE, or **EXCELLENCY**, a title now given to ambassadors, as representing not the affairs alone, but the persons of sovereign princes, to whom it was formerly applied. The privilege of being addressed as 'Your Excellence,' and of demanding a private interview with the prince to whom he is accredited, are the chief distinctions between the privileges of an ambassador and an envoy or minister plenipotentiary. See **AMBASSADOR**, **EMBASSY**.

EXCHANGE, a term applied to buildings or places of resort for merchants. The name Bourse (Purse) is applied in France and Belgium to a resort of this kind; and in Berlin, Hamburg, and other German cities, there is the equivalent word *Börse*. Exchanges have usually comprehended an open quadrangle, surrounded by an arcade, free to all persons; but in some cases large reading-rooms now constitute resorts of this kind, and these are open only to a body of subscribers, and visitors whom they introduce. Of this description are the Exchanges of Manchester and Glasgow.

Exchanges originated in the commercial cities of Italy, Germany, and the Netherlands, from which last-named country they were copied by England. The merit of introducing them is due to Sir Thomas Gresham, who, having resided as British agent at Antwerp in 1550, chose the Bourse of that city as a model for the Royal Exchange of London. Their institution in England is therefore coincident with the rise of commercial prosperity at the middle of the 16th century. The first stone of Gresham's Bourse, for so it was originally called, was laid June 6, 1566, a site being found for it by removing eighty houses in Cornhill, and it was finished in November 1567. It consisted of a quadrangle with an arcade; above was a corridor with stalls, for the sale of wares. This corridor was called the *pawn*—believed to be a corruption of *bahn*—Ger. for path or walk. Outside were shops. On January 23, 1570–1571, the Bourse was ceremoniously opened by Queen Elizabeth immediately after dining at the house of Sir Thomas Gresham in Bishopsgate Street. Having viewed the whole Bourse, the queen, by herald and trumpet, caused it to be proclaimed 'The Royal Exchange.' This first Exchange of London was almost entirely destroyed by the great fire of 1666. A new Exchange was forthwith erected on the spot, and opened September 28, 1669. This second Royal Exchange had the same fate; it was destroyed by fire, January 10, 1838. The foundation-stone of the third Exchange was laid by Prince Albert, January 17, 1842. Completed in three years, at a cost of £150,000, from the designs of W. Tite, it was opened January 1, 1845, by Her Majesty Queen Victoria.

The term Exchange seems to have been naturally adopted from the circumstance that buying and exchanging of merchandise, and also exchanging and paying away of money, formed the chief object of concourse. In the present day, early intelligence in matters affecting commerce and public finance forms a principal attraction of this kind of resort. Although open daily, there are usually certain days and hours of meeting when the throng is considerable. The meeting is familiarly called 'Change.' The two great days of meeting at the Royal Exchange, London, are Tuesdays and Fridays, and the busiest time is from 3 to 4 o'clock. At this time are seen the greatest people on Change; some of whom, such as the Rothschilds, occupy a well-known spot.

In London, there are several other Exchanges, but for special purposes; among these are the Corn Exchange in Mark Lane, the Coal Exchange in Lower Thames Street, the Hop and Malt Exchange in Southwark, the Hide and Skin Exchange or Market in Bermondsey, and the Stock Exchange, near the Bank of England. Exeter Change, which was a sort of bazaar, with a menagerie of wild beasts, stood in the Strand, upon or near the site of the house of the Earl of Exeter; the building, as an interruption to the thoroughfare, was removed in 1829. Numerous additions have recently been made to the list of exchanges in the large towns of England and Scotland; and among smaller towns, the Plait Hall at Linton, opened in 1869, may be regarded as an exchange for the straw-plait bonnet and hat trade. Corn exchanges are now numerous. In foreign countries, the Bourse at Paris, and the Merchants' Exchange at New York, are noteworthy for architectural elegance.

EXCHANGE, in Political Economy, is sometimes applied to the conversion of the money of one country into its equivalent in the money of another—as by stating the relation which French francs or German marks bear to British pounds. The technical meaning of the word has now, however, come to be the difference between the actual value of money, taken by the standard of bullion, in any two places with relation to each other. If, in London, it costs more than £100 to pay £100 in St. Petersburg, the rate of exchange is against the former town, and in favor of the latter; an inhabitant of which will be able to pay a debt of £100 in London with less than £100 worth of bullion in St. Petersburg. The process will be best explained by analyzing it through means of simple examples. If Thomson & Co. of London buy £100 worth of wine from De la Rue of Paris, and De la Rue, on the other hand, buy £100 worth of cotton goods from Thomson & Co. of London, the two debts, *vere there no others between the merchants of the same towns*, would extinguish each other, and there would be no necessity either for transmitting money or drawing bills of exchange. Suppose, however, that it is not De la Rue, but his neighbor Bonchamp who has bought the £100 worth of cotton goods from Thomson & Co., then the debts of all will be settled by Bonchamp paying £100 to De la Rue on Thomson & Co.'s account. Suppose, next, the case of De la Rue being due nothing to Thomson & Co., and Bonchamp being due them only £50, a like sum has to be otherwise found. Van Pradt of Amsterdam is due precisely this sum to Thomson & Co., while either De la Rue or Bonchamp is due the same amount to Van Pradt for a purchase of Gouda cheeses; then it is clear that the several debts can be adjusted among them without the transmission of bullion. It will cost some trouble to adjust the payments, however, and this trouble will have to be paid for. As in paying Thomson & Co. their debt of £100, De la Rue will have to pay for this trouble, the rate of exchange will be against him. If the debt, or any part of it, cannot be met by such an adjustment out of cross debts and credits, it will be necessary for the debtor to send bullion to his creditor; and this being an expensive process, it throws the rate of exchange against the debtor who so pays. For instance, if the sum due by the Frenchmen to Van Pradt was only £25 instead of £50, then De la Rue would have had to be at the expense of sending £25 to London in bullion. No such actual transactions take place in the existing mercantile world, because the accounts in debtor and creditor connected with the three towns above referred to are to be counted in thousands, and runify into other towns; but the above examples may be held to represent the groups of debtors and creditors, as algebraic signs represent quantities.

The individual merchants in one trading town have no idea how the surplus of debit or credit may lie between them, far less can they tell how it may be adjusted by debits and credits in other towns; but through the agency of bankers, bill-discounters, and other persons who deal in money, the relations of all trading-places towards each other are in a constant state of shifting and adjustment; and any one who has to pay a debt in any trading-place can find out how much he has to give to get that debt paid, and can pay it accordingly. When, through the operation of these complicated transactions, you require to give more than £100 in London to get that amount paid in Paris, then the rate of exchange is against London, and is in favor of Paris, where less than £100 in cash will pay a debt of £100 in London. The dif-

ference will generally depend on the difficulty of adjusting questions of debt and credit throughout the field of European commerce, in such a manner as to get the debt paid. If it cannot be paid by adjustment, then bullion must be sent; and thus it is generally said, that the rate of exchange against any place is limited by the charge of transmitting bullion to it. The rate of exchange is liable to be brought to a level also by commercial exportation and importation, since, whenever it is expensive to get money sent to a country, there is a temptation to send goods to that country, to compensate the debt. In the general circle of transactions of this kind, the state or town which has the largest amount of transactions will have the largest number of debtors and of creditors, and will thus afford the chief facility for each compensating the other. It is thus that London is the center of the money-market, where all the debts and credits in the world may be said to meet and extinguish each other. While the old notions about the Balance of Trade (q. v.) existed, it was supposed that the nation which the exchange was against was going to ruin; while that which it was in favor of was prospering through the other's loss. At present, it is inconvenient and expensive to a country to have the exchange against it. An adverse exchange generally indicates a sort of break in the circle of trade, which it would be advantageous to fill up, and *may* be caused by the commerce of a country decreasing; on the other hand, however, the imports for which a country pays in cash or in expensive bills, may be the same as a highly advantageous traffic. Gold-producing countries find bullion their most advantageous export, and the same is the case with countries into which gold has flowed in excess.

EXCHANGE, DEED OF, in English law, a common law assurance, whereby persons severally seized of lands, mutually grant them in exchange, each his own land for that of the other. In order to a valid exchange, five things are necessary: 1. The two subjects must be of the same nature, as lands for lands, chattels for chattels, but not real for personal estate. 2. The parties must take an equal estate; thus, an estate in fee cannot be exchanged for an estate tail. 3. The word 'exchange' must be used. 4. There must be entry, and if either party die before entry, his heir may avoid the exchange. 5. Since the statute of Frauds (29 Car. II. c. 3) if the interest be larger than a term for three years, the exchange must be in writing.

A mutual warranty and right of entry was formerly implied in an exchange. This effect of the deed has been taken away by 8 and 9 Vict. c. 106, s. 4. By the 8 and 9 Vict. c. 118, s. 92, called the Common Enclosure Act, the commissioners are empowered to make exchanges for the better carrying out of the purposes of the act. A deed of exchange closely resembles in its particulars an Excambion (q. v.) in Scotland.

EXCHANGES, MILITARY, are certain arrangements made between officers of the English army. An officer may exchange, or change places, in the Guards, or Line, with another of equal rank in any regiment of the above corps, by mutual consent, and subject to the approval of the Minister of War, and on payment of a sum agreed upon between the officers. On the abolition of the system of purchasing commissions in 1871, the sum paid in effecting an exchange was limited to the actual cost thrown upon the officer exchanging. In view, however, of the general wish of the army, a bill was introduced into parliament in 1874 (but was withdrawn as regards that session), to render again legal the payment of money as a bonus for exchanges. In the following year (1875) the bill, having been again brought forward, was passed. As each of the exchanging officers enters his new corps at the bottom of his rank, exchange benefits officers who stick to their regiment, by advancing them towards the top of the list, and therefore nearer to promotion. An officer on full-pay may exchange with another on half-pay, provided a younger life be not thereby added to the half-pay list, and subject always to the consent of the Secretary for War. Exchanges are ordinarily arranged by the army agents.

EXCHEQUER, CHANCELLOR OF THE. The office of Chancellor of the Exchequer, in modern times, will be accurately described when we say that he is the first finance minister of the Crown. Strictly speaking, he is the under-treasurer, the office of Lord High Treasurer being now vested in the Lords Commissioners of the Treasury. When the Prime Minister is a member of the House of Commons, he sometimes holds the office of Chancellor of the Exchequer. The judicial functions of the Chancellor of the Exchequer may now be considered matter of history. See EXCHEQUER, COURT OF. When the chief baron and the barons are equally divided in opinion, he may be required to rehear the cause with the barons, and to give his opinion. But the last instance in which this was done was in 1735; and though the decision which Sir Robert Walpole gave is said to have given great satisfaction, the custom is not likely to be reverted to.

EXCHEQUER, COURT OF, now merged in the High Court of Justice in England, was the court wherein all matters relating to the royal revenues were adjudicated upon. It is said (Madox,

Hist. of Ex. i. 177) that as early as the reign of William the Conqueror a Court of Exchequer was in existence. This was probably nothing more than a branch of the *Aula Regia*, or great council of the nation; but on the sub-division of that court in the reign of Edward I., the Court of Exchequer acquired a separate and independent position. The special duty then assigned to the court was to order the revenues of the crown, and to recover the king's debts and duties. The court was then denominated the *Scaccarium*, a word derived, it is said, from *scacus* or *scacum*, a chess-board; and it was so called because a checkered cloth was anciently wont to be laid upon the table of the court (Madox, *Hist. of Ex.*), a practice which, until the late act, prevailed in the Court of Exchequer in Scotland. The court formerly consisted of two divisions, an equity, and a common law or plea side. Lord Coke (*Inst.* iv. 118) appears to doubt whether the equitable jurisdiction of the court can be traced back further than the statute 33 Henry VIII. c. 39. This equitable jurisdiction of the Exchequer was abolished by 5 Vict. c. 5, and transferred to the Court of Chancery. On the first institution of the court, the business was chiefly confined to matters connected with the royal revenue, but a privilege was conceded to all the king's debtors and farmers, and all accountants of the Exchequer, to sue and implead all manner of persons. This privilege was exercised by means of a writ of *quo minus* (now abolished by 2 Will. IV. c. 39), wherein it was set forth that the plaintiff being a debtor of the king, was, by reason of the wrong done to him by the defendant, deprived of the means of discharging his debt to the crown (*quo minus sufficiens existit*). The benefit of this writ was by degrees extended to all the lieges, on the fiction that they were crown debtors. By this means the Court of Exchequer acquired a concurrent jurisdiction with the other courts of common law. The judges of the Exchequer consisted originally of the lord treasurer, the chancellor of the Exchequer, and three puisné judges; these last were called barons of the Exchequer. The title of baron is said by Mr. Selden (*Tit of Hon.* 2, 5, 16) to have been given to the judges in the Exchequer because they were anciently made of such as were barons of the kingdom. The chancellor of the Exchequer sat only on the equity side of the court. The last occasion on which he was called upon to exercise his judicial functions was in 1735, when Sir Robert Walpole was chancellor of the Exchequer. From 1873 till 1881 the court constituted a division of the High Court of Justice, having a chief baron and four barons of Exchequer. But by the Supreme Court of Judicature Act (1881) the power formerly exercised by the Chief Baron of Exchequer, is henceforth exercised by the Lord Chief-Justice of England.

The Court of *Exchequer Chamber* was formerly a court of all the judges in England assembled for decision of matters of law (Coke, *Inst.* iv. 110, 119). Lord Campbell states that the Lord Chancellor was in the habit of adjourning cases of extraordinary importance into the Exchequer, that he might have the opinion of the twelve judges (*Lives of the Chancellors*, i. 10). But the ordinary jurisdiction of the Court of Exchequer Chamber was as a court of error, in which capacity it revised the judgments of the three courts of common law. This court was established by 31 Edw. I. c. 12, for the purpose of reviewing the decisions of the common-law side of the Court of Exchequer, and was composed of the judges of the other two courts—viz., the Queen's Bench and the Common Pleas. By 27 Eliz. c. 8, it was enacted that the judges of the Common Pleas and Exchequer should form a second Court of Exchequer Chamber, for review of certain cases in the Queen's Bench. But this intermediate Court of Appeal was abolished by the Judicature Act of 1873, as inconveniently composed, and somewhat unnecessary. An appeal now lies from each division of the High Court of Justice in England, direct to the Court of Appeal, which succeeded to the jurisdiction formerly vested in the House of Lords, as the Supreme Court of Appeal, and consists of the Lord Chancellor, and the chiefs of the divisions, and the judges of the Privy Council.

In Scotland, before the Union, the Exchequer was the king's revenue court. It consisted of the treasurer, the treasurer-depute, and as many of the lords of Exchequer as the king was pleased to appoint (Ersk. i. 3, 30). The Scottish Court of Exchequer was continued by the 16th article of the treaty of Union, until a new court should be established, which was effected by 6 Anne, c. 26. A privative jurisdiction was conferred on the court as to questions relating to revenues and customs of excise, and as to all honors and estate real and personal, and forfeitures and penalties arising to the crown within Scotland. But questions of title to lands, honors, &c., were reserved to the Court of Session. The judges of the court were the high treasurer of Great Britain, the chief baron, and four other barons; and English barristers as well as Scotch advocates were allowed to practise in the court. In cases of difficulty, and where there was a collision of jurisdictions, it was formerly not unusual to hold conferences with the barons; and the form of desiring the conference was to send the Lord Advocate, and, in his absence, the Solicitor-general, to request a

meeting, though it has been doubted whether they were bound to carry the message (Shand's *Practice*, 27). By 2 Will. IV. c. 54, it was provided that successors should not be appointed to such of the barons as should retire or die, and that the duties of the court should be discharged by a judge of the Court of Session. And now, by 19 and 20 Vict. c. 56, the Court of Exchequer is abolished, and the jurisdiction transferred entirely to the Court of Session.

The Court of *Exchequer Chamber* in Ireland was established by 40 Geo. III. c. 39, but was abolished as an intermediate Court of Appeal between the Irish Courts and the High Court in England.

EXCHEQUER BILLS, bills issued at the Exchequer under the authority of acts of parliament, as security for money advanced to the government. They contain an engagement on the part of the government for the payment of the principal sums advanced with interest. These bills form the chief part of the unfunded debt of the country. They were first issued in the reign of William III., in the year 1696, and were drawn for various amounts from £100 to £5. At that time they bore interest at the rate of threepence per day on a hundred pounds (Macaulay, *History of England*, iv. 700). The interest was reduced to 2d. during the reign of Anne. During the war 1793—1814, the rate of interest was usually 3½d. At present, it is generally from 1½d. to 2½d. per £100 per diem. Holders of these bills are exempt from all risk, except that arising from the amount of premium or discount they may have given for them. The bills pass from hand to hand as money, and are payable at the Treasury at par. They may also be paid to government in discharge for taxes. When it is intended to pay off outstanding Exchequer bills, public notice is given by advertisement. The advances of money to the government by the Bank of England are made on Exchequer bills. These bills are a convenient means whereby the government can meet a sudden demand for unusual expenditure. The amount of Exchequer bills in 1880—81 was £5,162,800. Another portion of the unfunded debt is constituted by Exchequer Bonds, with fixed rates of interest for definite periods. In 1881 their value was £11,483,700. Between 1874 and 1881 the total unfunded debt including Treasury Bills, Exchequer Bills, and Exchequer Bonds, rose from £4,479,600 to £22,077,500.

EXCIPIENT (Lat. *excipio*, I receive), an inert or slightly active substance, introduced into a medical prescription as a *vehicle*, or medium of administration for the strictly medicinal ingredients. Thus, conserve of red roses, or bread-crumbs, is used to make up pills; sulphate of potash, or white sugar, in medicinal powders; water, mucilage, white of egg, and many other substances in fluid mixtures.

EXCISE, the name of a tax on commodities, from the Latin *excisus*, cut off, as being a portion of the value of the commodity cut off and set apart for the revenue before the commodity is sold. This is not its actual nature, however, for the manufacturer who looks to a profit on his outlay does not give part of the value to the revenue; he merely counts the tax as part of his expenditure, which he intends to get back with a profit, so that it constitutes an addition to the ultimate price which the purchaser or consumer has to pay. A tax on commodities sold and bought is a very obvious one, but it has generally appeared in the simple shape of a toll on goods brought to market; and the complicated arrangements for officially watching the process of a manufacture for the purpose of seeing that none of the dues of the revenue are evaded, is of comparatively modern origin. It was first introduced into England by the Long Parliament, who established an excise on liquors in 1643.

Though always unpopular, the excise in some form or other has ever since continued to be a material element in the taxation and revenue of Britain. In the earlier part of last century, Sir Robert Walpole entertained the notion of enlarging its productiveness while mitigating its proportional pressure, by the bonding system, which suspends the exaction of the duty until the goods are sold, and thus leaves the manufacturer all his capital to be devoted to production. See **WAREHOUSING SYSTEM**. But the rumor of an enlargement of the unpopular excise duty created a general excitement, and the memorable cry of 'Liberty, Property, and no Excise,' compelled Walpole to abandon his project.

An excise, when compared with other taxes, has its good and its bad features: it is a method of extracting money for national purposes from personal expenditure on luxuries, and is especially serviceable when fed from those luxuries the use of which in excess becomes a vice. On the other hand, it renders necessary a system of inquisitorial inspection not only very offensive to all free people, but very open to abuse and fraud; while at the same time excessively high duties, and duties on commodities strictly of domestic manufacture, lead to smuggling and all its demoralizing consequences. The evils of an excise were formerly aggravated by the practice of farming the duties—that is, by letting them to the highest bidder, whose interest it became, like any

other contractor, to make the greatest possible profit by his speculation, and consequently to exact the duties in the most rigorous manner. In every well-regulated revenue system, it is of course only fair to all parties that the duty as the law lays it on should be fully exacted; but in the age of farming, the arrangements were all slovenly, and there was much latitude of power in the hands of the farmers. The farming system became very oppressive in France, especially in the *gabelle* or excise on that necessary of life, salt. It is a curious fact, however, that when the farming of the excise was abolished in Scotland by the Union, the people grumbled, saying they were easier under the farmers, their own neighbors, who acted on the principle of 'live and let live,' than under the officers sent down from England, who rigidly collected the impost.

An excise works most easily when it is laid on some commodity banished from domestic production, and created by manufacturers on a large scale. In a great distillery, the excise officer is almost a portion of the establishment, who has an eye on every step of the process, with a view of seeing that the commodity does not get into the market without government obtaining its proper share—sometimes far the greater part—of the market price. The social influence of such an arrangement is very different from that of the old candle and salt duties, which made it the function of the exciseman to pounce on a farmer's family melting the surplus tallow of the last killed sheep, or of a fisherman boiling sea-water to procure salt for his potatoes.

The manufacturer, however, though he has the benefit of the bonding system, feels the excise regulations to be a perpetual drag and hindrance in his operations, since there are multitudes of minute operations which he cannot perform without sending special notice to the excise department, or having an officer actually present. This renders it necessary, too, that all the steps of the process should not merely be defined as between the manufacturer and the officer, but should be set forth in an act of parliament; and hence deviations for the purpose of economy, or by way of experiment, become difficult, and sometimes impracticable. As difficulties with which the producer has to contend, these things require him to lay on the selling price of the commodity a larger addition, by reason of the excise, than the actual amount of the duty.

No method of taxation requires a nicer adjustment to the social condition of the country than an excise. Thus, in England, in the year 1746, a duty of 20s. a gallon was laid on spirits, with the view of suppressing the vice of drunkenness, which, on the other hand, it greatly increased, for the law became a dead letter, and the smuggler fully supplied the market, although within the two years in which the law was in force, no fewer than 12,000 persons were, according to Tindal's History, convicted of offences against the act. In Scotland, the duty, which was 5s. 6d. a gallon, had to be reduced in 1823 to 2s., on account of the prevalence of smuggling—half the consumption of the country, in fact, paying no duty. The duty has since then been gradually raised, until it now amounts to 10s. a gallon, forming a vast source of revenue. The whole excise revenue of the United Kingdom for 1880-81 amounted to £25,300,000, of which £14,400,000 were derived from spirits, £3,500,000 from beer, and £2,680,000 from malt, and there were besides the license-duties for selling liquors. The productiveness of this great source of revenue, and the expense connected with the levying of a duty on other commodities, has led to the gradual removal of many excise duties, as, for instance, on salt, candles, leather, glass, soap, paper, and race-horses. The malt-tax was transferred to beer in 1880. In 1849, the excise department was amalgamated with that of stamps and taxes to form the Board of Inland Revenue; and many changes have been made both as to the articles taxable, and on the organization of the excise system. The only articles on which excise duties are now charged are spirits, beer, chicory, and the passenger receipts of railway companies. But various taxes of the nature of license-duties for following particular pursuits are collected in the excise department; also several items chargeable before 1869 as assessed taxes. License-duties must be taken out yearly by auctioneers, appraisers, brewers, maltsters, distillers, makers of vinegar, victuallers, sellers of beer, spirits, and wine, sellers of playing-cards if also makers, hawkers, horse-dealers, house-agents, tobaccoists, pawnbrokers, dealers in sweets, and dealers in patent-medicines. Game-licenses, gun-licenses, and licenses for male-servants, horses, dogs, carriages, and the use of armorial bearings, come under the same department. According to the present organization of the excise department, the United Kingdom is divided into collections, each under a collector; the collections are sub-divided into districts, each under a supervisor; and these into divisions, each under division-officers and ride-officers. The efficiency with which these officials discharge their duties secures a very complete payment of taxes, and their manner of dealing with the tax-payers leaves a *minimum* of just ground for complaint.

EXCITANTS, or STIMULANTS, are those pharmaceutical preparations which, acting through the nervous system, tend to

increase the action of the heart and other organs. They all possess more or less of a pungent and acrid taste, and give rise to a sensation of warmth when placed on a tender part of the skin. The class is a very numerous one, and the application of excitants or stimulants to the human subject should always be under the supervision of a qualified medical practitioner.

EXCLUSION BILL, a proposed measure for excluding the Duke of York, afterwards James II., from the succession to the throne, on account of his avowed Catholicism. A bill to this effect passed the Commons in 1679, but was thrown out by the Upper House. As the new parliament summoned in 1681 seemed determined to revert to this measure, it was dissolved, and Charles ruled henceforth without control. See CHARLES II., JAMES II.

EXCOMMUNICATION is exclusion from the fellowship of the Christian Church. The ancient Romans had something analogous in the exclusion of persons from the temples and from participation of the sacrifices, which persons were also given over with awful ceremonies to the Furies. The Mosaic Law decreed excommunication in case of certain offences; and the intimate connection of things civil and ecclesiastical under the Jewish polity, rendered it terrible even as a temporal punishment. The Jews, in practice, had three degrees of excommunication. The first, *Niddui*, was an exclusion from the synagogue for thirty days, that the offender might be ashamed. The second, *Cherem*, was also for thirty days, but beside exclusion from the synagogue, carried with it a prohibition to all other Jews of any intercourse with the individual, and was often proclaimed with sound of trumpet. The third, *Shammatha* or *Anathema Maranatha* (see 1 Cor. xvi. 22), was exclusion from the synagogue and privileges of the Jewish Church for life, with loss of civil rights, and was accompanied with terrible curses, in which the offender was given over to the judgment of God. In the Christian Church, excommunication has in all ages been practised, as indeed every society must necessarily have the power of excluding unworthy members and those who refuse to comply with its rules, and the New Testament plainly recognizes and establishes this right in the church. But two different degrees of excommunication were soon distinguished—the first or lesser, a mere exclusion from the Lord's Table and from other privileges of members of the church; the second or greater, pronounced upon obstinate offenders and persons who departed from orthodox doctrine, more solemn and awful, and not so easily capable of being revoked. Penances and public professions of repentance were required; and in Africa and Spain, the absolution of *lapsed* persons (i. e., those who in time of persecution had yielded to the force of temptation, and fallen away from their Christian profession by the crime of actual sacrifice to idols) was forbidden, except at the hour of death, or in cases where martyrs interceded for them. But for a long time, no civil consequences were connected with excommunication. Afterwards, the greater excommunication was accompanied with loss of political rights, and exclusion from public offices. The power of excommunication also, which had been at first in the church as a body, gradually passed into the hands of the bishops, and more especially of the popes, who did not scruple to exercise it against entire communities at once.

The *capitularies* of Pepin the Less, in the 8th c., ordained that the greater excommunication should be followed by banishment from the country. The Roman Catholic Church pronounces the sentence of excommunication with many circumstances of terrible solemnity, and it contains a prohibition to all Christian persons of all intercourse with the person excommunicated, and of extending to him even the most ordinary social offices. The latest 'examples' made by the pope were Napoleon I. in 1809, and Victor Emmanuel, king of Italy, in 1860; neither of whom, however, was excommunicated by name, the pope having confined himself to a solemn and reiterated publication of the penalties decreed by his predecessors against those who unjustly invaded the territories of the Holy See, usurped or violated its rights, or violently impeded their free exercise. Pope Innocent III., in the Lateran Council (1215), declared that excommunication put an end to all civil rights and dignities, and to the possession of any property. The excommunication of a sovereign was regarded as freeing subjects from their allegiance, and in the year 1102, this sentence was pronounced against the Emperor Henry IV., an example which subsequent popes likewise ventured to follow. But the fearful weapons with which the popes armed themselves in this power of excommunication, were rendered much less effective through their incautions employment, the evident worldly motives by which it was sometimes governed, and the excommunications which rival popes hurled against each other during the time of the great papal schism. The Greek Church also makes use of excommunication, and every year at Constantinople, on a certain Sunday, the greater ban is pronounced against the Roman Catholic Church.—The Reformers retained only that power of excommunication which appeared to them to be inherent in the con-

stitution of the Christian society, and to be sanctioned by the Word of God; nor have any civil consequences been generally connected with it in Protestant countries. To connect such consequences with excommunication in any measure whatever, is certainly inconsistent with the principles of the Reformation. Nevertheless, in England, until the 53d of Geo. III. c. 127, and in Ireland, until the 54th, c. 68, persons excommunicated were debarred from bringing or maintaining actions, from serving as jurymen, from appearing as witnesses in any cause, and from practising as attorneys in any of the courts of the realm. All these disabilities were removed by the statutes above named; and the excommunicated were declared no longer liable to any penalty, except 'such imprisonment, not exceeding six months, as the court pronouncing or declaring such person excommunicate shall direct.'

In the Roman Catholic Church, the power of excommunicating is held to reside, not in the congregation, but in the bishop; and this is believed to be in exact accordance with the remarkable proceeding commemorated in the First Epistle of St. Paul to the Corinthians (1 Cor. v. 3-5), and with all the earliest recorded examples of its exercise. Like all the other powers of the episcopate, it is held to belong, in an especial and eminent degree, to the Roman bishop, as primate of the church; but it is by no means believed to belong to him exclusively, nor has such exclusive right ever been claimed by the bishops of Rome. On the contrary, bishops, within their sees, archbishops while exercising visitatorial jurisdiction, heads of religious orders within their own communities, all possess the power to issue excommunication, not only by the ancient law of the church, but also by the most modern discipline. As to the prohibition of intercourse with the excommunicated, a wide distinction is made between those who are called 'tolerated' and those who are 'not tolerated.' Only in the case of the latter (a case extremely rare, and confined to heresiarchs, and other signal offenders against the faith or public order of the church) is the ancient and scriptural prohibition of intercourse enforced. With the 'tolerated,' since the celebrated decree of Pope Martin V. in the Council of Constance, the faithful are permitted to maintain the ordinary intercourse. It is a mistake, likewise, to ascribe to Catholics the doctrine, 'that excommunication may be pronounced against the dead.' The contrary is expressly laid down by all the canonists (Lignori, *Theologia Moralis*, lib. vii. n. 13, 1). In the cases in which this is said to have been done, the supposed 'excommunication of the dead' was merely a declaration that the deceased individual had, *while living*, been guilty of some crime to which *excommunication is attached by the church laws*. Catholic writers, moreover, explain that the civil effects of excommunication in the medieval period—such as incapacity to exercise political rights, and even forfeiture of the allegiance of subjects—were annexed thereto by the civil law itself, or least by a common international understanding in that age. Examples are alleged in the law of Spain, as laid down in the Sixth Council of Toledo—a mixed civil and ecclesiastical congress—(638); in the law of France, as admitted by Charles le Chauve (859); in the Saxon and in the Swabian codes; and even in the English laws of Edward the Confessor; all which, and many similar laws, proceed on the great general principle of these medieval monarchies, viz., that orthodoxy and communion with the Holy See were a necessary condition of the tenure of supreme civil power; just as by the 1 Will. and Mary, s. 2, c. 2, profession of Protestantism is made the condition of succession to the throne of England. Hence, it is argued, the medieval popes, in excommunicating sovereigns, and declaring their subjects released from allegiance, did but declare what was, by the public law of the period, the *civil* effect of the exercise of what in them was a *spiritual* authority.

By the discipline of the Roman Catholic Church, kings or queens, and their children, are not included in any general sentence of excommunication, unless they be specially named.

EXCRETION. See **SECRETION**.

EXCULPATION, LETTERS OF, in the law of Scotland, are the warrants granted to the accused party, or panel as he is called, in a criminal prosecution, to enable him to cite and compel the attendance of such witnesses as he may judge necessary for his defence. These letters are issued as a matter of course, on application at the Justiciary Office, if the prosecution be in the High Court, or to the sheriff clerk in cases of Sheriff Court libels. If there be any special defence, such as *alibi*, a written statement of its nature along with the articles to be founded on, and a list of the witnesses to be called, must be lodged with the clerk of court the day before the trial.

ENE, a river of the south-west of England, rises in Exmoor, in the west of Somersetshire, and flows 19 miles south-east to the borders of Devonshire, and then 35 miles south through the east part of that county into the English Channel at Exmouth. The lower five miles form a tideway a mile broad at high water, with wooded and picturesque shores, and navigable for large vessels. The chief tributaries are the Barle, which is 24 miles long,

Batham, Loman, Culm, and Creedy. The E. passes Dulverton, Brompton, Exeter, and Topsham. It has a clear and merry current through wooded and romantic vales.

EXECUTION, in the law of Scotland, signifies the attestation by a Messenger-at-arms (q. v.), or other officer of the law, that he has given a citation, or carried through a Diligence (q. v.), in terms of the warrant of the judge. It corresponds to an affidavit of service of writ or summons in the common law courts, and of a bill or claim in Chancery. Executions must be subscribed by the messenger or other executor, and by one or two witnesses; and where the execution consists of more pages than one, each page, or at least each leaf, must be so attested. The witnesses to the fact of service, not merely to the subscription of the messenger; and the execution ought strictly to bear that they are witnesses to the premises. Till the passing of recent acts (1 and 2 Vict. c. 114, &c.; see **EVIDENCE**), two witnesses were necessary to all executions, but one is now sufficient, except in cases of pointing, where two are still required. (*Bell's Law Dictionary*, and authorities cited).

EXECUTION, CRIMINAL. See **CAPITAL PUNISHMENT**.

EXECUTION, MILITARY AND NAVAL, usually takes place by hanging or shooting, according to the rank of the offender and the nature of the offence. In some rare instances, blowing from the mouth of a gun has been resorted to. For particulars of the acts for which death is awarded, see **PUNISHMENTS, MILITARY AND NAVAL**, and **MUTINY ACT**.

EXECUTION OF CRIMINALS. See **CAPITAL PUNISHMENT**. Executions took place publicly in the United Kingdom till 1860, when it was by an act of parliament made law that all executions should take place within the precincts of a prison, in the sight of certain officials, newspaper reporters, and others invited to be present. The United States, Bavaria, and the colony of Victoria had previously adopted this method. The lack of that terror with which public executions were supposed to strike the multitude is, by this private mode of procedure, held to be more than compensated by the prevention of what was a brutalizing public spectacle. In London, executions took place for the most part at Tyburn until 1783, when a scaffold erected in the front of Newgate prison became the common place of execution. 'The gallows was built with three cross-beams for as many rows of sufferers; and between February and December 1785, ninety-six persons suffered by the "new drop," substituted for the cart. About 1786, here was the last execution followed by burning the body; when a woman was hung on a low gibbet, and life being extinct, faggots were piled around her and over her head, fire was set to the pile, and the corpse burned to ashes. On one occasion the old mode of execution was renewed: a triangular gallows was set up in the road opposite Green-Arbour Court, and the cart was drawn from under the criminal's feet.—Timbs's *Curiosities of London*. To render executions more impressive, they were in some cases ordered to take place near the scene of guilt. About forty years ago, two men were hanged at Bishopbriggs, near Glasgow, in sight of the scene of a murder they had committed. The ordinary place of execution in most towns in Great Britain and Ireland is outside the prison. At Edinburgh, executions took place chiefly in the Grassmarket, until 1784, when they were transferred to a platform at the west end of the Tolbooth, a building removed in 1817. The interval between sentence and execution is about three weeks, the nature of the crime not making any difference in this respect. In all parts of the British Empire, the convict under sentence of death is allowed to make choice of a spiritual adviser who shall attend on him; and generally, everything that humanity can suggest is done to assuage the bitterness of his fate. At one time, the bodies of murderers after execution were, in terms of their sentence, delivered to professors of anatomy for dissection; and it would appear that in some instances the mangled corpse was made a kind of public show. Such took place on the execution of Earl Ferrers, 1760. The body having been conveyed from Tyburn in his lordship's landau and six to Surgeon's Hall, was, after being disembowelled and laid open in the neck and breast, exposed to public view in a first-floor room. A print of the time depicts this odious exhibition.

The ordering of the bodies to be dissected, having led to great abuse, was abolished in 1832; since this period, the bodies of executed murderers are buried within the precincts of the prison, and the bodies of other malefactors are given to their friends. See **ANATOMY (in Law)**. It was also at one time customary to hang the bodies of certain malefactors in chains after execution—as, for example, the bodies of pirates were so hung on the banks of the Thames—but this usage, revolting to public feeling, is likewise abandoned. From the improved state of the criminal law, death-sentences are now of comparatively rare occurrence, and still more rarely are such sentences executed, for, except in cases of deliberate and aggravated murder, the extreme sentence of the law is now usually commuted by the crown into penal servitude for life. The secretary of state for the home department, however, exer-

cises his power in this respect with much care and discretion; and the element of arbitrariness, which might be supposed to spring from differences of temper in different home secretaries, is very seldom obvious.

A great change took place in the public attendance at executions before they were discontinued. Formerly, persons belonging to the higher and middle ranks were habitually present at these dismal exhibitions; many hiring windows at a considerable sum for the occasion. Literature furnishes us with various instances of persons of cultivated mind attending regularly from a morbid love of the spectacle. George Selwyn was fond of seeing executions. His friend Gilly Williams, writing to him of the condemnation of John Weskett (January 9. 1765) for robbing the house of his master, the Earl of Harrington, says: 'Harrington's porter was condemned yesterday. Cadogan and I have already bespoke places at the Brazier's. I presume we shall have your honor's company, if your stomach is not too squeamish for a single swim.'—Selwyn's *Correspondence*, vol. i. p. 323. The Earl of Carlisle, writing to Selwyn, speaks of having attended the execution of Hackman, a murderer, April 19, 1779.—*Ibid.* vol. iv. p. 35. James Boswell, the biographer of Johnson, had a passion for seeing executions, and even for accompanying criminals to the gallows. He was indulged with a seat in a mourning coach to Tyburn, along with the above-named Hackman, the ordinary of Newgate, and sheriff's officer. Visiting Johnson on the 23d of June 1784, he mentions that he has just come from the shocking sight of fifteen men hanged at Newgate. Boswell's *Johnson*, vol. viii. p. 331, Croker's edition. At public executions there were to the last considerable crowds, but they consisted chiefly of the lowest of the population. During the excesses of the French Revolution, the executions in Paris were enjoyed as a spectacle by crowds of female Jacobins. From the circumstance of these furies employing themselves with knitting needles while attending daily at the scaffold, they became familiarly known as the *Tricoteuses* (Knitters). Some further information concerning executions will be found in DROWING, GUILLOTINE, HANGING, MAIDEN, NEWGATE, PARRICIDE, PEINE FORTE ET DURE, PRESSING TO DEATH, TYBURN, AND WHEEL (BREAKING ON THE).

EXECUTION OF DEED, the performance of the ceremonies required by law in order to make a deed binding and effectual. These ceremonies in England consist in signing, sealing, and delivering. According to the ancient common law of England, signature was not necessary to a deed. By 29 Car. II. c. 3 (statute of Frauds), signing was required for almost all deeds. But it is still a question which has not been positively decided whether, when a seal is used, it is necessary that the parties should sign. When a party, from any cause, is unable to write, it is usual for him to place his mark in the place of signature. But a mark is unnecessary, and signature by another, at request of the party, is enough. Sealing is the most ancient form of authentication of deeds. In England, deeds are technically known as deeds under seal. A seal is absolutely essential to the validity of an English deed, but any species of seal is sufficient, and in practice a common wafer is usually appended. Delivery is the third requisite to authenticate a deed. Delivery may be made either to the grantee or to another person for him. In the former case, the deed becomes absolute; in the latter, it is called an *Escrow*, and does not acquire its full effect till the conditions are fulfilled. Witnesses are not absolutely required to a deed in England, but in practice it is usual that one witness should attest. Before execution, a deed must be read, if required, by a party to it; and if not read, it is void as to the party requesting. Where a person is ordered in Chancery to execute a deed or other instrument, and is in prison for failure to comply with the order, the court may make an order that the instrument be executed by the officer of the court; and the execution having been so made, the instrument is equally valid as if signed by the party. The execution of wills in England is regulated by 7 Will. IV. and 1 Vict. c. 26. By this statute it is required that every will shall be signed at the foot or end by the testator in presence of two witnesses. See **WILL**.

In Scotland, sealing was formerly an essential requisite for execution; but that practice was by 1584 c. 4 dispensed with in regard to registered deeds, and has long fallen into disuse. The solemnities of execution are now regulated by the old acts 1540 c. 117, and 1681 c. 5. By the former of these acts, the signature of the maker of the deed is required, and by the latter, the presence of two witnesses is made essential. In order to a valid execution of a deed or will in Scotland, it is necessary that the maker should sign in the presence of two witnesses, or should in their presence acknowledge his signature, and that the witnesses should then sign their own names, writing after them the word 'witness.' In case the maker of the deed cannot write, the deed is signed in his presence by two notaries, in presence of four witnesses. But in case of a will, one notary and two witnesses are sufficient. A deed thus witnessed is received as conclusive proof of the facts against the maker. Subscription by initials has been permitted in Scot-

land. But this mode of execution is irregular, and where it has been adopted, proof has been required that *de facto* the signature was so made. There is one exception to the rule that witnesses must attest the signature—viz., that of a deed or other instrument the whole or the essential parts of which are holograph, i. e., in the testator's handwriting, being valid without witnesses. Bills and promissory-notes, receipts, and mercantile accounts do not require to be holograph or attested.

EXECUTION ON CIVIL PROCESS is the method whereby the English High Court enforces its judgment on the person or estate of those against whom judgment has been given. The common law of England allows four different writs to issue against refractory debtors—viz., a *fi. fa.* (called commonly a *fi. fa.*), a *capias ad satisfaciendum* (*ca. sa.*), *levari facias*, and *elegit*. These writs issue from the court of the Division in which the proceedings are grounded, and are addressed to the sheriff of the county. By a *fi. fa.* the goods and chattels of a debtor may be attached. This writ lies against all proprietors, peers, &c. A writ of *ca. sa.* is directed against the person of a debtor. It does not lie against privileged persons. Under this writ, the sheriff may imprison a debtor, and detain him until the debt has been satisfied. A writ so stringent in its effect is regarded by the law as the last remedy; hence, when a *ca. sa.* has been issued, no other writ can proceed against the debtor. But if a *fi. fa.* has been first issued for a part of the debt, a *ca. sa.* will still lie for the remainder. By recent statutes, a *ca. sa.* cannot be issued to imprison for debt unless fraud was involved. A *levari facias* is now seldom used. It is directed against a man's goods and the profits of his lands. The writ of *elegit* is of very ancient date. It is directed against the lands themselves. See **ELEGIT**. In the Chancery Division of Court, execution against the estate is effected by writ of *fi. fa.*, or writ of *elegit*. Execution against the person is by writ of attachment. Should this latter writ be returned *non est inventus*, the party prosecuting has it in his option to take out a writ of sequestration of the estate, with issues of course, or to obtain an order for the serjeant-at-arms. An attachment does not lie against a peer or other privileged person, but an order called a sequestration *nisi* is issued. In cases of contempt, the High Court in each division has also the power to order personal commitment. In all cases execution may issue immediately, each writ being renewable after a year, within six years; but the court or judge can stay execution to a time fixed—or subject to conditions.

Execution for debt in Scotland, or, as it is technically expressed, diligence in execution, is either real or personal: by the former, the debtor's lands may be attached; by the latter, his person and his movables. In order to entitle a creditor to use diligence against the person or estate of his debtor, the debt on which the diligence proceeds must be duly constituted by a liquid document, or by a decree, or by an action in which decree is sought. In this latter case, the law in peculiar circumstances allows diligence on the dependence, in order that a party may not be deprived of his remedy during the currency of the action, but such diligence depends for its effect upon the judgment in the cause. In the case of bonds and other instruments registered for execution (see **REGISTRATION**), the law allows summary diligence to proceed; that is to say, execution may proceed without the need of further application to the court. Diligence against heritage includes **INHIBITION**, **ADJUDICATION**, **RANKING AND SALE**, **POINDING OF THE GROUND**. Personal diligence is by **HORNING AND CAPTION**, **ARRESTMENT**, and **FORTHCOMING**. See these several heads.

EXECUTIONER, the official who inflicts capital punishment. In England, it is the province of the sheriff to perform this as well as every other ministerial duty enjoined by the criminal courts, but practically he acts by his servants or officers, and he only attends to see the law properly carried out. In royal burghs in Scotland, this duty is imposed on the civic magistracy, one of whom attends for the purpose. In times happily bygone, so numerous were the public executions, that almost every county and town had its executioner, as an acknowledged officer of justice, with a salary for his subsistence. Yet, we learn that on certain occasions, so odious and so onerous was the duty to be performed, that a special executioner was employed. Such was the case at the execution of Charles I. The task of putting this unfortunate monarch to death is well known to have been performed by two men, who, from a dread probably of the vengeance of the Royalists, had concealed their faces under visors. In consequence of the mystery thus assumed, public curiosity was much excited, and several persons fell under the suspicion of having been concerned in the bloody deed; rumor even went so far as to decide who was the wielder of the axe, and who held up the head. It cannot be said, however, that any certainty was ever arrived at on the subject. See *Chambers's Edinburgh Journal*, first series, vol. iv. p. 317.

Like many other offices, that of executioner seems to have been at one time hereditary in England. Shakspeare, in *Coriolanus* (act ii. scene 1), makes Menenius, one of the characters in the

play, speak of 'hereditary hangmen.' In several German states, the office of Headsman (q. v.) is said to have been also hereditary; certain families being thus, as it were, condemned to perpetual infamy. The last headsman of the Tower of London died in 1861. The office was latterly a mere sinecure, and has not been filled up. In some parts of England, the office was annexed to other posts; for instance, the porter of the city of Canterbury was executioner for the county of Kent, in the time of Henry II. and Henry III., for which he had an allowance of 20s. per annum from the sheriff, who was reimbursed by the Exchequer. The sum of thirteence-halfpenny was long popularly spoken of as 'hangman's wages;' such sum, equal to a merk Scots, being the fee at one time paid to the executioner when he officiated. In the 17th c., this sum, small as it now appears, was considerably above the wages of a skilled mechanic.

From Gregory Brandon, the London executioner in the reign of James I., the name Gregory was employed as a familiar designation for executioners for a considerable period. Brandon had the address to procure a coat-armorial from the College of Heralds, and became an esquire by virtue of his office. One of his successors was named Dun, or 'Squire Dun,' as he was called. Dun is referred to in Butler's *Ghost*, published in 1682:

For you yourself to act 'Squire Dun,'
Such ignominy ne'er saw the sun.

He was succeeded about the above year by John or Jack Ketch, commemorated by Dryden (*Epilogue to the Duke of Guise*), and his name has since been synonymous with hangman.—Cunningham's *Handbook of London*, article Tyburn.

Executioners have, in some instances, come to trouble. John Price, the London executioner, was executed 31st May 1718 for murder. In the account of him, it is stated that one day, on returning from Tyburn, he was arrested for a debt, which he discharged by a small sum in his pocket, along with the proceeds of the clothes of three felons he had just executed.—*Old Bailey Chronicle*, i. p. 147. If this work can be credited, the executioner was about the same time arrested while accompanying John Meff, a criminal, to Tyburn. This arrest, which is amusingly depicted in an engraving, stayed the execution of Meff; being conducted back to Newgate, his sentence was commuted to transportation for seven years, but having returned to England before the period expired, he was taken and executed. On the 24th May 1736, the executioner, on returning from Tyburn, after executing five felons, picked the pocket of a woman of 3s. 6d. (Hone's *Every-Day Book*, ii. p. 695), but what was his punishment is not related. In 1682, Alexander Cockburn, hangman of Edinburgh, was executed for the murder of a Bedesman, or privileged mendicant. Early in the 18th c., the executioner of Edinburgh was John Dalgliesh, who acted at the execution of Wilson the smuggler in 1736, and is alluded to in the *Heart of Mid-Lothian*. It was he who also officiated at the execution of the celebrated Maggie Dickson, a woman condemned in 1738 for infanticide, but who came to life again after enduring the sentence of the law, and lived unmolested for years afterwards as a hawker of salt in the streets of Edinburgh. It is said of Dalgliesh, that, in whipping a criminal, he made a point of laying on the lash 'according to his conscience,' which showed him to have been a most considerate executioner. John High or Heich, accepted the office of Edinburgh executioner in 1784, in order to escape punishment for stealing poultry; he died in 1817. See *Traditions of Edinburgh*, by R. Chambers. The emoluments of the Edinburgh executioner at one time comprehended a recompense in kind in the markets of the city—viz., a *loek* or handful, and a *goupen* or double handful, of meal from each sack; hence he received the designation of *Lockman*. These emoluments were latterly commuted into a regular salary of 12s. per week, besides a free house, and a special fee of £1, 11s. 6d. at each execution; from the Exchequer the executioner also received a small annual allowance as Deemster (q. v.). The last of the Edinburgh executioners was John Scott, whom it was customary to confine in jail for eight days previous to an execution, in order to insure his attendance; the expenses incurred by him during one of these periods of seclusion being, as we find, £1, 2s. 6d., which sum was discharged by the city. Scott was killed by a malicious assault in 1847. Since this period, Edinburgh has had no regular hangman, but, like all other places in Great Britain, depends on the London executioner, who is hired for the occasion.

This personage, until lately, was the well known William Calcraft. For an execution at Edinburgh in 1854, Calcraft's fee and expenses amounted to £33, 14s.; his assistant received £5, 5s.; and for taking charge of both, the city criminal officers were paid £1, 1s.: total expenses for the execution, £40, independently of the cost of erecting the scaffold. In 1815, the magistrates of Glasgow entered into an arrangement by stamped indenture with Thomas Young, who engaged to act as executioner at a recompense of £1 per week, a free house, with coal and candles, a pair of shoes and stockings once a year, and a fee of a guinea at each execution. At Young's death in 1837, his successor, John Mur-

doch, was recompensed differently. He was paid £1 per month, by way of retainer, and the sum of £10 for an execution. After his death, Calcraft officiated, he in turn having been succeeded by Marwood. Besides the usual fees, executioners have from early times claimed the clothes of those who suffer, as a perquisite of office.

The most noted executioner of Paris was the late M. Sanson, who officiated at the mournful death-scene of Louis XVI., and is said to have possessed acquirements and feelings not to be expected from one of his degrading profession. He was latterly assisted by his son, M. Henri Sanson. See *Memoirs of the Sansons* (1875). The Parisian executioner is familiarly styled 'Monsieur de Paris.'

No professional executioner is employed at capital punishments in the United States. There the sentence is executed by the sheriff, with the assistance of an under-jailer; this last official performing the fatal toilet of the criminal, while the sheriff, by a movement affecting the drop, puts him to death in virtue of the sentence and the law of the state. This seems an advance on the practice in England, where, however, it could not be introduced, for the simple reason, that no one fit for the rank of sheriff or magistrate would accept of office with an obligation to perform the duty of executioner in person. The military executioner attached to an army is styled Provost-marshal (q. v.).

EXECUTIVE. See GOVERNMENT.

EXECUTOR, IN ENGLAND, the person to whom the execution of a last will and testament of personal estate is by testamentary appointment confided (Williams on *Executors*, 197). The appointing by will of an executor, without giving any legacy or appointing anything to be done by him, is sufficient to make a will. The appointment of an executor can only be by a will, the person who takes charge of the estate of an intestate being called an Administrator (q. v.). The appointment may be either express or constructive, i. e., gathered from the general terms of the will. An early duty of an executor is to take Probate (q. v.) of the will he derives his title solely from the will; the estate vests in him from the death of the testator, at which time his responsibility begins, and from which time he may enter upon all the duties of managing the estate. But his position will not be recognized as suitor in any court until he has taken probate. The whole personal estate vests in the executor, and if the testator has made no disposition of the residue, it devolves, by common law and equity, upon the executor.

The court, in some cases only, will endeavor so far to carry out the intentions of the testator as not to give the beneficial interest to the executor, where there appears from the will a necessary implication that he should not receive it. By 21 Henry VIII. c. 5, an executor is bound to prepare an inventory of the personal estate. This, if required, must be produced. An executor may raise actions in respect to the estate in his charge; and generally it may be said that his powers, duties, and liabilities are commensurate with those of the deceased. He may enter the house of the deceased to remove the personal property. The first claims to be discharged are those of the funeral and the expenses of probate. He must then pay the debts; and he is responsible for paying them in due order, so that those having a legal preference shall first be discharged. An executor is not bound to accept the office; but if he administers, he cannot then renounce the executorship without cause. On the death of an executor the office does not pass to his executor.

An executor to a will in Scotland is called a testamentary executor, to distinguish him from the next of kin, who are styled executors. The term executor is given to all who manage the estate of a deceased, whether appointed by will or by authority of the court. The former are called executors nominate; the latter, executors dative. All executors must, before entering upon their duties, obtain *Confirmation* (q. v.) from the Commissary Court. This is equivalent to probate in England. But in Scotland, no right vests in the executor until after confirmation, except a title to sue, being exactly the reverse of the English rule. An executor acting without confirmation is called a *Vitiosus Intrinmitter* (q. v.). Executors must, on entering upon their office, exhibit a full inventory of the whole movable estate of the deceased. An executor is only liable to the extent of the inventory. He is not bound to pay interest on the funds in his hands unless they bore interest before confirmation, or unless he is guilty of undue delay in administering the estate. He is not bound to pay the debts for six months after the death of the deceased. But, as in England, the expenses of the funeral and confirmation are entitled to immediate payment. Servants' wages and a year's house-rent have also a preferable claim. An executor is entitled to claim one-third of the *Dead's Part* (q. v.), after deducting debts. But should he receive a legacy, he is bound to impute that towards payment of his claim.

EXECUTORS, in Scotland, the heirs *in mobilibus* of a person deceased. They are the whole next of kin in the nearest degree

in blood; but where the heir to the heritage is one of the nearest of kin (e. g., the oldest son), he is not entitled to share in the movables without collation (q. v.). The order of succession among executors is first descendants; then collateral, or brothers and sisters, and their children; and lastly, ascendants, i. e., the father and those claiming through him. But the mother and her family, till recently, were not allowed to succeed to her own child *ab intestato*. This harsh rule was so strictly carried out, that where there were no relations by the father, the crown succeeded as *ultimus hæres*, to the exclusion of the mother.

By 18 Vict. c. 23, the law of succession to movables has been in some degree altered. On the death of an intestate leaving no issue, his father, if he survive, is entitled to take one-half of the movable estate, in preference to brothers and sisters. If the father be dead, the mother takes a third. No further provision, however, is made for the mother in case she is the only surviving relative. The result is, therefore, that the other two-thirds would still go to the crown. See SUCCESSION MOVABLES.

EXECUTORY DEVISE, in English Law, is such a limitation of a future estate or interest in lands or chattels (though in the case of chattels, it is more properly a bequest) as the law admits in the case of a will, though contrary to the rules of limitation in conveyances at common law (Blackstone, *Comm.* ii. 334). By common law, a freehold cannot be limited on a freehold, as an estate to A and his heirs; but if he die before he attain the age of 21, then to B and his heirs. Nor can an estate be given to commence at a time uncertain, as to A when he returns from Rome. But though these limitations would be void in a deed, common law will sustain them as executory devises. This form of limitation is restrained by the law against Perpetuities (q. v.), which requires that the estate must take effect within a life or lives in being and twenty-one years after. The law will not interpret a limitation as an executory devise, if it can be otherwise sustained. Whenever, therefore, a future interest in land is so devised as to fall within the rules laid down for the limitation of contingent remainders, such devise will be construed as a contingent remainder, and not as an executory devise (Cruise, *Digest*, vi. 369). An executory devise, unlike a remainder, cannot be defeated by any act of the first taker or devisee; when, therefore, an absolute power of disposition is in the first taker, the limitation over is not an executory devise. Within the period allowed for these estates, an executory devise constitutes a species of estate tail; and for this purpose, it is frequently used in America.

EXEGETIS (from Gr. *eks*, out of, and *egeomai*, I lead) properly signifies the exposition or interpretation of any writing, but is almost exclusively employed in connection with the interpretation of Sacred Scripture, to which, therefore, the subjoined remarks specially apply. The expositor or interpreter is called an *exegete*. To interpret a writing, means to ascertain thoroughly and fundamentally what are the conceptions and thoughts which the author designs to express by the words he has used. For this purpose, it is necessary, in regard to books written in a foreign language, that the exegete should know well, first, the precise signification of the words and idioms employed by the writer. This is termed *grammatico-philological* exegesis. In the next place, he must be acquainted with the things denoted by these words, and also with the history, antiquities, and modes of thought of the nation. This is termed *historico-antiquarian* exegesis. Both together constitute *grammatico-historical* exegesis.

When only an exposition of the system of thought contained in a writing is sought after, this is termed *doctrinal* or *dogmatic* exegesis; while the investigation of a secret sense, other than that literally conveyed by the words of a writing, is termed *allegorical* exegesis. But if a writing is regarded from a practical point of view, and in reference to its bearing upon life and manners, the exposition is termed *moral* exegesis. The complete and coherent exegesis of a writing forms what is called a *commentary*, but, if restricted to certain difficult words or knotty points, the elucidations are termed *scholia*. The scientific exhibition of the rules and means of exegesis is called *Hermeneutics* (q. v.). In the earliest ages of the Christian Church, the allegorical method of exegesis prevailed. By the Alexandrian school in particular, it was greatly abused. Origen, however, the greatest of this school, deserves high credit for endeavoring to secure a basis for grammatical exegesis, by a sharp separation of the literal, the moral, and the mystical sense of Scripture. Besides the Alexandrian school, the Syrian historico-exegetic school had many adherents in the East. Among these may be mentioned Cyril of Jerusalem, Ephraem Syrus, John Chrysostom, and Theodorus of Mopsuestia. First, towards the end of the 4th, and during the 5th centuries, a narrowing of the principle of the free interpretation of Scripture begins to be observable, through the rapid development of monkery and the hierarchical system; in consequence of which, the importance of the classic writers was undervalued, and the study of them ultimately abandoned in the Western Church, while a feeling of superstitious reverence, wholly unintelligent and un-

scriptural, grew up for the letter of the 'Word,' and exegesis, if employed at all, was employed simply to bolster up preconceived views. By and by, independent exegesis was supplanted by the well-known *Catenæ*, consisting of expositions of books of Scripture strung together from the writings of the older church Fathers. In the East, the first of these was got up by Procopius, 520 A.D.; in the West, by Primasius, 550 A.D. Although much was done for the exegesis of the Old Testament by eminent Jewish scholars, such as Solomon Jarchi, Aben-Esra, and David Kimchi, Christian theologians for the most part, knowing only the text of the Vulgate, stuck, during the dark ages, to the interpretations of the Fathers. First in the 12th, 13th, and 14th centuries, efforts were made by individual scholastics, especially by Abeiard, St. Bernard of Clairvaux, Thomas Aquinas, and Nicholas of Lyra, to re-introduce something like a grammatico-historical exegesis of Scripture. But it was mainly to the great revival of letters in the 15th c., and the humanistic scholars whom it produced, such as Laurentius Valla, Erasmus, &c., that an advance in exegesis was owing. The Complutensian Polyglott also exercised a great and beneficial influence. Shortly after, the Reformation gave an impulse to exegesis, so powerful, that it is felt at the present day; and, indeed, its effect is far more visible in the recent biblical criticism of Germany than it was in the days of Luther himself.

The desire for the unfettered exegesis of Scripture strongly animated the reformers, but, in fact, the long black night of ignorance—known as the dark and middle ages—has influenced them too, and disqualified them for framing at once a comprehensive exegetical science. It required a couple of centuries to recover from the effects of medieval ignorance. The more important Lutheran exegetes are: Luther, Melancthon, Brenz, Joach, Camerarius, Strigel, Chemnitz, &c.; of the Reformed or Calvinistic school may be mentioned Calvin, Zwingli, Ecclampadius, Bucer, Beza, Bullinger, Grotius, Clericus, &c.; and of the Roman Catholics, especially Paul Sarpi. During the 17th c., the exegesis of Scripture was for the most part at a stand-still, but about the middle of the 18th c. it suddenly revived. This revival is due principally to Joh. Aug. Ernesti (q. v.), and J. Sal. Semler (q. v.), who established new principles of criticism and hermeneutics, through which grammatico-historical exegesis once more began to make its appearance. The labors of Wetstein and Kennicott in regard to biblical MSS. were of immense service. Since their day, on to the present, criticism has been constantly at work on the writings of the Old and New Testament. Cognate languages have been more and more profoundly studied; the antiquities of the East, of Egypt, Assyria, Arabia, and other countries, have been investigated, and brought to bear on the subject; the manners and customs which prevail in these lands, and which, in some of them, have prevailed from time immemorial; the laws that determine the growth of civilization in nations, and enable us to enter into and comprehend the condition of mind peculiar to races in a primitive stage of development, and to appreciate their modes of thought, and to weigh the value of their literary and religious records—all these have received, and are still receiving careful attention at the hands of numerous scholars, so that it is not too much to say that we are at the present day better fitted—so far as outward helps go—to understand the real meaning of Scripture, than those who have lived at any other period subsequent to its composition. Among the eminent names in the recent development of biblical exegesis are F. A. Wolf, J. Dav. Michaelis, Eichhorn, Gesenius, Wahl, Bretschneider, Winer, Rosenmüller, Hitzig, Hirzel, Ewald, Umbreit, De Wette, Knobel, Lücke, Paulus, Meyer, Olshausen, Hengstenberg, &c. The influence of the *grammatico-critical* and *critico-historical* exegesis of modern Germany, is only beginning to make itself felt in this country. The most important contributions to the science recently made by British scholars, are those by Conybeare and Howson, Alford, Stanley, Jowett, Ellicott, &c.

EXELMANS, REMY JOSEPH ISIDORE, COMTE, a distinguished French general, was born at Bar-le-duc, 13th November 1775. He entered the army in 1791, was promoted to the rank of captain in 1799, served with distinction in the campaign of Naples under Macdonald and Championnet, and in 1801 was attached as aide-de-camp to the staff of Murat.

In 1808, while with Murat in Spain, he was arrested, and sent to England, where he remained a prisoner for three years. He was with Napoleon in the Russian campaign in 1812, for his brilliant conduct in which, the Emperor created him general of division, September 8th of the same year. E. seems to have been equally esteemed under every successive government. On the fall of Napoleon, he was for some time banished from France, but was permitted to return in 1819. In 1831 Louis Philippe restored his titles and rank. Louis Napoleon named him Grand Chancellor of the Legion of Honor, and on March 11, 1851, raised him to the dignity of *Maréchal de France*. On the 21st July 1852, E. had a bad fall from his horse, from the effects of which he expired on the following night.

EXERCISE, a very important element of medical regimen, both in the preservation of health and in the cure of disease. To preserve all the functions of the body in healthy action, it is necessary to secure their due and regular action or exercise; to allow of complete inaction of any part or function, is to initiate disease, and probably even structural change, or atrophy. Hence the development of the muscular system, of the secretions, and even of the mind and its organ, the brain, require the more or less regular use of exercise, either in the form of productive and useful work, or by means of artificially devised methods calculated to serve a like purpose in regard to the economy. Thus, scholastic education is exercise for the mind; Gymnastics (q. v.), for the body. Both these means enter largely into enlightened medical practice, though they are often too much neglected. Exercise, to be beneficial, must be attended with rest, to allow the tissues which are worn away during vital action to be restored; but rest of one part or organ is often best secured by bringing others into activity; so that, except during sleep, there is rarely a necessity for a complete and simultaneous disuse of all the faculties, or even of those most immediately under our control. The best regulated life is that which secures due and proportionate exercise at intervals for all the functions, mental as well as bodily.

EXETER (the *Carr-Isle* of the Britons, the *Isca Damnoniorum* of the Romans, *Exancester* of the Saxons), a city, episcopal see, separate county, parliamentary and municipal borough, and river-port, in the south-east of Devonshire, and the capital of that county. It lies on an acclivity on the left bank of the Exe, 10 miles north-west of its mouth, 170 miles west-south-west of London, and 73 miles south-west of Bristol. It is on the whole well built and clean, and has two main lines of street meeting near the center. There are some fine squares and terraces. The Guildhall has a singular portico, added in 1593, and projecting into the street. It was restored, with considerable regard to artistic effect, in 1864.

In 1865 an elegant new post-office was erected, as was also a lunatic asylum, just outside the city. A quadrangle of almshouses, 45 in number, was completed in 1866, along with a church attached to them; and the Albert Memorial Museum was opened in 1868. The number of British and foreign vessels (sail and steam) which entered the port in 1873 was 749 vessels, of 69,631 tons burden; cleared, 803, of 65,664 tons. The population of the parliamentary borough in 1881 was 47,098. Exeter cathedral, a cruciform structure, magnificent in its ornamentation, was erected 1112–1478. In one of its towers is the great Tom of Exeter or Peter's Bell, 12,500 lbs. weight, and a large curious antique clock. E. has a large floating ship-basin, 917 feet long, 90 to 110 feet broad, and 18 feet deep; and a ship-canal, 15 feet deep and 30 feet broad. This canal extends 5 miles, and terminates at Turf, about 2 miles from the head of the estuary of the Exe. E. has magnificent nurseries, and exports dairy, farm, and orchard produce from a neighborhood rich in such products. The town sends two members to parliament. E. was anciently the chief residence of the West Saxon kings. Exeter bishopric, fixed here in 1050 by Edward the Confessor, includes Devon and Cornwall, 23 deaneries and 588 benefices. The city was formerly surrounded with walls and strongly fortified. On a height to the north of E. are the ruins of Rougemont Castle, built by William I., on the site of one said to be as old as Cæsar's time. Many Roman and Greek coins have been found in E., besides tessellated pavements, fragments of columns, and small bronze statues.

EXETER COLLEGE, Oxford. This college was founded in 1314, by Walter de Stapledon, Bishop of Exeter, who removed from Hart Hall to the present site of Exeter College, a rector and twelve fellows. In 1404, Edmund Stafford, Bishop of Salisbury, added two fellowships, and gave the college its present name. Sir William Petre, in 1565, founded eight more; and in 1636, Charles I. annexed one more for the islands of Jersey and Guernsey. In 1770, Mrs. Sheers left certain rents for the establishment of two fellowships. All these fellowships were originally appropriated to various archdeaconries or counties, especially in the west of England. A peculiarity in this college was, that the above foundations, though generally called fellowships, were, strictly speaking, only scholarships. Important changes were introduced by the rector and fellows, under the authority of 17 and 18 Vict. c. 81, and approved of by the commissioners appointed to carry out that act. The number of fellowships was reduced to 15—all open without any restriction as to place of birth. The revenues of two fellowships were divided among the rectorship and the 15 fellowships. The remaining 8 fellowships were devoted to the foundation of 22 scholarships; ten open without restriction; ten limited to persons born, or for three years educated in the diocese of Exeter; and two limited to persons born in any of the Channel Islands. Several exhibitions also are attached to the college; and there are about 16 benefices in the gift of the Society. The number of names on the books is about 750.

EXETER or EXON DOMESDAY. See DOMESDAY BOOK.

EXETER HALL, a large proprietary building, on the north side of the Strand, London, is 131 feet long, 76 feet wide, and 45 feet high. It was completed in 1831, and can contain upwards of 3000 persons. It is let chiefly for religious assemblies, and is in great request during the 'May Meetings' of the several religious societies. It is also let as a concert-room, and has been the scene of many great musical fêtes.

EXHAUSTIONS, METHOD OF, is a mode of proving mathematical propositions regarding quantities by continually taking away parts of them. The method was frequently employed by the ancient geometers; its fundamental maxim, as stated by Euclid, being that those quantities are equal whose difference is less than any assignable quantity. Euclid employs the method in Book x. Prop. 1; and it was used by Archimedes to prove that the area of a circle is equal to that of a right-angled triangle whose one leg adjoining the right angle is the radius, and the other the circumference. In this ancient method we may see the rudimentary form of the modern transcendental analysis.

EXHIBITION, ART. See ART EXHIBITIONS.

EXHIBITION, INDUSTRIAL (Fr. *Exposition de l'Industrie*). Exhibitions of this kind originated in France, where the first took place in 1798, at the suggestion of the Marquis d'Avèze. It was held in the Maison d'Orsay and its grounds; but it appears to have been rather a collection of such objects of French art-manufacture as could be borrowed from their owners, than an assembling together of competing artists and manufacturers with their respective works. It is, nevertheless, interesting as a historical fact, having been the first of these displays of which we have any clear and authentic record; and its more important effect was to familiarize the French mind with national exhibitions.

In the same year, another exhibition was held in Paris, on a grander scale, and with considerable success. It embraced all kinds of manufactures; whereas that of the Maison d'Orsay was chiefly devoted to those of artistic merit; hence the credit has been claimed for the latter one of being the commencement of industrial exhibitions, certainly, however, without justice or truth.

In consequence of the obvious utility of the exhibitions of 1798, another was held in 1802, under the consulate of Napoleon, with equal success, and thus led to the establishment of triennial exhibitions, which were, with occasional interruptions from political causes, held until the novel idea was originated in this country, in 1850, by his Royal Highness the Prince Consort, of holding a universal exhibition open to all comers.

That was not, however, the first industrial exhibition held in the United Kingdom. The Royal Dublin Society, possibly from the French sympathies of Ireland during the Revolution, as early as 1829 adopted the plan of triennial exhibitions, which was several years before any other part of the United Kingdom; they took place in the Society's rooms in Dublin. Like the French, however, they at first comprised only specimens of native industry.

In England, the first well-organized exhibitions were those of the Cornish Polytechnic Society, in which were illustrated the mineral wealth of the county, and its mechanical appliances for mining purposes, &c. These were continued annually without intermission until 1850. Manchester, Birmingham, and Liverpool also held local exhibitions; that of the second town was by far the most important, and is fairly entitled to be considered the prototype of the 1851 exhibition; indeed, it is by no means certain that both did not arise from the same cause—the agitation in favor of a great national exhibition, commenced by His Royal Highness the Prince Consort and the Society of Arts as early as 1848. The Birmingham exhibition was held in 1849.

The Manchester exhibitions were the earliest held in the great English industrial towns, but they, like those which were held in the Mechanics' Institutes of Liverpool and Leeds, and subsequently in the Collegiate Institution of Liverpool, had a mixed character, the illustrations of art and manufactures being pretty well mingled with objects of natural history and various other curiosities, for the amusement of the visitors. That of Birmingham, however, was much more completely devoted to the true objects of industrial exhibitions; it was held in the spacious apartments of Bingley Hall, and was a great success, especially when it is borne in mind that it was carried out solely by private enterprise. The multitudinous manufactures of that wonderful place were amply illustrated, and a most careful attention was paid to the exhibition of those objects of art which were best calculated to foster the taste of designers, and others, whose duty it was to give refinement to the masses, by gradually improving those objects of necessity and ornament in everyday use. The success of the Bingley Hall Exhibition no doubt acted most beneficially upon that of 1851 which was approaching, for it gave an unmistakable impetus to the industrial pursuits of the people of Birmingham, and through them acted widely upon others.

The first metropolitan movement in favor of holding a national exhibition in this country was immediately after the French Ex-

position in 1844, the results of which were so beneficial, that several applications made to the government requesting that the matter should be officially taken up. The government, however, as usual, proved itself to be simply executive, and did nothing.

In the meantime, the Society of Arts tried the experiment of holding exhibitions annually in their own building in the Adelphi; but these, though eminently successful, were not sufficient to satisfy those with whom a national exhibition had become a fixed idea. In 1849, His Royal Highness devoted himself thoroughly to this object, and made the happy suggestion of throwing open the exhibition to all nations. The plans, too, were suggested for raising the necessary funds and other essential points, and the scheme soon took a tangible form; and it was finally determined by the government to issue a royal commission, which was gazetted January 3, 1850. From this moment the Great Exhibition was fairly launched.

In order to enable the commissioners to enter into contracts, and otherwise incur obligations, it was necessary to procure subscriptions to a guarantee fund. The subscription-list was opened by the Queen with £1000. The exhibition took place in a vast structure of iron and glass, called the Crystal Palace, in Hyde Park, London. The edifice, planned by Sir Joseph Paxton (q. v.), was opened by Her Majesty, May 1, 1851. It was 1851 feet long by 456 feet broad, and 66 feet high; the entire area covered being 13 acres. On the ground floor and galleries there were 8 miles of tables. The glass employed in the structure weighed upwards of 400 tons. The number of exhibitors exceeded 17,000. The exhibition was open 144 days, being closed October 11. The entire number of visitors was 6,170,000, averaging 43,536 per day. The largest number at one time in the building was 109,760, on October 8. The entire money drawn for tickets of admission amounted to £505,107; and after all expenses were defrayed, a balance of £150,000 was left over; so that there was no call on those who subscribed the guarantee fund. Popularly, this great exhibition was properly enough called the World's Fair, for it attracted visitors from all parts of the world. When the exhibition was over the building was cleared away.

The importance of this celebrated exhibition was so obvious, that other countries became anxious to have something of the same kind. An exhibition was held in Cork in 1852; although not of an international character, it was the first for which any special structure was erected in Ireland, and deservedly gave great satisfaction. The home manufactures of Ireland were admirably displayed in conjunction with those of other parts of the kingdom. Dublin got up an international exhibition in 1853, and by the princely munificence of Mr. Dargan, was enabled to make an admirable display, in a building of great beauty. The Dublin Society added a new feature—high art was associated with industrial art, and a gallery of pictures, the finest ever brought together in this kingdom before, was there exhibited with great success. In the same year a similar exhibition took place in a crystal palace in New York. France, in 1855, repeated the same experiment with immense success; both the industrial and the art collections were such as the world had never seen before. Though wanting the imposing magnitude of the Hyde Park building, the contents of the Palais de l'Industrie, with its detached Picture-gallery and its Annex, were of the choicest description, and reflected the highest credit on French taste and skill. Several other continental nations followed with various success. In Europe, it has now taken root, and every country looks upon an exhibition of its industrial resources and productions, from time to time, as a grand necessity which must be met. In 1861, there was an exhibition at Haarlem, in which a vast assemblage of admirably arranged specimens illustrated every industry followed by the most industrious and methodical people of Europe. In Belgium, also a small industrial exhibition was held in 1861 at Brussels, consisting chiefly, however, of articles of use, in which tasteful design was the chief consideration.

Such is a brief outline of the early history of these exhibitions, which now form a prominent feature in this era of the history of civilization. The fulness of their effects is still to be seen, but, judging of the beneficial effects they have already produced, it is not too much to say, that they appear destined to help most largely in diffusing a love of industry, and a peaceful emulation over the whole globe. Commerce may have its weak points, even its meannesses, but it cannot be denied that few of the occupations of man are more humanizing, or tend more to teach the value of peace and good-will; and if this be conceded, certainly nothing can more assist it than these great gatherings, in which each nation shows its own specialities, and gives to others the ideas which it has accumulated through its centuries of progress in industrial art. Like the social interchange of thought, this interchange of inventive genius brings out new talents; and succeeding generations will reap a rich harvest of results from our industrial exhibitions. Among the more important international exhibitions held since that at London in 1862 have been: those at Paris, in 1867, and again in 1878; that at Vienna, in 1873; the American

Centennial Exhibition of 1876 at Philadelphia; and those at Sydney and Melbourne, in 1879 and 1880 respectively. There have also been numerous national exhibitions of the products of some one country. And of late, exhibitions of the results and appliances of single industries (like the Electrical Exhibition at London in 1882, and the International Fisheries Exhibition at London in 1883) have become frequent and valuable.

Since the article on this subject first appeared in the *Encyclopædia*, several international exhibitions have been held. The most important have been those at London (1862); Paris (1867); Vienna (1873); Philadelphia (1876); Paris (1878). The English colonies of New South Wales and Victoria held exhibitions at Sydney in 1879 and Melbourne in 1880. Calcutta resolved on one in 1884. Recently, exhibitions of special industries of interest have attained international importance; as the Fisheries Exhibitions at Berlin (1880), Norwich, Edinburgh, and London (1883); and the Electrical Exhibitions at Paris, London (1882), and Vienna (1883).

The great International Exhibition in the United States of America was held in Philadelphia in 1876 in honor of the centenary anniversary of American independence. The main building was 1876 feet long, 464 feet broad; and in all 190 buildings were erected. No fewer than 8,000,000 paid for admission, and both commercially and in other respects this memorable enterprise was very successful.

The French nation gave a remarkable illustration of the elasticity of its energy and the wealth of its resources, by undertaking an International Exhibition at Paris in 1878, but a few years after national calamities unparalleled in recent history. And the enterprise met with success greater than could have been anticipated. Opened on the 1st May by the president, Marshal MacMahon, it was visited ere its close in October, by multitudes from all civilized lands. The huge building erected for the display in the Champ de Mars, was called the Palace du Trocadéro, and is designed to be permanent. The close was marked by a lottery on a very large scale, the innumerable prizes being selected chiefly from amongst the exhibits.

EXMOOR FOREST, a moory, mostly uncultivated waste, consisting of dark ranges of hills and lonely valleys, 14 square miles in area, in the west of Somersetshire and north-east of Devonshire. It is bordered by deep wooded glens. The hills rise in Dunkery Beacon to 1668 feet, in Chapman Barrow to 1540, and in Span Head to 1510. Devonian slates, with some new red sandstone in the north, form the substratum. It is covered with heath, interspersed with juniper, cranberry, and whortleberry, with much meadow-land. Throughout this tract there is a native breed of ponies, known as Exmoor ponies, reputed to be stout and hardy. Since 1851, E. has become an iron-mining district. The river Exe, and its tributary the Barle, rise in Exmoor. It is subject to winds and mists.

EXMOUTH, a town in the east of Devonshire, on the left bank of the mouth of the Exe, 10 miles south-east of Exeter. It stands at the base and on the slope and top of a hill rising from the sandy estuary of the Exe. It is noted for its mild climate. From about 1700, it was the chief watering-place on the Devon coast, till the rise of Torquay. There is a fine promenade on a sea-wall eighteen feet high. The Woodbury Hills on the east, 800 feet high, protect it from the east winds. Here Sueno the Dane landed in 1003. It was taken by the royalists in 1646. Pop. (1871) 5614; (1881) 6245.

EXMOUTH, EDWARD PELLEW, VISCOUNT, a famous naval commander, was born at Dover, April 19, 1757. He entered the navy when 13 years of age, and first attracted notice by his gallant conduct in the battle on Lake Champlain, October 11, 1776. In 1782, he attained the rank of post-captain. In 1793, having been appointed to the command of the *Nymphé*, a frigate of 36 guns, he encountered, and, after a hard-fought battle, captured *La Cleopâtre*, a French frigate, which carried the same number of guns. For this victory, he was knighted. In 1799, he received the command of the *Impétueux*, 78 guns, and was sent to the French coast, where many of his most brilliant actions took place. In 1804, Sir E. Pellew was advanced to the rank of Rear-admiral of the Red; in 1808, to that of Vice-admiral of the Blue; and in 1814, he was raised to the peerage, with the title of Baron Exmouth of Canonteign, Devonshire, with a pension of £2000 a year. In 1816, he was sent to Algiers, to enforce the terms of a treaty regarding the abolition of Christian slavery, which the Dey of Algiers had violated. With a combined fleet of 25 English and Dutch vessels, he bombarded the city for seven hours, and inflicted such immense damage, destroying all the Algerine fleet and many of the public buildings, that the Dey consented to every demand. E., who had been wounded in the leg and cheek in this action, received on his return to England the thanks of both Houses of Parliament, and was promoted to the rank of viscount, 10th December 1816. In 1821, he retired from public service, loaded with honors. He died 23d January 1833.

EXOCETUS. See FLYING-FISH.

EXODUS ('the departure'), the name given to the second book of the Pentateuch. It may be regarded as composed of two parts—the first historical, and the second legislative. The historical extends to the end of the 18th chapter. It embraces a narrative of the various preparations, natural and supernatural, made under the providence of God for the deliverance of the Israelites from their bondage in Egypt, and also describes the accomplishment of their deliverance, and the journeyings of the people in the wilderness as far as Mount Sinai. The legislative is devoted to a minute and elaborate account of the institution of the theocracy. The book presents us with three aspects of Hebrew history. We have, first, a picture of a people enslaved; second, of a people redeemed from bondage; and third, of a people sanctified and set apart to the service of God. The period embraced by the history of the book is usually reckoned at 142 or 145 years, which number is obtained as follows: From the death of Joseph to the birth of Moses, 60 or 63 years; from the birth of Moses to the departure from Egypt, 80 years; and from the departure out of Egypt to the erection of the tabernacle, 1 year. It cannot be denied, however, without wildly violating all the ordinary laws of the increase of population, that this is much too short a period to account for the existence of such a number of Hebrews as left Egypt—viz. 600,000, exclusive of women and children—i. e., in all, at least 2,500,000. Those who went down into Egypt with Jacob were 'threescore and ten souls,' and in 215 years, these, though prohibited from intermarrying with the Egyptians, had amounted to between two and three millions. The writer of Exodus, indeed, says (chapter xii., verse 40) that 'the sojourning of the children of Israel, who dwelt in Egypt, was 430 years,' adding that they left the land 'even the selfsame day' on which they had entered it. This statement, however, does not seem to harmonize with the author's previous narrative, and is certainly inconsistent with the language of the Apostle Paul, who says (Gal. iii. 17) that the law was given 430 years after the covenant with Abraham, which took place about 215 years before Jacob and his sons went down into Egypt, so that, according to this view, the Israelites could only have been in Egypt 215 years. This is the number commonly accepted; but it is not wonderful that some writers should affirm, that 'it would be more satisfactory if we could allow 430 years for the increase of the nation in Egypt rather than any shorter period.' A still longer period would undoubtedly afford additional satisfaction; and Bunsen, in his *Ägypten's Stelle in der Weltgeschichte*, endeavors to show that the Israelites were in Egypt for fourteen centuries instead of two, and that the number 215 only indicates the period of oppression, the time when they were 'evilly entreated.' This conclusion is, of course, arrived at by the application of principles of criticism not generally recognized in the schools of British theology; but there seems no avoiding the conclusion, that the usual chronology is hopelessly wrong.

May it not be that the interval which elapsed between the death of 'Joseph and all his brethren, and all that generation' (Exodus i. 6), and the period when there arose up a new king over Egypt which knew not Joseph (Exodus i. 8), was much longer than we suppose? The passage itself in Exodus seems to favor this idea; for the intervening verse (Exodus i. 7) speaks of the children of Israel 'increasing and multiplying, and waxing exceeding mighty, and filling the land,' without any reference at all to the time occupied in this process; and such words are certainly more applicable to a series of centuries than of years, while centuries, besides, would harmonize better than years with the statement that the Egyptian king knew not (i. e., had forgotten all about) Joseph. The only grave objection to this otherwise extremely probable hypothesis, is its incompatibility with the statement of St. Paul; an objection, however, which Luther would not have found insurmountable, for in an exactly similar case he said of the inspired Stephen that 'he was no historian, and did not trouble himself about particulars.'—*Zu Apostelgesch.* vii. Bd. 1, 1160.

In explanation of the chronological difficulty, the confusion resulting from the use of *letters* as numerals in Hebrew MSS. has been urged; and this is notoriously a fertile source of error and contradiction, which rationalistic critics have not sufficiently kept in mind. To adduce such a reason, however, would be unavailing in the present case; for if it could be proved that the period stated in Exodus may have been abbreviated through the negligence of some careless transcriber, or otherwise, and thus an approximation be made to the fourteen centuries of Bunsen, this would only place the writer of the Pentateuch in more visible antagonism with St. Paul himself. The date of the exodus is fixed by Usher at 1491 B.C.; by the Septuagint, at 1614 B.C.; by Hales, at 1648 B.C.; by Wilkinson, about 1495 B.C., in the reign of Thothmes III.; and by Bunsen, as late as 1320 or 1314 B.C., in the reign of Menephthah, in the latter of which years Manetho gives what appears to be the Egyptian version of the event. The genuineness and authenticity of the book of E. have

been sharply criticised in modern times; but in fact, as early as the time of Josephus (*Ant.* ii. 16), there were Jews who looked upon the miracle of the crossing of the Red Sea, &c., as fabulous. Among the theologians who have questioned the integrity of E., are Von Lengerke, Stähelin, De Wette, Knobel, and Colenso, who find traces of an older and a later author, the former of whom they call Elohistie, and the latter Jehovistic. Their objections have been replied to by Hengstenberg, Hävernick, &c., who endeavor to show that the distinction is artificial, and the attempt to follow it out in detail a failure. See PENTATEUCH.

EXOGENOUS PLANTS, or EXOGENS (Gr. *exo*, outwards; *gennao*, to produce), are those in which the woody substance of stem increases by bundles of vascular tissue added externally. The exogenous stem contains a central *Pith* (q. v.), from which *medullary rays* proceed to the Bark (q. v.), and the bark is easily separable from the woody part (see WOOD) which it surrounds. The exogenous is thus very different in structure and manner of growth from the endogenous or the acrogenous stem. Amidst the cellular substance of the young stem, when it has developed itself from the seed, woody cords are seen connecting the cotyledons, and afterwards the leaves, when these appear, with the root, in the central axis of which they join. A section of the stem exhibits the cellular substance traversed by vascular bundles (wood and bast), which in the section are more or less wedge-shaped, radiating from the center, but yet not prolonged into the center itself, which, even to the greatest age of the stem, remains occupied by the cellular pith. Additional bundles are interposed, as growth proceeds, diminishing the proportion of cellular substance in the stem, yet without these bundles ever becoming so compacted together as to cut off the communication between the cellular center of the stem and its bark, which is maintained by means of the medullary rays, often, indeed, imperceptible to the naked eye, but always present even in the hardest and most close-grained wood. The woody layers which are formed in successive years, as new leaves and branches are developed, are formed amidst the *Cambium* (q. v.), into which the woody fibres of the new leaves descend, between the bark and the former wood. Thus the concentric circles are formed, usually one for each year's growth, distinguishable even in the most matured timber, and by which the age of trees is very commonly computed. The beginning of each new layer is generally marked by a greater abundance of *pitted vessels*, the openings of which are conspicuous in the transverse section. In pines, the line of separation between the layers is marked by greater density of texture, and often by deeper color. The age of trees cannot, however, be calculated with perfect certainty from the concentric circles of the stem, as any circumstance which temporarily arrests the growth in any summer, may produce an effect similar to that ordinarily produced by the change of seasons; whilst in the trees of tropical countries, at least where the wet and dry seasons are not very marked, concentric circles are often not to be discovered.

The structure of the branch of an exogenous tree perfectly corresponds with that of the stem. The vascular bundles of the stem or branch form a loop where a leaf begins, and those of the leaf and its axillary bud spring from the loop. The roots of exogenous plants have not a central pith like the stem, but in a few trees, as the horse-chestnut, the pith is prolonged to some extent into the root.

Anomalies are not unfrequently to be met with in the structure of exogenous stems, and particularly among the twining woody plants of tropical countries. There are also very many herbaceous plants, in which, although the structure agrees with that of an exogenous tree in its first year, no further development is ever attained; whilst in many, even this is very imperfectly reached; but yet these are on other accounts unhesitatingly classed with exogenous plants. The exogenous stem and dicotyledonous seed are so constantly found together, that the designation exogenous plants is often applied to that great division of the vegetable kingdom, which is also called dicotyledonous. See BOTANY. Exogenous plants are also characterized by a particular mode of germination, with reference to which they are called *exorhizal* (Gr. *exo*, outwards; *rhiza*, a root), the radicle simply lengthening, and not having to break through the coat of the embryo. The leaves of exogenous plants generally exhibit a net-work of veins, instead of the parallel veins characteristic of endogens, and a greater proportional breadth of leaf usually accompanies this reticulated venation.

Exogenous plants are far more numerous than endogens. All the trees and shrubs of Britain, and those of temperate and cold climates generally, are exogenous, as well as very many herbaceous plants of these parts of the world, and many trees, shrubs, and herbaceous plants of the tropics. Almost all trees, except palms and a few *Liliaceæ*, *Pandanaceæ*, and tree-ferns, are exogenous.

EXORCISM (from *exorcizo*, to conjure), i. e., conjuration in the name of the gods, the term used by the Fathers of the church to

denote the act of conjuring evil spirits, in the name of God or Christ, to depart out of the person possessed. The first Christians adjured evil spirits in the name of Jesus Christ, who had conquered the devil; but as the opinion was at the same time entertained, that all idolaters belonged to the kingdom of Satan—who suffered himself to be worshipped under the form of idols—it was customary to exorcise heathens previous to their receiving Christian baptism. After Augustine's theory of original sin had found acceptance in the 5th c., and all infants were regarded as belonging to Satan's kingdom, exorcism became general at the baptism even of Christian children. Following the practice of the Roman Catholic Church, Luther retained exorcism, but it was laid aside by the Reformed Church. Although abandoned by illustrious and orthodox Protestant theologians, such as Chemnitz and Gerhard, or deemed unessential, and in modern times done away with by the 'Protestant' Church, the practice has been recently revived by the Old Lutheran or High-Church party.

In the Catholic Church, the function of exorcism belongs peculiarly to one of the so-called 'minor orders.' See **ORDERS**. Our Lord having not only himself in person (Matt. ix. 32, Mark i. 25, Luke iv. 35, viii. 29) cast out devils, but having also given the same power to his disciples, it is believed to be permanent in the church. Of its exercise in the early church, both in relation to 'energumens,' or persons possessed, and in the administration of baptism, there are numerous examples. Tertullian and Origen speak of it as of ordinary occurrence, and the council of Carthage, in 255, alludes to its use in baptism. The rite of exorcism is used by the modern church in three different cases: in the case of actual or supposed demoniacal possession, in the administration of baptism, and in the blessing of the chrism or holy oil, and of holy water. Its use in cases of possession is now extremely rare, and in many diseases is prohibited, unless with the special permission of the bishop. In baptism it precedes the ceremony of applying the water and the baptismal form. It is used equally in infant and in adult baptism, and Catholic writers appeal to the earliest examples of the administration of the sacrament as evidence of the use of exorcism in both alike. The rite of baptismal exorcism in the Roman Catholic Church follows closely the Scriptural model in Mark viii. 33. The exorcisms in the blessing of the oil and water resemble very closely the baptismal form, but are more diffuse.

EXOSMOSE. See **ENDOSMOSE**.

EXOSTEMMA, a genus of American trees and shrubs of the natural order *Cinchonaceae*, nearly allied to *Cinchona*. Several species yield febrifugal barks, which, however, do not contain the cinchona alkaloids. The most valued of these barks are Caribbee Bark (q. v.) and Saint Lucia Bark, the latter of which is the produce of *E. floribunda*, a native of the more mountainous parts of the West Indies.

EXOTERIC. See **ESOTERIC**.

EXO'TIC PLANTS, or **EXOTICS** (Gr. coming from abroad), cultivated plants originally derived from foreign countries. The term is most frequently applied to those of which the native country differs so much in soil or climate from that into which they have been conveyed, that their cultivation is attended with difficulty, requiring artificial heat or other means different from those requisite in the case of indigenous plants. The cultivation of many such exotics is carried on with great success in our green-houses and hothouses; but there are a few which, notwithstanding all the care of the gardener, can almost never be made to flower, and others which, although they flower, seldom produce ripe fruits and seeds. Nor are difficulties of this kind experienced only in the cultivation of those which belong to warmer climates than our own, but sometimes even with the natives of colder regions; thus, the delicious fruit of the *Rubus arcticus*, abundant in the most northern parts of Europe, is scarcely ever to be seen in the gardens of Britain, although the plant grows with sufficient luxuriance.

EXPANSION. See **HEAT**.

EXPECTATION (Lat. *expectatio*, a waiting, or looking out), i. e., the treatment of disease without active remedies, by simply observing its progress and averting its consequences through physiological means; as, for instance, when a Fracture (q. v.) is treated by keeping the ends of the broken bone in their proper place, until the natural processes of repair are completed. Expectation is in this and other cases obviously a quite different thing from inaction, or the systematic doing of nothing, with which it has been sometimes confounded.

EXPECTATION OF LIFE. See **PROBABILITY**.

EXPECTATION WEEK is the name given to the period elapsing between Ascension Day and Whitsunday, because during this time the apostles continued praying in earnest expectation of the Comforter.

EXPECTORANTS (Lat. *ex*, out of, and *pectus*, the breast), medicines given to carry off the secretions of the air-tubes. See **BRONCHI**, **BRONCHITIS**. The principal expectorants are antimony, squill, ipecacuanha, senega, balsam of tolu, lobelia, gum ammoniac, asafoetida, galbannum, &c.

EXPECTORATION (see **EXPECTORANTS**), the mucus or other secretion discharged from the air-passages. The examination of expectoration is of the utmost value in the diagnosis of diseases of the chest as will be seen in their separate description. See **CHEST**, **BRONCHITIS**, **PNEUMONIA**, **CONSUMPTION**, &c.

EXPENSES or **COSTS** OF A **LAWSUIT**. The arrangements adopted in England with reference to charges exigible from the parties to lawsuits are stated under **COSTS**. In Scotland these charges are commonly spoken of as expenses, and in the present article we shall, consequently, confine ourselves to the Scottish practice. In addition to demanding payment of the sum claimed, or performance of the alleged obligation where it has no reference to a pecuniary transaction, the pursuer of an action at law in Scotland almost always asks the court to pronounce decree in his favor for the expense of the proceedings which he has found it, or may find it, necessary to institute. On the other hand, the defender usually demands the expense attending his defence; and the general rule is, that the party found ultimately to be in the wrong has decree pronounced against him for the expense which he has occasioned to his opponent, as well as for the subject-matter of the suit. As it is quite usual for a party to succeed in one branch of his action, and to fail in another; or to occasion unnecessary expense by the unskillful or careless mode in which he conducts some portion of it, even though on the whole he be in the right; the adjustment of the amounts incurred by the parties respectively often involves not only much nicety of calculation, but questions of very considerable legal difficulty.

In so far as the adjustment of expenses is a matter of calculation, it is effected by the auditor of the Court of Session, or of the inferior courts. See **AUDITOR** and **SHERIFF**. In so far as it involves questions of law, these, if not previously decided by the judge, must be carried back to him from the auditor. If either party means to object to the amount awarded to him by the auditor in his report, he must lodge with the clerk of the process a short note of his objections without argument. A copy of this note must be furnished to the agent for the opposite party, and the court, or the Lord Ordinary, before whom the action depended, may direct the objections to be answered either *viva voce* or in writing. Should the objector fail to make good his objection, the expense of discussing it will be laid on him. If the objection has been stated to the auditor, and he has reported it to the court, it does not follow that the expense of discussing it will be laid wholly on the objector, even if unsuccessful. Where an appeal to the House of Lords has been actually presented, and service of an order thereon has taken place, a motion for expenses is incompetent, but a mere intimation of an appeal is not enough to prevent decree for expenses being pronounced. If the agent who has conducted the cause wish it, the decree for expenses will be pronounced in his favor; and the party found liable will not be allowed to plead a counter-claim against the client, as by that means he might prevent the agent from recovering what he very probably has disbursed. The taxation of expenses is said to be between *party and party*, and not between agent and client; that is to say, the losing party has to pay only the expenses which have been necessarily incurred in discussing the question between the parties judicially, not the unnecessary expenses which the over-anxiety of the successful party may have led him to incur to his own agent. Practically, there are very few cases in which the expenses recovered do cover all the *bona fide* claims of the agent against his client, which is the chief reason why litigation is always attended with expense, even to the winning party.

EXPERIMENT and observation are the means by which we extend and confirm our knowledge of nature. An experiment is properly a proceeding by which the inquirer interferes with the usual course of a phenomenon, and makes the powers of nature act under conditions that, without his interference, would never, perhaps, have presented themselves all together. The introduction of experiment distinguishes the modern method of investigating nature from that of ancient times and of the middle ages. It is by this means that physics and chemistry have made such rapid strides within the last two centuries. Through experiment, the investigator becomes master of the phenomena he is considering; for he can contrive to set aside the unessential circumstances that so often conceal the real relations and conditions of things, and make these come out into the light. Experiments exhibited during a lecture on any branch of science are made, not with a view to the discovery of truth, but to aid in the exposition of truths already discovered; they are sometimes called demonstrative experiments.

EXPERT (Lat. *expertus*, from *ex* and *peritus*, specially skilled), a man of special practical experience or education in regard to a

particular subject—a word commonly applied (after the French) to medical or scientific witnesses in a court of justice, when selected on account of special qualifications, as in the case of an analysis of the contents of the stomach in suspected poisoning. The term is similarly applied to a person professionally skilled in handwriting for detection of forgery of deeds and signatures.

EXPONENT AND EXPONENTIAL. When it was wanted to express the multiplication of unity for any number of excessive times by the same number of quantity, e. g., $1 \times 5 \times 5$, or $1 \times a \times a \times a$, it was found a convenient abbreviation to write 1×5^2 and $1 \times a^3$, or simply, 5^2 and a^3 ; and the numbers 2 and 3, indicating how often the operation of multiplication is repeated, were called exponents. But the theory of exponents gradually received extensions not originally contemplated, and has now an extensive notation of its own. Thus, $a^0 = 1$, $a^1 = a$, $a^{-2} = \frac{1}{a^2}$, $a^{\frac{1}{2}} = \sqrt{a}$, $a^{\frac{1}{3}} = \sqrt[3]{a}$, $a^{\frac{2}{3}} = \sqrt[3]{a^2}$, or the cube

root of the square of a . Also a^x is the x th power of a , x being any number integral or fractional; and, a continuing the same, x may be so chosen that a^x shall be equal to any given number. In this case, x is called the logarithm of the number represented by a^x . Considered by itself, a^x is an exponential. Generally, any quantity representing a power whose exponent is variable, is an exponential, as a^x , x^x , y^x , &c. Exponential equations are those which involve exponentials, such as $x^x = b$, $a^x = c$.

EXPOSURE OF INFANTS. See **INFANTICIDE**.

EXPRESSIO'NE. *CON*, or **ESPRESSIVO**, Italian terms in music, meaning with expression; impassioned, with pathos. Where the word appears at the beginning of a composition, the piece must be executed throughout with feeling. 'Espressioni' frequently appears above certain passages which alone are to be performed so, while the harmony in the accompaniment goes on quietly.

EXTENSION, in Logic, is a word put into contrast with another term, **COMPREHENSION**, and the two mutually explain each other. A general notion is said to be extensive according to the extent of its application, or the number of objects included under it. Thus, *Figure* is a term of very great extension, because it contains in its compass many varieties, such as round, square, oblong, polygonal, &c. In like manner, *European* is more extensive than *German*, *man* than *European*, *animal* than *man*, *organized* being than *animal*. The highest genera are formed by taking in a wider range of objects. *Matter* and *Mind* are the most extensive classes that we can form. For, although a higher genus is sometimes spoken of, viz., *Existence*; to call this a class is to generalize beyond real knowledge, which does not begin till we have at least two actual things to contrast with each other. What can be contrasted only with non-existence, non-entity, or nothingness, is not genuine knowledge: no property can be affirmed of it apart from the thing itself.

Matter, in its contrast to *mind*, is a real cognition; and *vice versa*, *mind* in its contrast to *matter*. These, then, are the most extensive terms that have any real knowledge attached to them. But this property of extension is gained by dropping more and more of the peculiarities of the included individuals; 'organized being,' in order to include both plants and animals, must drop from its signification what is peculiar to each, and mean only what is common to both. In short, these very extensive notions have a very narrow signification; it is the less extensive that have most meaning. The meaning of 'Man,' or the number of attributes implied in this generic expression, is large. Everything that goes to a human being—the human form and organization, the mental attributes of reason, speech, &c.—is expressed by this term, which is on that account said to be more **COMPREHENSIVE** than *animal* or *organized being*. Thus it may be seen that the greater the extension, the less is the comprehension; and the greater the comprehension, the less is the extension. An individual-name is the term of greatest comprehension, and of least extension. 'Socrates' comprehends all that is common to men and to philosophers, together with all that is peculiar to himself. On the logical uses of this distinction, see Sir W. Hamilton's *Lectures on Logic*, i. 140.

EXTENT, in English Law, a writ issuing out of the Court of Exchequer to compel payment of debts to the crown. In order to warrant the issue of this writ, the debt must be a debt of Record (q. v.). Extents are in chief or in aid. The former are issued against the crown debtor, and under it the body, land, and goods may all be taken at once. An extent in aid is issued at the suit of a crown debtor against a person indebted to the crown debtor. On this writ, the chattels only of the person against whom it is issued can be attached. Writs of extent in aid were at one time made the means of great abuse; persons who were not crown debtors were in the practice of assigning debts to the crown, and thereupon obtaining a writ in aid. This practice

was stopped by 7 James I. c. 15, forbidding assignments to the crown. Persons then resorted to other means, such as taking the debt in name of the crown, or getting themselves appointed bailiffs for the crown, and in that character procuring the issue of the writ. At last, the practice was finally stopped by 57 Geo. III. c. 117, by which it is enacted that the amount of the crown debt shall be endorsed on every extent in aid, and that any overplus beyond the crown debt shall be paid into court to be disposed of as the court shall direct. By the treaty of Union, extents were introduced into Scotland on revenue matters; but the sheriff is only entitled to take the debtor's movables.

EXTENT (in Scotland). There were no taxes in feudal times. The king was supported by the rents of his property lands, and by the occasional profits of superiority—ward, non-entry, marriage, escheat, and the like—which were known by the general name of *Casualties* (q. v.). Beyond these, and the expenses which the discharge of his ordinary duties to his superior imposed on him, the vassal was not liable to be taxed. But to this rule there were some exceptions. When it became necessary to redeem the king from captivity, to provide a portion for his eldest daughter, or to defray the expense of making his eldest son a knight, a general contribution was levied. One of these occasions occurred when Alexander III. betrothed his daughter Margaret to Eric, the young king of Norway, and engaged to give her a *tocher* of 14,000 merks. This sum was far beyond the personal resources of the king, and consequently fell to be levied by a land-tax—land and its fruits being then the only appreciable species of property. But if the tax was to be levied fairly and equally, this could be done only by ascertaining the value of the whole lands in the kingdom, as had been done in England in the time of Edward I. (4 Edw. I. i. anno 1276). Whether this was the first occasion on which a general valuation of all the lands of Scotland had been made, as Lord Kames thought (*Law Tracts*, tract xiv.), or whether there had been earlier valuations of the same kind, as others have supposed (*Cranston v. Gibson*, May 16, 1818, Fac. Coll.), is still a subject of dispute amongst antiquaries. It is certain, however, that the valuation here spoken of was long known as *the old extent*. As such, it is spoken of in the act of indenture of 15th July 1326, by which the parliament of Scotland agreed to give to King Robert Bruce the tenth penny of all the rents of the laity during his life. In this latter act it was provided that such lands as had been wasted by the war should be revalued by an inquest before the sheriff, and the return, or formal verdict, was so framed as to contain a statement both of the present value of the lands, and of what they were worth 'in the time of peace.' In almost all cases, the new was considerably under the old valuation, a fact which shows how widespread must have been the devastation of that terrible war. The same deplorable fact is brought out by the Extent taken with a view to raise the sum necessary for the ransom of David II. On this occasion, the new extent of the temporal lands scarcely amounted to £25,000, whereas the old extent exceeded £50,000 (*Cranston v. Gibson*, *ut sup.*). But this state of matters was reversed when James I. succeeded in restoring peace and prosperity. Indeed, even before the influence of his personal qualities could have been felt, the condition of the country must have improved, because the extent which was taken in 1424, for the purpose of redeeming him from captivity, shows in general an advance upon that even of the time of Alexander III.

In several later cases (1481, 1488, 1535), in which grants were made to the crown, the assessments were levied from temporal lands by a series of new extents, according to present value. During the minority of Mary, the assessments, which were heavy and numerous, were levied according to an old extent, but it is doubtful whether it was the extent of Alexander III., or of David II., or a later one than either. The extents of which we have spoken did not apply to church lands. The share of the subsidies applicable to them was levied according to the value of the benefices as settled by 'Bagimont's Roll,' which was made up in the time of Alexander III. by Benemundus de Vicei, vulgarly called Bagimont. Cromwell introduced a more equitable rule of assessment, and fixed precisely the ratio to be laid upon each county; and his system was adhered to, with little variation, after the Restoration (Act of Convention, 23d January 1667). The rent fixed by these valuations, commonly called the *valued rent*, was that according to which the land-tax and most of the other public and parochial assessments were imposed till the passing of the recent Valuation Acts in 1854 and 1857. See **VALUATIONS OF LAND**.

E'XTRACT OF MEAT is obtained by acting upon chopped meat by cold water, and gradually heating, when about one-eighth of the weight of the meat dissolves out, leaving an almost tasteless insoluble fibrine. The extract of meat contains the salts and savory constituents of the meat, and is a light and stimulating article of food. See **BEEF-TEA** and **BROTH**. It may be concentrated into small bulk, and when desired, may be afterwards treated with water, and being heated, forms an agreeable light

soup, though rather stimulating than nutritious. See PRE-SERVES.

EXTRACTION OF ROOTS. See EVOLUTION. The roots which have in practice to be most frequently extracted are the square and cube roots. It is proposed to explain the rule for their extraction as it is given in books of arithmetic. And first of the square root. The square of $a + b$ is $a^2 + 2ab + b^2$, and we may obtain the rule by observing how $a + b$ may be deduced from it. Arranging the expression according to powers of some letter a , we observe that the square root of the first term is a .

$$\begin{array}{r} a^2 + 2ab + b^2(a + b) \\ a^2 \\ \hline 2a + b \end{array}$$

Subtract its square from the expression, and the remainder is $2ab + b^2$. Divide $2ab$ by $2a$, and the result is b , the other term in the root. Multiply $2a + b$ by b , and subtract the product from the remainder. If the operation does not terminate, it shows that there is another term in the root. In this case, we may consider the two terms $a + b$ already found as one, and as corresponding to the term a in the preceding operation; and the square of this quantity having been by the preceding process subtracted from the given expression, we may divide the remainder by $2(a + b)$ for the next term in the root, and for a new subtrahend multiply $2(a + b) +$ the new term, by the new term; and the process may be repeated till there is no remainder.

The rule for extracting the square root of a number is an adaptation of this algebraical rule. In fact, if the number be expressed in terms of the radix of its scale, it is seen to be a concealed algebraical expression of the order we have been considering. Thus, $N = ar^n + br^{n-1} + \dots + q$. The number 576 in the denary scale may be written $5 \times 10^2 + 7 \times 10 + 6$; and treating it as an algebraical expression, we should find its root to be $2 \times 10 + 4$, or 24. The only part of the arithmetical rule now requiring explanation is the rule of pointing. As every number of one figure is less than 10, its square must be less than 10^2 ; generally, every number of n figures is less than 10^n (which is 1 followed by n ciphers); but also every number of n figures is not less than 10^{n-1} , and therefore its square is not less than 10^{2n-2} —which is the smallest number of $2n - 1$ figures. Also, 10^{2n} is the smallest number of $2n + 1$ figures. It follows that the square of a number of n figures has either $2n$ or $2n - 1$ figures. If, then, we put a point over the units place of a number of which the root is to be extracted, and point every second figure from right to left, the number of points will always equal that of the figures in the root. If the number of figures be even, the number will be divided into groups of two each; if odd, the last group will contain only a single figure.

The rule for the extraction of the cube root of a number is deduced from that for the extraction of the cube root of an algebraical expression in the same way as in the case of the square root. The cube of $a + b$ is

$$\begin{array}{r} a^3 + 3a^2b + 3ab^2 + b^3(a + b) \\ a^3 \\ \hline 3a^2 \end{array}$$

Hence the rule in algebra. Arrange the expression according to descending powers of a , the cube root of the first term a^3 is a , the first term of the root. Subtract its cube from the expression, and bring down the remainder. Divide the first term by $3a^2$, and the quotient is b , the second term of the root. Subtract the quantity $3a^2b + 3ab^2 + b^3$. If there is no remainder, the root is extracted. If there is, proceed as before, regarding $a + b$ as one term, corresponding to a in the first operation. Let, for example, $a + b = a^1$, then $3a^{1-2}$ is the new trial divisor. If c be the new term or third figure of the root, then the quantity to be subtracted to get the next remainder is $3a^{1-2}c + 3a^1c^2 + c^3$, and so on till there is no remainder. The rule of pointing in the extraction of the cube root may be proved, as in the case of the square root, by showing that the cube of a number of n figures contain $3n$, $3n - 1$, or $3n - 2$ figures; and therefore, if we put a point over the units place, and on each third figure, we shall have as many periods as there are figures in the root.

It may be observed that a rule for the extraction of any root of a number may be got from considering how, from the expansion of $a + b$ to the n th power, or $a^n + na^{n-1}b + \dots$, the root $a + b$ is to be obtained. See EVOLUTION and INVOLUTION.

EXTRACTION OF MATTER is the term applied to certain organic matters resembling humine, found in soils during the decay of vegetable matter, and which are precipitated during the concentration of water solutions.

EXTRACTS, in a technical sense, are medicinal preparations of vegetable principles, got either by putting the plants in a solvent or menstruum, and then evaporating the liquid down to

about the consistency of honey, or by expressing the juice of the plants and evaporating; this last is properly *inspissated juice*. Extracts, therefore, contain only those vegetable principles that are either held in solution in the juices of the plants themselves, or are soluble in the liquid employed in extracting them, and at the same time are not so volatile as to be lost during evaporation. Now, as many extractive matters are more or less volatile, it makes a great difference whether the operation is conducted at a low or at a high temperature. Extracts are called *watery* or *alcoholic* according as the menstruum employed is water or spirits. Ether is also used in extracting. Different plants of course afford different extracts, some being of the nature of bitters, others being used as pigments tannin, &c. Extracts are liable to great uncertainty in point of strength and composition, and require to be prepared with great care. Evaporation in vacuo is found to be a great improvement.

EXTRADITION, the giving up, by authority of law, a person accused of a crime, to the foreign jurisdiction within which it was committed, in order that he may be tried there. Extradition is always the subject of international treaty. A treaty or convention for this purpose was entered into between this country and France in 1843, and between this country and the United States of America in 1842. Nearly all other states have done likewise. The crimes for which extradition is allowed were settled by the Extradition Act 1870, 33 and 34 Vict. c. 52, and include murder, manslaughter, coining, forgery, larceny, false pretences, bankrupt offences, rape, abduction, child-stealing, burglary, arson, robbery, threats to extort money, sinking of ships, revolt and assaults in ships; but there is no surrender if the offence is one of a political character. The surrender is effected through the intervention of the Secretary of State, and it is by the Secretary's warrant that he is finally handed over with the depositions to the foreign state making the requisition.

EXTRAVASATION is the escape of any of the fluids of the living body from their proper vessels (*vas*) through a rupture or injury in their walls. Excrementitious matter thus sometimes escapes into the abdomen through a wound or ulceration of the bowels. But the term is oftenest used in speaking of the escape of blood from injured blood-vessels. Extravasation is distinguished from exudation by this, that in the last the vessels remain entire, and the effusion takes place by filtration through their walls; nor does more than a part of the blood so escape, the blood globules being retained, while in extravasation perfect blood is effused. Many kinds of extravasation are immediately fatal, such as that of urine or of gall into the abdomen, or of blood from the vessels of the brain in many cases of apoplexy. The dark color resulting from a bruise is owing to extravasated blood from ruptured capillary vessels.

EXTREME UNCTION, a sacrament of the Roman Catholic Church, which, as the other sacraments supply spiritual aid in the various circumstances of life, is believed to impart to the Christian in death grace and strength to encounter the struggle, as well spiritual as bodily, of the dying hour. The rite of unction in different forms is common to several of the sacraments; the name 'extreme' is given to that of the present sacrament, because it is reserved for the last act of the Christian career. The council of Trent declares this sacrament, although 'promulgated' in the well-known passage of St. James v. 14, 15 (which Protestants regard as having more to do with the general belief in the sanative properties of oil), to have been 'instituted' by Christ. The Fathers frequently allude to the rite of unction, and although many of these allusions certainly refer to the unctions of baptism and confirmation, yet Catholics rely on several passages of Origen, Chrysostom, Caesarius of Arles, and Pope Innocent I., as decisive regarding the unction of the dying, as also upon the fact that in the various separate churches of Oriental Christians—Greek, Coptic, Armenian, and Nestorian—the rite is found, although with many ceremonial variations. In the Roman Catholic Church, the sacrament is administered by the priest, who, 'dipping his thumb in the holy oil, anoints the sick person, in the form of the cross, upon the eyes, ears, nose, mouth, hands, and feet; at each anointing making use of this form of prayer: "Through this holy unction, and his most tender mercy, may the Lord pardon thee whatever sins though hast committed by thy sight. Amen." And so of the hearing and the rest, adapting the form to the several senses.'—Challoner's *Catholic Christian Instructed*. Extreme unction is reputed by Catholics one of the sacraments 'of the living'; that is, it ordinarily requires that the recipient should have previously obtained remission of his sins by absolution or by perfect contrition; but it is held to remit, *indirectly*, actual sins not previously remitted, and also (although not infallibly, but according to the merciful designs of Providence) to alleviate, and even to dispel, the pains of bodily disease. The holy oil which forms the 'matter' of this sacrament must be blessed by the bishop—a ceremony which is performed with great solemnity once each year by the bishop, attended by a number of priests, on Maundy-Thurs-

day. The oil so blessed is reserved for use during the year. In the Greek Church, the sacrament is administered by several priests conjointly. In its most solemn form, seven priests unite in its administration; in ordinary circumstances, it is conferred by two. The Greek form of words also differs, although not substantially, from that of the Latin Church. The Greeks call this sacrament 'The Holy Oil,' and sometimes 'The Oil of Prayer.'

EXTREMITY. See **SKELETON.**

EXUMAS, comprising Great Exuma, Little Exuma, and the Exuma Keys, form part of the group of the Bahama Islands. They contain about 2000 inhabitants, who are employed partly in agriculture, including at one time the growing of cotton, but chiefly in salt-making. In the last named business, the E. rank second among all the subdivisions of the group. They have exported as much as 116,000 bushels of salt a year. Next to Nassau in New Providence, Little Exuma is the most considerable port of entry in the Bahamas.

EXUVIÆ, a term applied to organic remains, now seldom employed, but frequently used by the older geologists.

EYALET, or **VILAYET**, is the largest and most important of the administrative divisions of the Turkish empire, formerly known as pashalics. These are again divided into *livas* or *sanjaks*, the *livas* into *cazas* or districts, and the *cazas* into *nahiés* or communes, containing villages or hamlets. Each eyalet or general government, as it may be called, is administered by a pasha, who is governor, and the general name for whom is *vâli* or viceroy. The governors of the eyalets belong to the Dignities of the Sword, and are pashas of two tails; and when they are raised to the rank of vizier, as is frequently the case, they become pashas of three tails.

EYCK, HUBERT and **JAN VAN**, two illustrious painters of the old Flemish school. Much discussion has arisen as to the time of the birth of these brothers, and the various dates assigned range from 1350 to 1400. Some maintain that Hubert was born in 1366, and Jan in 1370; while Kugler—in general a good authority on ancient art—states the dates to be 1366 and 1400, making Hubert thirty-four years older than Jan. Their birthplace was Maas-Eyck, and they chiefly resided at Bruges and Ghent, and became the founders of the Flemish school of painting. The honor of being the inventors of oil-painting is claimed for them, though sufficient evidence has been adduced to show that it was practised previously. Before their time, the custom, however, particularly in Italy, was to paint with gums or other substances of an adhesive nature dissolved in water; and if not the inventors, they were at least the first who brought into notice and perfected the mode of mixing colors with oil or some medium of which oil was the chief ingredient; while, for transparent and brilliant coloring and minute finish, their works have never been surpassed. Till the death of Hubert, the brothers generally painted in conjunction: one of their most important works was an altar-piece with folding-doors, representing the Elders adoring the lamb—a subject taken from the Apocalypse—painted for *Jodocus Vyts*, who presented it to the cathedral of St. Bavon, in Ghent. The two central divisions of this picture are all that now remain in the church at Ghent. Some of the wings are in the Gallery at Berlin. The masterpieces of the brothers are for the most part in the cities of Ghent, Bruges, Antwerp, Berlin, Munich, and Paris. In the National Gallery, London, there are three pictures of Jan van E., which, though small, well exemplify the high qualities of his works. These are portraits of a Flemish merchant and his wife, standing in the middle of an apartment, with their hands joined—signed and dated 1434: of the portrait of a man in a cloak and fur-collar, with a red handkerchief twisted round the head as a turban—painted, according to an inscription on the lower part of the frame, October 21, 1433: and portrait of a man with a dark-red dress, with a green head-covering—signed and dated 10th October 1432. Hubert died in 1426, and Jan in 1441. Compare Waagen, *Ueber Hub. und Jan van Eyck* (Breslau, 1822); Hotho, *Die Malerschule E.'s* (1858).

EYE, ANATOMY AND PHYSIOLOGY OF THE. In this article we shall consider: 1. The structure of the human eyeball, and of certain accessory parts or appendages which serve to protect that organ, and are essential to the due performance of its functions. 2. The most striking modifications which this organ presents in some of the lower animals. 3. The special uses of the various parts of the eye considered as an optical instrument; and 4. The action of the retina.

1. The *globe of the eye* is placed in the anterior part of the cavity of the Orbit (q. v.), in which it is held in position by its connection with the optic nerve posteriorly, and with the muscles which surround it, and by the eyelids in front. It is further supported behind and on the sides by a quantity of loose fat, which fills up all the interstices of the orbit, and facilitates the various movements of which the eye is capable.

The form of the eyeball is nearly spherical; but on viewing the organ in profile, we see that it is composed of segments of two spheres of different diameters. Of these, the anterior, formed by the transparent cornea, has the smaller diameter, and is therefore the most prominent; and hence the antero-posterior slightly exceeds (by about a line) the transverse diameter. The radius of the posterior or sclerotic segment is about $\frac{1}{10}$ ths, and that of the anterior segment about $\frac{1}{8}$ ths of an inch.

When the eyes are in a state of repose, their antero-posterior axes are parallel; the optic nerves, on the other hand, diverge considerably from their commissure within the cavity of the skull to the point where they enter the globe; consequently, their direction does not coincide with that of the eye. Each nerve enters the back of the globe at a distance of about $\frac{1}{4}$ th of an inch on the inner side of the antero-posterior axis of the eye.

The eyeball is composed of several investing membranes, and

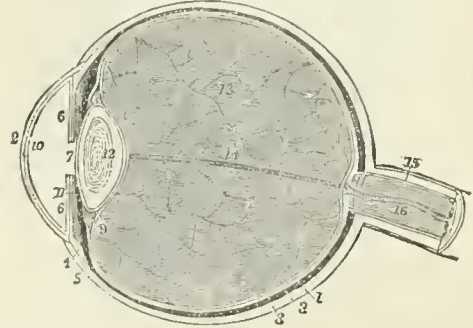


Fig. 1.

A longitudinal section of the coats of the eye.

1, the sclerotic, thicker behind than in front; 2, the cornea; 3, the choroid; 4, the iris; 5, the pupil; 6, the retina; 7, the anterior chamber of the eye; 8, the posterior chamber; 9, the crystalline lens, enclosed in its capsule; 10, the vitreous humor, enclosed in the hyaloid membrane, and in cells formed in its interior by that membrane; 11, the sheath; and 12, the interior of the optic nerve, in the center of which is a small artery. (The other numbers in the figure refer to parts not noticed in this article.)

of certain transparent structures, which are enclosed within them, and which, together with the cornea (one of the membranes), act as refractive media of various densities upon the rays of light which enter the eye.

The outermost coat of the eye is the *sclerotic* (from *skleros*, hard). It is a strong, dense, white, fibrous structure, covering about four-fifths of the eyeball, and leaving a circular deficiency anteriorly, which is occupied by the cornea. Posteriorly, it is perforated by the optic nerve, and it is there continuous with the sheath which that nerve derives from the dura mater, the fibrous investment of the brain and spinal cord. Near the entrance of the nerve, its thickness is about $\frac{1}{10}$ th of an inch; from this it diminishes to about $\frac{1}{16}$ th; but in front it again becomes thicker, from the tendinous insertions of the straight muscles which blend with it. This coat, by its great strength and comparatively unyielding structure, maintains the enclosed parts in their proper form, and serves to protect them from external injuries.

The *cornea* (so called from its horny appearance) is a transparent structure, filling up the aperture left in the anterior part of the sclerotic. Its circumference is overlaid by the free edge of the sclerotic, which in some parts presents a groove, so as to retain it more firmly; and the connection by continuity of texture between the two structures is so close, that they cannot be separated in the dead body without considerable maceration.

The cornea, in consequence of its greater convexity, projects beyond the line of the sclerotic; the degree of convexity, however, varies in different persons, and at different periods of life. It is thicker than any part of the sclerotic, and so strong as to be able to resist a force capable of rupturing that tunic.

Although beautifully transparent, and appearing to be homogeneous, it is in reality composed of five layers, clearly distinguishable from one another—viz. (proceeding from the front backwards) 1. The conjunctival layer of epithelium. It is in this epithelium that particles of iron, stone, &c., forcibly driven against the eye, usually lodge, and it is a highly sensitive membrane. 2. The anterior elastic lamina forming the anterior boundary of the cornea proper; it is not more than $\frac{1}{2000}$ th of an inch in thickness; and its function seems to be that of maintaining the exact curvature of the front of the cornea. 3. The cornea proper, on which the thickness and strength of the cornea mainly depend. 4. The posterior elastic lamina, which is an extremely thin membrane, in which no structure can be detected. It probably contributes, like the anterior lamina, to the exact maintenance of the curvature of the cornea, so necessary for correct vision. 5. The posterior epithelium of the aqueous humor, which is probably concerned in the secretion of that fluid.

For further details regarding these different layers, we must refer to Todd and Bowman's *Physiological Anatomy*, vol. ii. pp. 17-21.

The *choroid coat* is a dark-colored vascular membrane, which is brought into view on the removal of the sclerotic. Its outer surface, which is nearly black, is loosely connected with the sclerotic by connective tissue, in which are contained certain nerves and vessels—termed the ciliary nerves and vessels—which go to the iris. Its inner surface is soft, villous, and dark-colored. In front, it is attached to the membrane of the vitreous humor (see fig. 3)

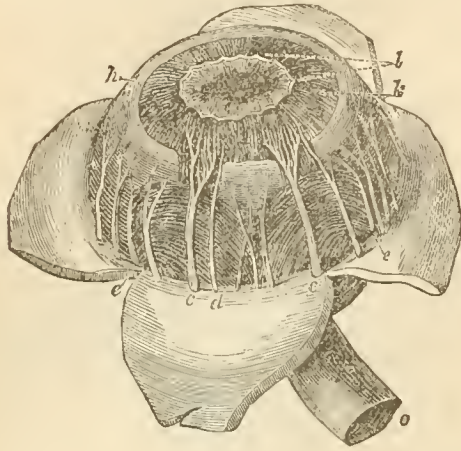


Fig. 2.

Choroid and iris, exposed by turning aside the sclerotic.

c, c, ciliary nerves going to be distributed in iris; d, d, smaller ciliary nerves; e, e, veins known as vasa vorticosae; f, ciliary ligament and muscle; g, g, converging fibres of iris; o, optic nerve.

by means of the ciliary processes, which consist of about sixty or seventy radiating folds. These are alternately long and short, and each of them is terminated by a small free interior extremity; and they are lodged in corresponding folds in the membrane of the vitreous humor. In other parts, it is loosely connected with the retina. The choroid is composed of minute ramifications of vessels—especially of veins, which, from their whirl-like arrangement, are termed *vasa vorticosae*—of connective tissue, and of pigment cells, which usually approximate to the hexagonal form, and are about $\frac{1}{1000}$ th of an inch in diameter. In albinos, this



Fig. 3.

The iris and adjacent structures seen from behind.

1, the divided edge of the three coats, the choroid being the dark intermediate one; 2, the pupil; 3, the posterior surface of the iris; 4, the ciliary processes; 5, the scalloped anterior border of the retina.

pigment is absent, and hence their eyes have a pink appearance, which is due to the unconcealed blood in the capillaries of the choroid and iris.

The *iris* may be regarded as a process of the choroid, with which it is continuous, although there are differences of structure in the two membranes. It is a thin flat membranous curtain, hanging vertically in the aqueous humor in front of the lens, and perforated by the pupil for the transmission of light. It divides the space between the cornea and the lens into an anterior (the larger) and a posterior (the smaller) chamber, these two chambers freely communicating through the pupil (see fig. 1).

The outer and larger border is attached all round to the line of junction of the sclerotic and cornea, while the inner edge forms the boundary of the pupil, which is nearly circular, lies a little to the inner side of the center of the iris, and varies in size according to the action of the muscular fibres of the iris, so as to admit more or less light into the interior of the eyeball; its diameter

varying, under these circumstances, from about $\frac{1}{4}$ d to $\frac{1}{2}$ th of an inch. It is muscular in its structure, one set of fibres being arranged circularly round the pupil, and, when necessary, effecting its contraction, while another set lie in a radiating direction from within outwards, and by their action dilate the pupil. These fibres are of the unstripped or involuntary variety. The nerves which are concerned in these movements will be presently noticed.

The varieties of color in the eyes of different individuals, and of different kinds of animals, mainly depend upon the color of the pigment which is deposited in cells in the substance of the iris.

Within the choroid is the *retina*, which, although continuous with the optic nerve—of which it is usually regarded as a cuplike expansion—differs very materially from it in structure. Before noticing the elaborate composition of this part of the eye, which has only been revealed by recent microscopical investigation, we shall briefly mention those points regarding it which can be established by ordinary examination. It is a delicate semi-transparent sheet of nervous matter, lying immediately behind the vitreous humor, and extending from the optic nerve nearly as far as the lens. On examining the concave inner surface of the retina at the back of the eye, we observe, directly in a line with the axis of the globe, a circular yellow spot (*limbus luteus*), of about $\frac{1}{30}$ th of an inch in diameter, called after its discoverer, the *yellow spot of Sömmerring*. As there has been much discussion regarding the structure and function of this spot, we may observe that Dr. Todd and Mr. Bowman, two of the most eminent English microscopists after several examinations, regard it as a small mound or projection of the retina towards the vitreous humor, with a minute aperture in the summit. The only mammals in which it exists are man and the monkey. Its use is unknown, but vision is remarkably perfect at this spot—a circumstance which, however, may possibly be accounted for by the fact, that it is singularly free from blood-vessels, which curve round it, and apparently avoid it.

The structure of the retina, as revealed by the microscope, is in the highest degree remarkable. Although its greatest thickness (at the entrance of the optic nerve) is only about $\frac{1}{100}$ th of an inch, and as it extends anteriorly, it soon diminishes to $\frac{1}{200}$ th of an inch, the following layers from without inwards may be distinguished in all parts of it. (1.) The layer of rods and cones, frequently termed, from its discoverer, the *membrane of Jacob*; (2.) The granular layer, including the parts indicated by 2, 3, 4, 5, in the figure; (3.) The layer of gray nerve substance; (4.) The expansion of the optic nerve; and (5.) The limiting membrane. These various structures are shown in fig. 4, which is copied from Kölliker and Müller's memoir on the structure of the retina. Details regarding the nature of these various layers are given in Kölliker's *Manual of Human Histology*, and in Todd and Bowman, *op. cit.*

It now remains for us to describe the *transparent media* which occupy the interior of the globe, and through which the rays of light must pass before they can reach the retina, and form on it the images of external objects. We shall consider them in the order in which the rays of light strike them.

Immediately behind the transparent cornea is the *aqueous humor* which fills up the anterior and posterior chambers which lie between the cornea and the lens. As its name implies, it is very nearly pure water, with a mere trace of albumen and chloride of sodium. As no epithelium exists in front of the iris, or on the anterior surface of the lens, it is most probably secreted by the cells on the posterior surface of the cornea.

The *crystalline lens* lies opposite to and behind the pupil, almost close to the iris, and its posterior surface is received into a corresponding depression on the forepart of the vitreous humor (see fig. 1). In form, it is a double-convex lens, with surfaces of unequal curvature, the posterior being the most convex. It is enclosed in a transparent capsule, of which the part covering the anterior surface is nearly four times thicker than that at the posterior aspect, in consequence, doubtless, of greater strength being required in front, where there is no support, than behind, where the lens is adherent to the vitreous membrane. The microscopic examination of the substance or body of the lens reveals a structure of wonderful beauty. Its whole mass



Fig. 4.

A vertical section of the human retina.

1, the layer of rods and cones (Jacob's membrane); 2, the external granular layer; 3, the intervening layer between 2 and 4; 4, the internal granular layer; 5, finer granular layer; 6, layer of nerve-cells; 7, fibres of the optic nerve; 8, limiting membrane.

is composed of extremely minute elongated ribbon-like structures, commonly called the *fibres of the lens*, which are regarded by Kölliker as *thin-walled tubes*, with clear, albuminous contents. These fibres are arranged side by side in lamellae, of which many hundred exist in every lens, and which are so placed as to give to the anterior and posterior surfaces the appearance of a central star, with meridian lines.

The lens gradually increases in density, and, at the same time, in refracting power, towards the center; by this means, the convergence of the central rays is increased, and they are brought to the same focus as the rays passing through the more circumferential portions of the lens. (According to Brewster, the refracting power at the surface is 1.3767, and at the center 1.3990.)

According to Berzelius, the lens contains 58 per cent. of water, 36 of albumen, with minute quantities of salts, membrane, &c. In consequence of the albumen, it becomes hard and opaque on boiling, as we familiarly see in the case of the eyes of boiled fish. In the adult, its long diameter ranges from $\frac{1}{16}$ to $\frac{1}{8}$ ths, and its antero-posterior diameter from $\frac{1}{16}$ th to $\frac{1}{8}$ th of an inch; and it weighs three or four grains.

The *vitreous humor* lies in the concavity of the retina, and occupies about four-fifths of the eye posteriorly. Its form is shown in fig. 1. It is enclosed in the hyaloid membrane, which sends numerous processes inwards, so as to divide the cavity into a series of compartments, and thus to equalize the pressure exerted by the enclosed soft gelatinous mass. Between the anterior border of the retina and the border of the lens, we have a series of radiating folds or platings termed the *ciliary processes of the vitreous body*, into which the *ciliary processes of the choroid* dove-tail. The vitreous humor contains, according to Berzelius, 98·4 per cent. of water, with a trace of albumen and salts, and hence, as might be expected, its refractive index is almost identical with that of water.

The appendages of the eye now claim our notice. The most important of these appendages are the *muscles within the orbit*, the

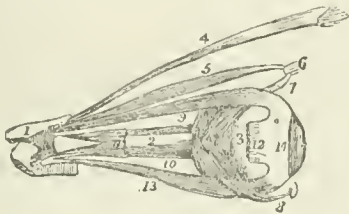


Fig. 5.

The muscles of the eyeball, the view being taken from the outer side of the right orbit.

1, a small fragment of the sphenoid bone at the back of the orbit, containing the foramen, through which 2, the optic nerve passes; 3, the globe of the eye; 4, the levator palpebrae muscle; 5, the superior oblique muscle; 6, its cartilaginous pulley, attached to the upper edge of the orbit; 7, its reflected tendon; 8, the inferior oblique muscle, the little knob near the figure 8 being a detached fragment of the superior maxillary bone, from which it arises; 9, the superior rectus; 10, the internal rectus, partly concealed by the optic nerve; 11, 12, the two ends of the external rectus, the intermediate p rion having been removed; 13, the inferior rectus; 14, the tunica albuginea, formed by the expansion of the tendons of the four recti muscles.

eyelids, the *lachrymal apparatus*, and the *conjunctiva*, to which (although less important) we may add the *eyebrows*.

The *muscles* by which the eye is moved are four straight (or *recti*) muscles, and two oblique (the superior and inferior). The former arise from the margin of the optic foramen at the apex of the orbit, and are inserted into the sclerotic near the cornea, above, below, and on either side. The superior oblique arises with the straight muscles; but after running to the upper edge of the orbit, has its direction changed by a pulley, and proceeds backwards, outwards, and downwards (see fig. 5). The inferior oblique arises from the lower part of the orbit, and passes backwards, outwards, and upwards. The action of the straight muscles is sufficiently obvious from their direction: when acting collectively, they fix and retract the eye; and when acting singly, they turn it towards their respective sides. The oblique muscles antagonize the recti, and draw the eye forwards; the superior, acting above, directs the front of the eye downwards and outwards, and the inferior upwards and inwards. By the duly associated action of these muscles, the eye is enabled to move (within definite limits) in every direction.

The *eyelids* are two thin movable folds placed in front of the eye, to shield it from too strong light, and to protect its anterior surface. They are composed of (1) skin; (2) of a thin plate of fibro-cartilage, termed the tarsal cartilage, the inner surface of which is grooved by thirty or forty parallel vertical lines, in which the Meibomian glands are imbedded; and (3) of a layer of mucous membrane, continuous, as we shall presently see, with that which lines the nostrils, and which joins the skin at the margin of the

lids, in which the eyelashes (*cilia*) are arranged in two or more rows. The upper lid is much the larger; and to the posterior border of its cartilage, a special muscle is attached, termed the *levator palpebrae superioris*, whose object is to elevate the lid, and thus open the eye; while there is another muscle, the *orbicularis palpebrarum*, which surrounds the orbit and eyelids, and by its

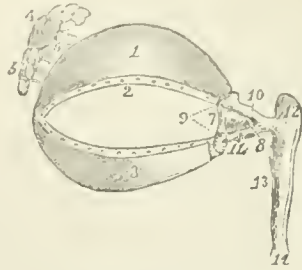


Fig. 6.

The appendages of the eye.

1, the cartilage of the upper eyelids; 2, its lower border, showing the openings of the Meibomian gland; 3, the cartilage of the lower eyelid, also showing on its border, the openings of the Meibomian glands; 4, 5, the lacrimal gland; 6, its ducts; 7, the plica semilunaris; 8, the caruncula lacrimalis; 9, the puncta lacrimalia; 10, 11, the superior and inferior lacrimal canals; 12, the lacrimal sac; 13, the nasal duct, terminating at 14 in the lower meatus of the nose.

contraction close the eye. The Meibomian glands secrete a sebaceous matter, which facilitates the free motion of the lids, and prevents their adhesion. The eyelashes intercept the entrance of foreign particles directed against the eye, and assist in shading that organ from an excess of light.

The *lachrymal apparatus* consists of the lachrymal gland, by which the tears are secreted; two canals, into which the tears are received near the inner angle of the eye; the sac, into which these canals open; and the duct, through which the tears pass from the sac into the nose. The gland is an oblong body, about the size of a small almond, lying in a depression in the upper and outer part of the orbit. The fluid secreted by it reaches the surface of the eye by seven or eight ducts, which open on the conjunctiva at its upper and outer part. The constant motion of the upper eyelid induces a continuous gentle current of tears over the surface, which carry away any foreign particle that may have been deposited on it. The fluid then passes through two small openings, termed the *puncta lacrymalia* (see 9 in fig. 6), into the canals; whence its further course into the lower portion of the nose is sufficiently obvious from the figure. The conjunctiva (or mucous coat) which covers the front of the eyeball, and lines the inner surface of the lids, passes down and lines the canals, sac, and duct; and is thus seen to be continuous with the nasal mucous membrane, of which it may be regarded as an offshoot or digital prolongation. See MUCOUS MEMBRANES.

We shall conclude this sketch of the anatomy of the human eye by a brief notice of the *nerves* going to this organ and its appendages.

Into each orbit there enters a nerve of *special sense*—viz., the optic nerve, a nerve of *ordinary sensation*—viz., the ophthalmic branch of the fifth nerve, and certain nerves of *motion* going to the muscular tissues, and regulating the movements of the various parts—viz., the third, fourth, and sixth nerves.

As the optic tracts from which the *optic nerves* originate are noticed in the article **BRAIN**, we shall merely trace these nerves from their *chiasma* or commissure forwards. This commissure results from the junction of the optic tracts of the two sides; and it is especially remarkable for the fact, that it presents a partial decussation of the nervous fibres; the central fibres of each tract passing into the nerve of the *opposite* side, and crossing the corresponding fibres of the other tract, while the outermost fibres, which are much fewer in number than the central ones, pass to the optic nerve of the *same* side. In front of the commissure, the nerves enter the optic foramen at the apex of the orbit, receive a sheath or investment from the *dura mater*, acquire increased firmness, and finally terminate in the retina.

The peculiar mode of termination of the optic nerves in the cup-like expansion of the retina, the impairment or loss of vision which follows any morbid affection of them, and the constant relation in size which is observed in comparative anatomy between them and the organs of vision, affords sufficient evidence that they are the proper conductors of visual impressions to the sensorium.

The first or ophthalmic division of the fifth or trifacial nerve sends branches to the skin of the eyelids and to the conjunctiva. That it is the nerve of ordinary sensation of the eye, is sufficiently obvious from the following facts: (1) That in disease of this nerve in the human subject, it is not uncommon to find the eyeball totally insensible to every kind of stimulus (particles of dust,

pungent vapors, &c.); and (2) that if the nerve be divided in the cranium (in one of the lower animals), similar insensibility results.

The most important of the nerves of motion of the eye is the third nerve, or *motor oculi*. It supplies with motor power the elevator of the upper eyelid, and all the muscles of the globe, except the superior oblique and the external straight muscle, and, in addition to this, it sends filaments to the iris and other muscular fibres within the eye. The application of an irritant (in vivisection experiments) to its trunk induces convulsive contraction of the principal muscles of the ball and of the iris; while division of the trunk occasions an external squint, with palsy of the upper eyelid and fixed dilatation of the pupil. The squint is caused by the action of the external straight and the superior oblique muscles, while the other muscles are paralyzed by the operation.

The normal motor action of the nerve upon the iris, in causing contraction of the pupil, is excited through the optic nerve, and affords a good illustration of *Reflex Action* (q. v.); the stimulus of light falling upon the retina, and, through it, exciting that portion of the brain from which the third nerve takes its origin. This nerve clearly exerts a double influence in relation to vision: (1) it mainly controls the movements of the eyeball and the upper eyelid; and (2) from its connection with the muscular structures in the interior, it regulates the amount of light that can enter the pupil, and probably takes part in the adjusting power of the eye to various distances.

The fourth nerve supplies the superior oblique muscle with motor power, while the sixth nerve similarly regulates the movements of the external straight muscle—the only two muscles in the orbit which are not supplied by the third pair.

Although not entitled to be termed a nerve of the orbit, the facial nerve deserves mention as sending a motor branch to the *orbicularis* muscle, by which the eye is closed.

2. *Comparative Anatomy of the Eye.*—In mammals, the structure of the eye is usually almost identical with that of man. The organ is, however, occasionally modified, so as to meet the peculiar wants of the animal. Thus, in the *Cetacea*, and in the amphibious *Carnivora* that catch their prey in the water, the shape of the lens is nearly spherical, as in fishes, and there is a similar thickening of the posterior part of the sclerotic, so as to thrust the retina sufficiently forward to receive the image formed by such a lens. (See the subsequent remarks on the eyes of fishes.) Again, instead of the dark-brown or black pigment which lines the human choroid, a pigment of a brilliant metallic lustre is secreted in many of the *carnivora*, forming the so-called *tapetum lucidum* at the bottom of the eyeball, which seems (according to Bowman) to act as a concave reflector, causing the rays of light to traverse the retina a second time, and thus probably increasing the visual power, particularly where only a feeble light is admitted to the eye. The pupil, moreover, varies in form, being transversely oblong in the *Ruminants* and many other *Herbivora*, and vertically oblong in the smaller genera of *Cats*. These shapes are apparently connected with the positions in which the different animals look for their food. Lastly, in some mammals (for example, the horse), there is a rudimentary third eyelid, corresponding to the *membrana nictitans* of birds.

In *birds*, the eye, though presenting the same general composition as in man, differs from the mammalian eye in several important points. From our knowledge of the habits of birds (especially birds of prey), we should naturally expect that from their rapid movements they should be able readily to alter the focus between the extremes of long and short sighted vision, and the modifications we shall now proceed to notice clearly have this object in view.

In reference to the figure, which represents a section of the eye of the owl, we see (1) that the shape of the organ is not spherical, as in mammals, nor flattened anteriorly, as in fishes and aquatic reptiles, but that the cornea is very prominent, and the antero-posterior diameter lengthened; the consequence of this arrangement being to allow room for a large quantity of aqueous humor, and to increase the distance between the lens and the posterior part of the retina, and thus to produce a greater convergence of the rays of light, by which the animal is enabled to discern near objects, and to see with a faint light. In order to retain this elongated form, we find a series of bony plates, forming a broad zone, extending backwards from the margin of the cornea, and lying embedded in the sclerotic. The edges of the pieces forming this bony zone overlap each other, and are slightly movable, and hence, when they are compressed by the action of the muscles of the ball, there is protrusion of the aqueous humor and of the cornea, adapting the eye for near vision; while relaxation of the muscles induces a corresponding recession of the humor and flattening of the cornea, and fits the eye for distant vision. The focal distance is further regulated by a highly vascular organ called the *marsupium*, or *pecten*, which is lodged in the posterior part of the vitreous humor (fig. 7, a). It is attached to the optic nerve at the point where it expands into the retina, and seems to be endowed with a power of dilatation and contraction; as it en-

larges, from distension of its blood-vessels, it causes the vitreous humor to push the lens forwards, while, as it collapses, the lens falls backwards again towards the retina.

In addition to an upper and lower eyelid, birds have an elastic fold of conjunctiva, which, in a state of repose, lies in the inner angle of the eye, but is movable by two distinct muscles, which draw it over the cornea. It is termed the *membrana nictitans*; it is to a certain degree transparent, for (according to Cuvier) birds sometimes look through it, as, for example, the eagle when looking at the sun. The lachrymal gland is situated as in mammals, but there is here a second gland, the *glandula Harderi*, which yields a lubricating secretion.

There are no very special peculiarities in the eyes of *reptiles*, and we therefore proceed to notice the most remarkable points presented by the eye of *fishes*.

From the comparatively great density of the medium (water) through which the rays of light pass before they impinge upon the transparent structure of the eye of the fish, it is obvious that

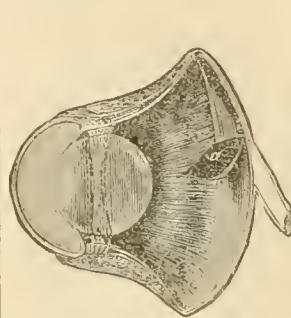


Fig. 7.—Eye of Bird.

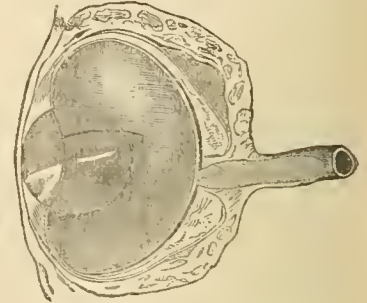


Fig. 8.—Eye of Fish.

this organ must act as a very powerful refractive apparatus. The main peculiarity in the eye of the fish is the size, extreme density, and spherical shape of the lens, which give it such an extraordinary magnifying power that it has been employed as a simple microscope. See Brewster's *Treatise on the Microscope*, p. 31. But its focus being shortened in proportion as its power is increased, it is necessary that the retina should be brought near its posterior surface. For this purpose, the eyeball is flattened by diminishing the quantity of vitreous humor, which, being of nearly the same density as the external water, exerts no perceptible power in bringing the rays of light towards a focus; and this flattened form is maintained by the existence of two cartilaginous plates in the tissue of the sclerotic, which in some of the larger fishes is actually converted into a bony cup. The aqueous humor having here no refractive power, is barely sufficient to allow the free suspension of the iris. The pupil is very large, so as to take in as much light as possible, but is generally motionless. Their eyes being constantly washed by the water in which they live, no lachrymal apparatus is necessary, nor does any exist; and the same remark applies to the *cetacea* amongst the mammals. We thus see that throughout the sub-kingdom of the *vertebrata* the eye is constructed according to one general scheme, with modifications to suit the mode of life of individual classes.

In all the above cases, the structure of the eye is essentially the same; that is to say, we have certain dioptric media for collecting the divergent rays to their proper focus on the retina, and we have the means of adjusting the eye for different distances. But if we examine the eyes of insects, we find that they are constructed on different principles.

In these animals, we have *simple* and *compound* eyes usually associated in the same individual. The simple eyes resemble in many respects the corresponding organs in higher animals, but the compound eyes are extremely elaborate and complex in their structure. They are two in number, appearing as hemispherical masses on the sides of the head. When examined with the microscope, their surface is seen to be divided into an enormous number of hexagonal facets, which are in fact corneae.

In the ant, there are only 50 of these facets in each eye; in the common house-fly, 4000; in butterflies, upwards of 17,000; and in some of the beetles more than 25,000. Each cornea is found to belong to a distinct eye, provided with a nervous apparatus, and exhibiting a lens, iris, and pupil. Strauss Durekheim, who has carefully studied these structures in the cockchafer, suggests that, the eyes of insects being fixed, nature has made up for their want of mobility by their number, and by turning them in all directions; so that it might be said that these little animals have a distinct eye for every object.

Compound eyes of similar structure occur in many of the crustaceans.

3. Having now described the anatomical structure of the eye in man and certain of the lower animals, we are able to proceed to

the consideration of the uses of the various parts of this organ. Assuming a general knowledge of the ordinary laws of geometrical optics (see DIOPTRICS, LENS, &c.), we will trace the course of the rays of light proceeding from any luminous body through the different media on which they impinge. If a luminous object, as, for example, a lighted candle, be placed at about the ordinary distance of distinct vision (about ten inches) from the front of the eye, some rays fall on the sclerotic, and being reflected, take no part in vision; the more central ones fall upon the cornea, and of these some also are reflected, giving to the surface of the eye its beautiful glistening appearance; while others pass through it, are converged by it, and enter the aqueous humor, which probably exerts no perceptible effect on their direction. Those which fall on and pass through the outer or circumferential part of the cornea are stopped by the iris, and are either reflected or absorbed by it; while those which fall upon its more central part pass through the pupil, and are concerned in vision. In consequence of its refractive power, the rays passing through a comparatively large surface of the cornea are converged so as to pass through the relatively small pupil and impinge upon the lens, which, by the convexity of its surface, and by its greater density towards the center, very much increases the convergence of the rays passing through it. They then traverse the vitreous humor, whose principal use appears to be to afford support to the expanded retina, and are brought to a focus upon that tunic, forming there an exact but inverted image of the object.

This inversion of the image may be easily exhibited in the eye of a white rabbit or other albino animal, after removing the muscles, &c., from the back part of the globe. The flame of a candle held before the cornea may be seen inverted at the back of the eye, increasing in size as the candle is brought near, diminishing as it retires, and always moving in a direction opposite to that of the flame.

The adaptation of the eye to distinct vision at every distance beyond that of a few inches, is extremely remarkable, and numerous attempts have been made to explain the mechanism by which its focal length admits of alteration under the influence of the will. One view that has met with much support is, that the focal length is modified by a slight movement of the lens. In the eye of the bird there is a structure termed the *ciliary muscle*, which obviously approximates the lens to the cornea when a short field of view is required, and although the corresponding structure is only slightly developed in man and mammals, it is probably sufficiently strong to produce the slight action required; while for the vision of distant objects the lens is carried back towards the retina by the elasticity of the connecting tissues.

It would appear, however, from the recent researches of Cramer, Helmholtz, Allen Thomson, and others, that the accommodation is effected rather by a change in the *form* than in the *position* of the lens. It has been experimentally proved, that when the eye is turned from a distant to a near object, the antero-posterior diameter of the lens becomes elongated, and the anterior surface becomes more convex, while the opposite changes take place in turning the eye from a near to a distant object. According to Helmholtz, the radius of curvature of the anterior surface of the lens diminishes on turning the eye to a near object from ten to six millimetres (from about 0.4 to 0.24 of an inch), while the most projecting point of the same surface is brought forward about 0.2 of an inch.

Whichever view be adopted, the ciliary muscle takes an active part in the process. According to the observations of Hueck, the focal distance may be changed about three times in a second. The accommodation from a near to a distant object is effected much more rapidly than the converse process.

There are two well-known forms of defective vision in which this power of adaptation is very much limited—viz., short-sightedness or *myopia*, and long-sightedness or *presbyopia*. The limitation, however, is not due to a defect in the muscular apparatus to which we have referred, but to an abnormality either in the curves or in the density of the refracting media. In *short-sightedness* from too great a refractive power from either cause, the rays from objects at the ordinary range of distinct vision are brought too soon to a focus, so as to cross one another, and begin to diverge before they fall on the retina; the eye in this case being able to bring to the proper focus on the retina only those rays which were previously diverging at a large angle from a very near object. The correction for this deficiency is accomplished by interposing between the eye and indistinctly-seen objects a *concave* lens, with a curvature just sufficient to throw the images of external objects at the ordinary distance of distinct vision backwards upon the retina. In *long-sightedness*, on the other hand, there is an abnormal diminution of the refractive power from too flat a cornea, a deficient aqueous humor, or a flattening of the lens, so that the focus is behind the retina. This defect is corrected by *convex* lenses, which increase the convergence of the rays of light. Long-sightedness, as its name *presbyopia* indicates, usually comes on at a comparatively advanced period of life, while short-sightedness is most

commonly met with in young persons; but these rules present occasional exceptions; and the common belief that the latter affection naturally disappears after the middle period of life, is altogether erroneous.

We have already noticed the most essential use of the iris—viz., its power, under the influence of light upon the retina, of modifying the size of the pupil, so as to regulate the amount of light entering the eye. But this is not its only use; one of its offices being to prevent the passage of rays through the circumferential part of the lens, and thus to obviate the indistinctness of vision which would arise from *spherical aberration* (the unequal refraction of the rays passing through the center and near the margin of the lens), in the same manner as the diaphragm employed by the optician. But there are additionally two other means by which this spherical aberration is prevented, which so well illustrate the wondrous mechanism of the eye, that we cannot omit to notice them. They are described by Professor Wharton Jones as follows:

(1.) 'The surfaces of the dioptric parts of the eye are not spherical, but those of the cornea and posterior surface of the lens are hyperbolic, and that of the anterior surface of the lens elliptical—configurations found by theory fitted to prevent spherical aberration. This discovery was made at a time when it was not known but that the dioptric parts of the eye had spherical surfaces.'

(2.) 'The density of the lens diminishing [as we have already shown] from the center to its periphery, the circumferential rays are less refracted than they would have been by a homogeneous lens with similar surfaces. This elegantly simple contrivance has been hitherto inimitable by human art.'—*The Actonian Prize Treatise*, 1851, p. 50.

Chromatic aberration, which is caused by the unequal refrangibility of the primitive rays of which white light is composed, when transmitted through an ordinary lens, whereby colored fringes are produced, is *practically* corrected in the eye, although it is doubtful whether it is *entirely* absent. The provision, however, on which the achromatism depends has not been determined with certainty, probably because we do not yet know the relative refractive and dispersive powers of the cornea and humors of the eye. Sir David Brewster denies that the chromatic aberration receives any correction in the eye, and maintains that it is imperceptible only in consequence of its being extremely slight.

We have hitherto been considering the eye as an optical instrument which projects pictures of external objects on the retina; we now come to the action of the nervous tunic, the *retina*, and its adaptation to the physical construction of the eye.

When the retina or the optic nerve is stimulated, we have the sensation of light, whatever may be the nature of the stimulus employed—as, for example, if it be a blow on the eye in the dark, or irritation of the optic nerve from some morbid condition. The sensation of light, then, consists in a recognition by the mind of a certain condition of these nervous structures, and this condition may be induced by the application of any stimulus; the ordinary stimulus obviously being the rays of light which fall upon the retina. There must, however, be a certain amount of light for the purpose of vision. Every one knows that it is difficult and painful to discern objects in a very faint light; and, on the other hand, that on suddenly entering a brilliantly lighted room from the dark, everything appears confused for one or two seconds. There is, however, a gradual adaptation of the retina to different amounts of light. Persons long immured in dark dungeons acquire the power of distinctly seeing surrounding objects; while those who suddenly encounter a strong light, are unable to see distinctly until the shock which the retina has experienced has subsided, and the iris has duly contracted. In protecting the retina from the sudden effects of too strong a light, the iris is assisted by the eyelids, the orbicular muscle, and, to a certain extent, by the eyebrows. Moreover, the dark pigment of the choroid coat acts as a permanent guard to the retina, and where it is deficient, as in albinos, an ordinary light becomes painful, and the protective appendages, especially the eyelids, are in constant use.

The persistence, during a certain time of impressions made on the retina, facilitates the exercise of sight. A momentary impression of moderate intensity continues for a fraction of a second; but if the impression be made for a considerable time, it endures for a longer period after the removal of the object. Thus, a burning stick, moved rapidly in a circle before the eyes, gives the appearance of a continuous ribbon of light, because the impression made by it at any one point of its course remains on the retina until it again reaches that point. It is owing to this property that the rapid and involuntary act of winking does not interfere with the continuous vision of surrounding objects; and, to give another illustration of its use, if we did not possess it, the act of reading would be a far more difficult performance than it now is, for we should require to keep the eye fixed on each word for a longer period, otherwise the mind would fail fully to perceive it. Again, in consequence of the retention of sensations by the retina, the image of an object may continue to be seen, especially

in certain morbid states of the system, and in twilight, for some seconds after the eyes have been turned away from it, and this physiological phenomenon has probably given origin to many stories of ghosts and visions. Thus, if a person has unconsciously fixed his eyes, especially in the dusk, on a dark, post or stump of a tree, he may, on looking towards the gray sky, see projected there a gigantic white image of the object, which may readily be mistaken for a supernatural appearance. These ocular spectra are always of the complementary color to that of the object. Thus, the spectrum left by a red spot is green; by a violet spot, yellow; and by a blue spot, orange. However great may be the velocity of a luminous body, it can always be seen; but if an opaque body move with such rapidity as to pass through a space equal to its own diameter in a less time than that of the duration of the retinal impression, it is altogether invisible; and hence it is, for example, that we cannot see bullets, &c., in the rapid part of their flight.

A small portion of the retina, corresponding to the entrance of the optic nerve, is incapable of exciting the sensation of vision when it receives the image of an object. According to Volkmann, this small invisible spot exactly corresponds in size with the artery lying in the centre of the optic nerve. If the 'blind spot' had been situated in the axis of the eye, a blank space would always have existed in the center of the field of vision, since the axes of the eyes in vision correspond. But as it is, the blind spots do not correspond when the eyes are directed to the same object; and hence the blank which one eye would present is filled up by the other eye. Mariotte, early in the last century, first described the existence of these blind spots. Any one may satisfy himself of their existence by the following simple experiment.

Let two small black circles be made upon a piece of paper, about four or five inches apart, then let the left eye be closed, and the right eye be strongly fixed upon the left-hand circle. If the paper be then moved backwards and forwards, a point will be found at which the right-hand circle is no longer visible, although it reappears when the paper is either brought nearer or removed further. Although no other part of the retina possesses the complete insensibility presented by the blind spot, it is probable that its anterior portions have very little to do with vision. When using only one eye, we direct it towards the object we wish to inspect, in such a way as to throw the image to the back of the globe; and when the eye is thus fixed, objects near the boundary of the field of vision are less distinctly seen than those at its center.

The extent of the field of vision for a single eye, the head being fixed, has been calculated by Dr. Young. He found that the eyeball was capable of a movement of 55 degrees in every direction, so that a single eye may have perfect vision of any point within a range of 110 degrees.

We have not yet referred to the longitudinal range, or greatest distance of human vision; indeed this range varies so extremely that it is difficult to assign an arbitrary limit to it. Many uncivilized races, as the North American Indians, and the inhabitants of the vast Asiatic steppes, possess powers of sight which would appear almost incredible if they had not been thoroughly and frequently corroborated. Our information is more definite regarding the limits of human vision in regard to the minuteness of the objects of which it can take cognizance. Ehrenberg has carefully studied this subject, and has arrived at the following results. The side of the smallest square magnitude usually visible to the naked eye—either of white particles on a black ground or conversely—is about $\frac{1}{400}$ th of an inch; and with the greatest condensation of light and effort on the part of the observer, squares with a side as small as $\frac{1}{100}$ th of an inch may be recognized, but without sharpness or certainty. Bodies smaller than these, when observed singly, cannot be discerned by the naked eye, but may be seen when placed in a row. Much smaller particles may, however, be distinctly seen, if they powerfully reflect light; thus, gold-dust, which in none of its diameters exceeded $\frac{1}{100}$ th of an inch, is easily discernable in common daylight. The delicacy of vision is far greater for lines than for minute areas, since opaque threads of $\frac{1}{400}$ th of an inch may be discerned when held towards the light.

Various topics which the reader might perhaps have expected to find noticed, such, for instance, as 'single vision with two eyes,' 'the appreciation of solid forms by the sense of vision,' 'correct vision with an inverted image on the retina,' &c., which belong fully as much to metaphysics as to physiology, are discussed in the article on VISION. We may also refer those who desire information on these points to Professor Bain's treatise on *The Senses and the Intellect*.

EYE, DISEASES OF THE. The diseases of the eye enumerated by the surgeon are very numerous, partly from the variety of the tissues and parts of which it is formed, partly because the exposed situation and transparency of the eye enable the diseases to be seen. Nearly all its parts are liable to inflammation and its consequences. See OPHTHALMIA. The eyelids are liable to various

diseases, as growths of several kinds, most of which the surgeon may remove; inflammation, as blear-eye (ophthalmia tarsi); to be misdirected inwards or outwards. *Entropion* and *Ectropion* (q. v.); and the upper eyelid may fall down (ptosis) from palsy of the common motor oculi nerve. The eyelashes may grow in upon the eye (trichiasis), and produce serious results. When plucked out, they grow again; and if they still grow in upon the eye after this palliative treatment has been tried several times, the surgeon has to cut down on their roots and destroy them. The duct which conveys away the tears to the nose is liable to inflammation and obstruction, causing watery eye. See LACHRYMAL ORGANS. The cornea is liable to opacity in various degrees. The mere *nebula* or cloudy condition, either limited or general, may pass off, and leave the cornea again clear; but the white mark, which is the cicatrix or scar of an ulcer, is permanent, although it may become smaller by the disappearance of the surrounding haze. The pupil may be closed as the result of iritis, or of operations for cataract, and an artificial pupil may be made by either of the three methods—incision, excision, or separation—but the operation is seldom attended with success. For opacities of the crystalline lens, see CATARACT. For an account of diseases of the nervous parts of the eye, see AMAUROSIS. Various affections of vision may arise from peculiar or altered conditions of the refracting humors of the eye—as near-sightedness (myopia), far-sightedness (presbyopia), the appearance of bodies (musae) floating in or before the eye; and there may be double vision (diplopia), with two eyes or with one. See VISION. The parts between the eye and its bony orbit may be the seat of inflammation, abscess, or tumor, making the eye protrude. The movements of the eyeballs may be affected from palsy of the motor nerves, or from contraction of the lateral recti muscles, causing inward or outward squinting. See SQUINTING. The eye may lose all feeling, from palsy of the fifth pair of nerves. The whole of the same side of the face, nostril, and mouth, will be in the same condition, and the eye becomes inflamed and disorganized. Substances thrown against the eye may injure it. Quicklime is rapidly destructive to the eye, slaked lime and mortar less so. When one of these, or any other caustic, has got into the eye, sweet oil is the best thing to introduce, until the surgeon arrives to remove them. If it is oil of vitriol (sulphuric acid) that has been the cause of the injury, a weak solution of soda may be used in the first place to neutralize the acid.

In gunpowder explosions near the eye, besides the burn, the particles are driven into the surface of it, and will cause permanent black stains over the white of the eye, unless they are carefully removed at the time. When chips of glass, stone, &c., are driven into the interior of the eye, there is little hope of it being saved from destructive inflammation. When only partially sunk into the cornea, as is often the case with sparks of hot iron, or 'fired,' as they are called, the rubbing of the projecting part on the eyelid causes great pain, and the surgeon has not much difficulty in removing them. Most commonly these, or other 'foreign bodies,' as particles of dust, sand, seeds, flies, &c., merely get into the space between the eyeball and the lids, almost always concealed under the upper, as it is the larger, and sweeps the eye. They cause great pain, from the firmness and sensitiveness of the papillary surface of the lid, soon excite inflammation, and their presence, as the cause, is apt to be overlooked. The lid must be turned round to find them. To do this, pull the front or edge of the lid forwards by the eyelashes, held with the finger and thumb, and at the same time press down the back part of the lid with a small pencil or key. The lid will readily turn round, when the body may be seen about its middle, and may be removed with the corner of a handkerchief. Another plan, which the person himself may try, is to pull forward the upper lid by the eyelashes, and push the lashes of the lower lid up behind it, when the foreign body may be brushed out. After the bodies are removed, a feeling as if they were still there may remain for some time.

EYE, a parliamentary and municipal borough in Suffolk, 20 miles north of Ipswich. Its streets are rather narrow and irregular. Pop. (1881) of municipal borough, 2296; of parliamentary borough, 6293. It sends one member to parliament, the parliamentary borough including eleven parishes. Eye, in Anglo-Saxon, means island; the river surrounding the town. Breweries, an iron-foundry, and a large flax manufactory furnish employment.

EYEBRIGHT (*Euphrasia*), a genus of plants of the natural order *Scrophulariaceae*, having a tubular calyx, the upper lip of the corolla divided, the lower of three nearly equal lobes, the cells of the anthers spurred at the base, a two-celled capsule and striated seeds. Some of the species are root-parasites. The only British species is the COMMON E. (*E. officinalis*), a little plant of at most six or eight inches in height, with ovate serrated leaves, and white or reddish flowers streaked with purple, appearing singly in the axils of the leaves. It is very abundant in many pastures, and even on high mountains, where—as in very northern regions—it is often to be seen of only an inch in height, gemming the

ground abundantly with its bright little flowers. It is a very widely distributed plant, a native of most parts of Europe, the north of Asia, the Himalaya, &c. It was once in great repute as a cure for ophthalmia, and is still much used in rustic practice for diseases of the eye. A spot on the corolla, something like a pupil, gave it much of its reputation, whilst the fanciful doctrine of *signatures* prevailed in medicine; but it has been found really efficacious in catarrhal inflammations of the eye, and in other catarrhal affections. It is a weak astringent. It is the *Euphrasy* of Milton, with which he represents the archangel Michael as *purging the visual nerve* of Adam.

EYE-PIECE, the name given to the microscope by means of which the image of the object formed in the focus of a telescope is observed. See **TELESCOPE**.

EYLAU, usually called Prussian Eylau, a town in the government of Königsberg, and 22 miles south of the town of that name, contains about 3000 inhabitants, and is celebrated for the battle fought there between Napoleon and the allies—Russians and Prussians—under Bennigsen, February 8, 1807. The French force amounted to about 80,000, and the allies numbered 58,000, but were superior in artillery. The battle was opened soon after daylight by a furious attack made by the French left on the Russian right and center, which, however, proved utterly unsuccessful, the attacking corps being all but completely destroyed. The murderous struggle was repeatedly renewed, and the promise of victory alternated now to the one side and now to the other. Night closed upon the whole allied line pressing onward and driving the French before them. Nevertheless, the victory is generally claimed by the latter, chiefly because the allied forces, unable to recruit their strength, were ordered to retreat from the field on the night of the battle, and to retire upon Königsberg. The loss of the allies is estimated at about 20,000, while that of the French must have been considerably greater.

EYRE, EDWARD JOHN, a distinguished explorer and colonial governor, is the son of an English clergyman in Yorkshire, and was born in 1817. Emigrating to Australia at the age of seventeen, he was prosperous as a squatter, and soon became a magistrate. In 1840 he failed in an attempt to explore the region between South and Western Australia—a task he accomplished, in spite of enormous difficulties, in 1841. In 1846 he became lieutenant-governor of New Zealand, and in 1852 of St. Vincent. In 1862 he was appointed governor of Jamaica, where in 1865 negro disturbances broke out. E., resolving on prompt measures, proclaimed martial law; a Mr. Gordon, believed to have had a leading part in the rising, was hurriedly tried by court-martial, and hanged two days after, the sentence having been confirmed by E. A commission sent to inquire into this case, found that Gordon had been condemned on insufficient evidence, and E. was recalled. On his return he was prosecuted for murder by a committee of whom J. Stuart Mill was the most prominent; Mr. Carlyle and Sir R. Murchinson promoted the E. defence fund. The charge of murder was dismissed by the magistrates of Market-Drayton in 1867. Since then E. has lived in retirement.

EZE'KIEL (meaning 'God will strengthen,' or 'strength of God'), one of the Hebrew prophets, was the son of the priest



Common Eyebright
(*Euphrasia officinalis*).

Buzi, and along with Jehoiachin, king of Judah, was carried captive, when still a young man, to Mesopotamia, by order of Nebuchadnezzar, about 598 B.C. He was a member of the Jewish community which settled on the banks of the river Chebar, and first appeared as a prophet about the year 594 B.C. His prophetic career extended over a period of 22 years.

The date of his death is not recorded.—The book of Ezekiel consists of three great parts: the *first* (chapters 1—24), composed before the final conquest of Jerusalem by Nebuchadnezzar, announces the complete overthrow of the kingdom of Judah, on account of its increasing unfaithfulness to God; the *second* (chapters 25—32) threatens the surrounding nations, which were exulting maliciously over the ruin of Judah, with divine punishment; and the *third* (chapters 33—48) prophesies the future deliverance of the Hebrew nation, and the rebuilding of Jerusalem. This last portion is generally believed to contain several Messianic predictions, three of which are considered specially remarkable (chaps. 36—37, 38—39, and 40—48); and it is beyond all question that only under a world-wide dispensation like the Christian, can the glorious visions of the prophet receive a historical realization. The book is full of magnificent but artificial symbolism, and of allegories difficult to understand; whence Jerome calls it 'a labyrinth of the mysteries of God;' but here and there, as in chapters 1st and 2d, it contains visions that indicate the possession on the part of E. of a most vivid and sublime imagination. E.'s authorship of the book has been questioned. The Talmud says, it was written by the Great Synagogue, of which E. was not a member; and Ewald, believing that traces of later elaboration are quite obvious, suggests that the collection and combination of the various prophecies into a book may not have been the prophet's own doing. The opinion of most critics, however, is, that a prophet who was so much of a literary artist as E., was more likely to have completed the book himself than to have left such a work to others. The text is far from being in a perfect condition. It is partly corrupted by glosses, has partly been retouched by later hands, and may often be amended by the Septuagint version. The best commentaries on the book of Ezekiel, are those of Hävernick (Erlangen, 1843) and Hitzig (Leip. 1847).

EZRA, a Jewish lawgiver of the 5th c. before Christ. He was descended from a distinguished priestly family, and was resident in Babylon in the reign of Artaxerxes Longimanus. With this monarch he seems to have been in considerable favor, and in the year 478 B.C. obtained permission to return to Jerusalem with a band of his countrymen amounting to 1754. His services to the new colony in regard to their civil and religious condition were very important. He endeavored to re-impose more strictly the law of Moses, forbidding marriages with heathen women, and annulling such ties where they had been formed. He also introduced into Jewish literature the square Chaldee character, instead of the old Hebrew or Samaritan one, which had been customary till then; but the tradition that he re-wrote from memory the sacred books burned at the destruction of the temple deserves no regard; and it is likewise a mere tradition that as president of the so-called Great Synagogue (an assemblage of Jewish scholars) he arranged and completed the canon of the Old Testament. See **BIBLE**.—The book called by his name, along with the book of Nehemiah, formed, among the Jews, the first and second books of Ezra. It records events which extended over a period of nearly 80 years, and divides itself naturally into two parts. The first six chapters embrace a period of 21 years, and relate the history of the first return from the Babylonish captivity; the rest of the book chronicles the *second* return under Ezra the priest, in the reign of Artaxerxes Longimanus. The book is partly written in Chaldee, and is probably the work of various authors.

F.



THE sixth letter in the Latin and English alphabets, corresponding to the *Vau* of the Hebrew, and the *Digamma* (q. v.) of the old Greek alphabet. See ALPHABET. *F* and *v* are called *labio-dentals*, from the organs employed in producing them; they belong to the class of consonants called *Aspirates* (q. v.), and bear the same relation to each other that exists between the unaspirated labials *p* and *b*.

In Latin, *f* had a peculiar sound, different from that of Greek *φ*, as we learn from Cicero and other Latin writers. What the sound was, we do not exactly know, but it approached to the nature of a strongly breathed *h*, as is indicated by the fact, that in the Sabine dialect it sometimes takes the place of *h*, as Sab. *fircus* = Lat. *hircus* (a he-goat); and the Latins made use both of *faba* and *haba* for 'a bean.' This affinity is also shown in modern Spanish, where *h* takes the place of the Latin *f*; as Lat. *femina*, Sp. *hembra*; *fl* becomes, in Spanish, *ll*, as Lat. *flamma* = Sp. *llama*. *F* in English and other Teutonic tongues, corresponds to *p* in Greek and Latin; as Lat. and Gr. *pater* = Eng. *father*; Gr. *pod-*, Lat. *ped-* = Eng. *foot*; Lat. *pisc-* = Eng. *fish*; Gr. *pur* = Eng. *fire*; Lat. *vulp-* = Eng. *wolf*. In some words, *v* takes the place in German of *f* in English; as Ger. *vater* = Eng. *father*; Ger. *vier* = Eng. *four*. In the Aberdeenshire dialect, *f* takes the place of *wh*, as *fat* for *what*; *fup* for *whip*. This seems to be a relic of the Teutonic pronunciation of *w* (= *v*), still to be observed in the Cockney pronunciation of *vill* for *will*, *ven* for *when*; but why the sharpening of the labial into *f* should be confined to one circumscribed district of Scotland, and to the case of *w* followed by *h*, it is hard to say.

F in Lat. and Greek becomes *b* in Eng.; as Gr. and Lat. *fer-* = Eng. *bear*; Lat. *frater* = Eng. *brother*. See Letter B.

More remarkable are the interchanges between *f* and the series *d, th, t*. Lat. *foris* = Gr. *thura*, Eng. *door*; Lat. *fera* = Gr. *ther*, Eng. *deer*; Eng. *red*, Sans. *ruthira*, Gr. *eruthros*, Lat. *rutilus*, *rufus*, *ruber*. In Russian, *Feodor*, *Afanasya* = *Theodor*, *Athanasia*. In words originally common to both Greek and Latin, the Greek *φ* is represented in Lat. by *f*; as Gr. *φῆμη* = Lat. *fama*. But in spelling Greek words with Latin letters, the Romans, after the time of Cicero, were careful to represent *φ*, not by *f*, which had a somewhat different power, but by *ph*. This mode of spelling words derived from Greek is still adhered to in English, German, and French, although the distinction in sound has long been lost sight of. The distinction began to disappear in the Latin itself in the time of the later Roman emperors, when inscriptions show such spelling as *Afrodite* for *Aphrodite*; and this simplification is followed in modern Italian, Spanish, and Portuguese. *Ph* is sometimes erroneously used in words having no connection with Greek; as *Adolphus*, for the Teutonic *Adolf* or *Adalolf*—i. e., 'noble wolf.'

F, in Music, is the fourth note of the natural diatonic scale of C, and stands in proportion to C as 4 to 3, and is a perfect fourth above C as fundamental note. *F* major, as a key, has one flat at its signature—viz., B flat. *F* minor has four flats the same as A flat major, of which it is the relative minor.

FAAM, or FAHAM (*Angraecum fragrans*), an orchid, native of India and the Mascarene Isles, much prized in the East for the delightful fragrance of its leaves, which is owing to the presence of *Coumarin* (q. v.), and resembles that of the Tonka Bean and of Vernal Grass. In the Isle of Bourbon, an infusion of *F* leaves is in great repute as a cure for pulmonary consumption and as a stomachic. In France, it has been successfully employed, under the name of *Isle of Bourbon Tea*, as an expectorant, anti-spasmodic and stomachic.

FABACEÆ. See LEGUMINOSÆ.

FA'BER is the name of two artists, father and son. John F., the elder, was born in Holland, where he acquired a knowledge of the art of mezzotinto-engraving. Subsequently, he came to England, and died at Bristol, May 1721. His works do not exhibit much talent.—The younger F., also called John, obtained, however, a high reputation as an engraver in mezzotinto. His principal works are the portraits of the Kit-Cat Club, and the Beauties of Hampton Court, several of which are executed with great freedom, vigor, and beauty. F. lived in London, where he is believed to have died in 1756.

FABER, REV. GEORGE STANLEY, a learned and voluminous divine of the Anglican Church, was the eldest son of the Rev. Thomas Faber, and was born 25th October 1773. He entered University College, Oxford, in 1789, where he achieved a brilliant academical reputation. Before his 21st year, he was elected Fellow and Tutor of Lincoln College. In 1796, he took his degree of M.A.; was Bampton Lecturer for 1801, in which capacity he delivered the lectures subsequently published under the title of *Horæ Mosæicæ*; and in 1805 became vicar of Stockton-on-Tees, in the county of Durham. After several changes, he received from Bishop Van Mildert, in 1832, the mastership of Sherburn Hospital, near the city of Durham, where he died 27th January 1854. F. wrote upwards of forty works, several of which, especially those upon prophecy, have enjoyed a very extensive popularity. All his writings are marked by 'strong masculine sense, extensive classical erudition, and a hearty love of hypothesis.' The principal are—*The Genius and Object of the Patriarchal, the Levitical, and the Christian Dispensations* (1823, 2 vols.); *The Difficulties of Infidelity* (1824); *The Sacred Calendar of Prophecy* (1828, 3 vols.); *The Primitive Doctrine of Election* (1836); reckoned by some critics the most valuable of all F.'s writings; *The Primitive Doctrine of Justification* (1837); and *Eight Dissertations upon the Prophetic Promises of a Mighty Deliverer* (1845, 2 vols.).

FA'BIUS, the name of one of the oldest and most illustrious patrician families of Rome. Three brothers of this name alternately held the office of consul for seven years (485–479 B.C.). In 479, the Fabii, under K. Fabius Vibulanus, migrated to the banks of the Cremera, a small stream that flows into the Tiber a few miles above Rome. Here, two years after, they were decoyed into an ambuscade by the Veientes, with whom they had been at war, and, with the exception of one member, who had remained at Rome, and through whom the race was perpetuated, the entire gens, consisting of 306 men, were put to the sword. The most eminent of the Fabii were Quintus Fabius Rullianus—supposed to have been the first who obtained for himself and his family the surname of *Maximus*—and his descendant, Quintus Fabius Maximus Verrucosus, named Cunctator, the Delayer. The former was the most eminent of the Roman generals in the second Samnite war, and was twice dictator, and six times consul. The latter, who, in the course of his career, was five times consul, and twice censor, was elected dictator immediately after the defeat of the Romans at Trasimenus. The peculiar line of tactics which he observed in the second Panic war obtained for him the surname by which he is best known in history. Hanging on the heights like a thundercloud, to which Hannibal himself compared him, and avoiding a direct engagement, he tantalized the enemy with his caution, harassed them by marches and counter-marches, and cut off their stragglers and foragers, while at the same time his delay allowed Rome to assemble her forces in greater strength. This policy—which has become proverbial as 'Fabian policy'—although the wisest in the circumstances, was neither appreciated in the camp nor at home; and shortly after, Marcus Minucius Rufus, Master of the Horse, was raised to an equal share in the dictatorship, a position, however, which he occupied but for a short time. During his fifth consulship, Fabius recovered Tarentum, which had long been one of Hannibal's important positions. He died in 203 B.C. C. Fabius, surnamed Pictor, executed upon the walls of the temple of Salus—dedicated by the dictator C. Junius Brutus Balbulus in 302—the earliest Roman paintings of which we have any record; and his grandson, Q. Fabius Pictor, was the first writer of a Roman history in prose.

FA'BLE (Lat. *fabula*) is a word of twofold signification. First, it is employed by some writers in a general sense to denote any fictitious narrative, as, for example, the incidents in an epic or dramatic poem. At one time also, when the myths of the Greeks and Romans were thought to be satisfactorily accounted for by regarding them as conscious inventions of the ancient poets and priests, it was customary to speak of them as *fables*, but this application of the term is now abandoned by scholars. See MYTH. According to the second and more frequent signification of the word, it denotes a special kind of literary composition, either prose or verse, in which a story of some kind is made the vehicle for conveying a universal truth. It differs from a parable in this respect, that while the latter never transcends in conception the

bounds of the probable or the possible, the former always and of necessity does.

The story of the 'Good Samaritan' imagined by the Saviour, is a parable; if it was not true, it might have been, for it contains nothing either improbable or impossible; but when Jotham went up to the top of Mount Gerizim, and spoke to the men of Shechem about the trees going forth to anoint a king over them, he made use of a fable proper. The peculiarity, therefore, of the structure of the fable consists in the transference to inanimate objects, or, more frequently, to the lower animals, of the qualities of rational beings. By the very novelty and utter impossibility of the representation, the interest of the hearer or reader is excited, and thus its symbolic meaning and moral become transparent to him, at least if the fable is well contrived. The ancient fabulists were simple, clear, and earnest in their representations. They seem to have sprung up in the East. Among the more celebrated are Bidpai (q. v.), or Pilpai, and the Arabian Lokman, who is said to have lived in the time of King David. Among the Greeks, the greatest name is that of Æsop (q. v.), whose fables, at a much later period—the precise time is not exactly known—were versified by a certain Babrius (q. v.). Among the Romans, Phædrus cleverly imitated Æsop, but with considerable modifications, thus giving a certain amount of independent value to his work. It is perhaps worth mentioning here, that the well-known fable of the *Town Mouse and Country Mouse*, told by Horace, is of purely Roman origin, and is probably the only one in existence of which that can be affirmed. Leaving the classical period, and before entering on the dark ages, we encounter the name of Aphthonius, who flourished in the early part of the 4th century, and who wrote indifferent fables in Greek prose; and still later, the name of Flavius Avianus, who composed forty-two, no better, in Latin elegiacs. During the dark ages, the fable in various forms appears to have been cultivated in the monasteries, although nothing meritorious has survived; but in the middle ages, it acquired fresh life and vigor. An addition of the fables current in Germany in the time of the Minnesingers has been published by Bodmer. The oldest known German fabulist is Stricker, who lived about the middle of the 13th c.; but the famous mediæval fable of *Reineke Fuchs*, or the History of Reynard the Fox (q. v.), stretches in some of its numerous primitive forms much further back. In later times, most nations have cultivated the fable with more or less success. We may mention among the English, Gay; among the Germans, Hagedorn and Gellert, and Lessing; among the Italians, Pignotti; among the Russians, Krylov; and above all, among the French, La Fontaine, whose fables are remarkable for their arch and lively humor, their delicate sarcasm, their sagacity, and felicity of expression. Now, however, the fable has gone entirely out of fashion.

FABLIAU, plur. FABLIAUX (from the Latin *fabulari*, *fabulare*, to speak or to tell), was the name given in the old French literature to a class of short metrical narratives, intended merely for recitation, and which had for their subject-matter the talk and news of the day in the middle ages. The narrator of such news was called a *fableur* (plur. *fablière*), in opposition to the *chanteur*, or singer proper, who composed poems not only for recitation, but also for singing. Besides the fabliaux, the department of the fable or embraced the *Romans d'aventure* (in short unrhymed romances), usually called *contes*, whence their author or reciter also bore the name of *conteur*; and the *dis*, or sayings, the special cultivator of which was termed a *discur*. As the fabliaux were fundamentally distinguished from the more genuine forms of poetry by the everyday character of their subject-matter, so the mode of treatment which their authors adopted was also more anecdotal, epigrammatic, and witty—the wit being richly spiced with scandal. They appear to have maintained a sort of ironical and parodistic antagonism to the idealism of the epics of chivalry. In these fabliaux, the essential character of the French people manifested itself, and that opposition of the real to the ideal, of the understanding to the imagination, which after the time of Francis I., began to characterize French literature generally. Thus they lashed not only the priesthood and the nobility in their actual degeneracy, but from the very character of their satire, they engendered a contempt for the religious-chivalric spirit itself, and for all ecclesiastical and knightly notions and ceremonies. The oldest fabliaux are not of French origin; they are a fruit of the Crusades, and were brought to France from the East, but they received a national coloring, and soon took root in the West. From them sprung the drama of France. One of the most fecund fablière was Rutebeuf, who flourished in the reigns of Louis IX. and Philippe III., whose works were published by Jubinal (2 vols., Paris, 1837). He was a true Parisian, and the prototype of Villon, La Fontaine, and Voltaire. The best collections of fabliaux and contes are those of Barbazan (3 vols., Paris, 1756), of Méon (2 vols., Paris, 1823), and of Jubinal (2 vols., Paris, 1839—1843).

FABRETTI, RAFFAELE, a distinguished antiquary and archæologist, was born at Urbino 1618, and was attracted at an early

period to antiquarian studies by the great classical remains of Rome. Under Pope Alexander VII., he became papal treasurer, and subsequently was appointed chancellor to the papal embassy at Madrid. A residence of 13 years in Spain enabled him to explore all the antiquities of the kingdom, and to carry his studies to a point which rendered indispensable his return to Rome, the great parent fount of ancient learning. He was there made judge; and under Innocent XII., became keeper of the papal archives of the castle of St. Angelo, a post which afforded the widest scope to his favorite pursuits. About this time, he wrote his two important works: *De Aquis et Aquaductibus Veteris Romæ* (4 vols., 1680, reprinted with notes and additions in 1788), and *Synagoga de Columnâ Trajani* (Rome, 1683). His treatise entitled *Inscriptionum Antiquarum Explicatio* (1699) throws invaluable light on the discoveries made by himself in the catacombs; and his erudite investigations concerning the reliefs known as the Æneïd Tables, and the grand subterranean canals of the Emperor Claudius, are equally full of interest to science. His rare collection of inscriptions, &c., is deposited in the ducal palace of Urbino. F. died in 1700.

FABRIANO, a city of Italy, in the province of Ancona (formerly part of the Papal States), is situated at the eastern base of the Apennine range, 28 miles west of Macerata. It has a cathedral, and several convents, but is chiefly worthy of mention on account of its great paper manufactures, which were established in 1564. The churches and private houses contain many specimens of the school of painting which flourished here. Pop. (1871) 7612.

FABRIANO, GENTILE DA, an Italian painter, who flourished in the early part of the 15th century. He was born—it is not exactly known when—at Fabriano, and received his first instructions from his father, who appears to have been a man of superior culture, as he taught his son the elements of physics and mathematics. F.'s first teacher in art was, it is supposed, Allegretto de Nuzio. Subsequently, he went to Florence, and studied under Fiesole. Among his earliest works of note is a fresco of the Madonna in the cathedral of Orvieto. In 1423, he painted an 'Adoration of the Kings' for the church of the Holy Trinity in Florence. This picture is one of the most admirable belonging to the school of Giotto. To the same period belongs a Madonna with Saints (now in the Berlin Museum). F. afterwards went to Venice, where he greatly increased his reputation by a picture of the bloody engagement between the fleet of the Republic and that of the Emperor Barbarossa off the heights of Picano. The Venetian senate was so delighted with the piece, that it conferred on the fortunate artist the dignity of a patrician, and a pension of a ducat *per diem* for life. Unhappily this work has perished. Pope Martin V. now called F. to Rome, and employed him, along with Vittore Pisanello, in adorning the church of San Giovanni Laterano. As his share of the work, he painted various incidents in the life of John the Baptist, five prophets, and portraits of Pope Martin himself and ten cardinals. He died, while engaged on this building, some time after 1450. F.'s pictures indicate a cheerful and joyous nature. He had quite a childlike love of splendor and rich ornamentation, but is never extravagant or excessive in his coloring.

FABRICIUS, or FABRIZIO, GIROLAMO, commonly named from his birthplace F. AB ACQUAPENDENTE, a celebrated anatomist and surgeon, was born in 1537, and died in 1619. He was the son of humble parents, who, notwithstanding their poverty, sent him to the university of Padua, where, in addition to the usual instruction in the classics, he studied anatomy and surgery under the celebrated Fallopius with such success, that on the death of the latter in 1562, F. was appointed to fill the vacant professorship. He continued to hold this office for nearly half a century, during which period his high character for eloquence, general erudition, and professional knowledge, attracted students from all parts of the civilized world to the university of Padua. Amongst the students was our countryman Harvey (q. v.), who attended his prelections in 1598, and who, as will be seen in our notice of his life, derived from F.'s observations on the valves of the veins the first clue to his great discovery. He was a most laborious investigator of nature; and we find him comparing and contrasting the same organ in man, and in several of the lower animals, on a more methodical plan than had been attempted by any of his predecessors. In this way he treated of the eye, the larynx, the ear, the intestinal canal, the development of the fœtus, and many other subjects.

The improvements which his knowledge of anatomy enabled him to introduce into the practice of surgery were very great; and his *Opera Chirurgica*, which embraced every complaint curable by manual operation, was so highly valued, that it passed through seventeen editions. He was greatly esteemed by his fellow-citizens, for we find that the Venetian republic not only erected for him a spacious anatomical amphitheater, in which his name was inscribed, but at the same time conferred upon him an annual stipend of a thousand crowns, and created him a knight of the

order of St. Mark. A few years before his death, he retired, with an ample fortune, from all professional duties, and died (some believe he was poisoned by his relatives) at the age of 82, in his villa on the banks of the Brenta, which still bears the name of the *Montagnuola d'Acquapendente*. We have not space for a list of his numerous anatomical and surgical works. Upwards of a century after his death (in 1723), the celebrated anatomist Albinus collected and published a complete edition of all his anatomical and physiological works.

FABRICIUS, JOH. CHRISTIAN, a Danish entomologist, born at Tønder, January 7, 1745, and died at Kiel in 1807. He studied at Copenhagen, Edinburgh, Leyden, and Freyberg, and finally went to Upsala, to attend the classes of Linnæus. A warm friendship was cemented between master and pupil, and throughout his life, F. was zealously employed in developing and applying the ideas and method of the great Swede. In 1775, F. was appointed to the chair of Natural History at the university of Kiel, and from that time he devoted himself to the prosecution of his entomological studies, and to the fuller development of a system of classification of insects, based upon the structure of the mouth. Although his system has been found inapplicable to many families of insects, the observations on which it was based have tended materially to the extension of this branch of science. The *Systema Entomologia* (Copenh. 1775), in which F. expounded his views, constituted a new era in the history of entomology, while his *Genera Insectorum* (Kiel 1776), *Mantissa Insectorum* (Copenh. 1787), and *Entomologia Systematica* (Copenh. 1792), opened hitherto unexplored fields of inquiry to the entomologist. F. was the author of several able treatises on the policy, statistics, and economy of Denmark, which were prepared by him in his capacity of councillor of state and Professor of Rural and Political Economy at Kiel. F.'s death was said to have been hastened by the grief which he experienced in consequence of the political misfortunes of his country.

FABRO'NI, ANGELO, an excellent biographical writer, was born at Marradi, in Tuscany, 7th February 1732, educated at Faenza and Rome, and in 1773, was appointed tutor to the sons of Leopold, Grand Duke of Tuscany. He died 22d September 1803. His *Vita Italorum Doctrina Excellentium qui Sæculo XVII. et XVIII. floruerunt* (20 vols., Pisa, 1778—1805), is one of the best Italian works of its kind, and contains quite a treasure of information; while his *Laurentii Medicei Vita* (2 vols., Pisa, 1784), and *Vita Magni Cosmi Medicei* (2 vols., Pisa, 1788—1789), are reckoned model biographies.

FAÇADE (Fr.), the exterior front or face of a building. This term, although frequently restricted to classic architecture, may be applied to the front elevation of a building in any style. It is, however, generally used with reference to buildings of some magnitude and pretensions; thus, we speak of the *front* of a house, and the *façade* of a palace. The back elevation of an important building is called the rear *façade*, in the same way as in England the back of a house is called the '*back front*.'

An edifice may have any number of *façades* when it shows a face or front in each direction. An elevation of the side of a building is called the *lateral façade*. The sides of a court or cortile are also called *façades*, and are distinguished as north, south, &c. *façades*.

FACCIOLA'TI, JACOPO, an Italian philologist and critic, was born at Torreglia, not far from Padua, in 1682. He was educated in the religious seminary at Padua, where he became successively Professor of Theology, Professor of Philosophy, and Superintendent-general of the classes, or rector of the institution. F. directed his attention chiefly to the revival of the study of ancient literature, and with this object, brought out a new edition of the *Lexicon Septem Linguarum*, called, from its original author, the monk Ambrosius of Calepio, the *Calepine Lexicon*. He was assisted in this work by his pupil, Forcellini, to whom is mainly owing the conception of a totally new Latin dictionary; an arduous undertaking, which F. continued till his death in 1769, and which was afterwards completed by Forcellini in 1771. F. and Forcellini, assisted by several others, likewise published a new edition of Nizoli's *Thesaurus Ciceronianus*. F.'s Latin epistles and orations are remarkable for the Ciceronian elegance of their style, and his notices on several philosophical writings of Cicero for their solidity, clearness, and taste.

FA'CET, a term employed to denote the plane surfaces of crystals, or those artificially cut upon precious stones.

FACIAL ANGLE. See **ANGLE**.

FACIL'ITY, in the legal terminology of Scotland, is a condition of mental weakness, short of that which will justify *Cognition* (q. v.), but which calls for the protection of the law, which is exercised by means of a process called *Interdiction* (q. v.). The object of interdiction is to prevent the facile person from granting deeds to his own prejudice, and after it has taken place, he cannot contract without the consent of his interdictors. Even without in-

terdiction, the deeds of a facile person, if to his prejudice, may be set aside, if there be proof of his having been circumvented or imposed on; and Erskine says that 'where lesion in the deed, and facility in the grantor concur, the most slender circumstances of fraud or circumvention are sufficient to set a deed aside.'—B. iv. tit. 1, s. 27. See **FRAUD**, **LESION**, **INSANITY**. There is no corresponding term in English law, and the remedy of interdiction is unknown, but weakness of mind approaching to idiocy will of course form an important element in proving fraud.

FA'CTOR, in Mathematics. The numbers 6 and 4, multiplied together, *make* 24; hence 6 and 4 are called *factors* of the product 24. Most numbers are products of two or more factors; thus $10 = 2 \times 5$; $12 = 3 \times 4$, or 2×6 , or $2 \times 2 \times 3$. Every product can be divided by any of its factors without remainder; a factor, therefore, is often called a *divisor*, or measure. 2, 3, 4, 6, 8, 12, are all factors or divisors of 24. Numbers that have no factor or divisor above unity, such as 2, 3, 5, 7, 11, . . . 23, &c., are called *Prime Numbers*. See **NUMBERS**, **THEORY OF**.

FACTOR, in its most general sense, is the term applied to any one who is employed to do business for another. Factory differs from the mandate of the Roman law in not being gratuitous. In mercantile transactions, the sale of goods is generally effected either by factors or brokers, both of whom are agents, remunerated generally by commission. But the powers of factors are higher than those of brokers, inasmuch as the former are intrusted with the possession of the goods, and authorized to sell them as if they were their own; whereas the latter have no possession or apparent ownership, but act not only really but ostensibly as agents. Factors frequently act on the principle of the *del credere commission* (q. v.), receiving, that is to say, a higher remuneration in consideration of undertaking to guarantee the solvency of the purchasers. At common law, a sale or other transaction by a factor was bad, if it was not fully warranted by the nature of the authority which he derived from his principal; but this doctrine has been modified by several statutes which have been passed for the protection of strangers dealing with persons intrusted with the possession of goods, the extent of whose authority they had no means of ascertaining. By 6 Geo. IV. c. 94, called the *Factors' Act*, it was provided that any person in possession of a bill of lading is to be deemed the true owner of the goods therein described, so far as to give validity to any contract or agreement made with him regarding them. 7 and 8 Geo. IV. enacts that if any factor shall, for his own benefit, and in violation of good faith, deposit or pledge any goods, or order for their delivery, he shall be guilty of a misdemeanor. In 1842, the powers of 6 Geo. IV. c. 94 were defined and extended by 5 and 6 Vict. c. 39, which enacted that *bonâ fide* advances to persons intrusted with the possession of goods or documents of title, though known to be agents, should be protected; *bonâ fide* deposits in exchange were also protected, but it was provided that there should be no lien beyond the value of the goods given up. The agent's responsibility to his principal is not diminished, but it is provided that if he shall make consignments contrary to the instructions of his principal, he shall be guilty of a misdemeanor.

In Scotland the term factor is applied to an agent managing heritable estates for another, letting farms, drawing rents, and the like, in which sense it is nearly synonymous with the English *steward*, a term which, in Scotland, again, is employed to denote an agent whose powers are of a far more limited kind than those of a factor, and who generally acts under him. If a factor pay money into a bank on his own account, he takes the risk of the bank's failure.

A factor cannot delegate his powers, but he may employ a third party to aid him in their discharge. He binds his principal to any engagement which he contracts within his powers. Factory may be recalled, and falls by the death of the principal; but actions already begun may go on, and those done in ignorance of the revocation or death are binding. Revocation is implied in the appointment of a new agent to do the same act. The mandate of factory subsists notwithstanding the supervening insanity of the mandant. Factors may be empowered to grant leases and pursue removings, but for these acts special powers are required. Writers to the Signet in Edinburgh, and writers in country towns, frequently act as factors for the neighboring landed proprietors. In 1877 an Act was passed to remove doubts and amend the previous *Factors Acts* (1823—77). See **AGENT**; **JUDICIAL FACTOR**.

FA'CTORIES are establishments where large numbers of persons concur in the production of some article of consumption, the principle of the division of labor being in all cases applied, and generally machinery to a greater or less extent. The factory-system is opposed to the practice of individual labor at the homes of the artisans. Every production of art requires a longer or shorter series of operations, often varying considerably in their nature. The hand-worker performs most of these himself; one and the same person makes the complete article. In a factory, every article goes through as many hands or machines as there are sepa-

rate processes required; each workman performs only one, and that always the same, process. The chief advantages of this way of proceeding are the following: Loss of time is avoided in passing from one operation to another, a loss which is the greater, the greater the difference in the nature of the operation. The workman, confined to one thing, in itself usually simple, not only learns it sooner, but attains a quickness and skill that one distracted with a variety of operations can never attain; besides, the constant occupation with one kind of work leads the workman to light upon improvements in tools and machines so as to increase their rapidity of execution and their precision. As only few of the processes are very difficult, it is possible to turn to some account less skillful workmen, and even children, and to assign to each person that kind of work at which he is most effective. All parts of the work, too, that are quite uniform in the case of each article, can generally be done by machinery. Lastly, in factories, there is more opportunity of turning to advantage all kinds of refuse.

A necessary consequence of these advantages is, that the cost of production is less on the factory-system than in the other way; and more than that, the articles themselves, when of a nature adapted to this mode of production, are better, and of a uniformity otherwise unattainable.

Wherever a comparatively homogeneous material has to be made into a large number of uniform articles, there the factory-system is in its proper place. The best examples are spinning, weaving, cloth-printing, pin and needle making, &c. But even in the manufacture of complex articles composed of different kinds of material, the factory-system may be pursued with advantage whenever the number of the articles required is great, and the separate parts of such a kind that a great number can be made exactly alike. This is the case with watches, weapons, locks, &c. Such a manufacture divides itself into as many separate employments as there are parts in each article, and the putting together and adjusting forms another. The degree of complexity is carried still further in such cases as the manufacture of carriages, where operations of the most heterogeneous kind have to concur. In some cases, factories do not concern themselves with the putting together of the parts, but merely produce them for hand-workers and special professionalists, as is the case in watch-making. In making clothes and shoes and the like, where each individual article requires special adaptation, factory work is not so suitable. How far it is advisable in any case to employ machinery, depends on the nature of the work, the cost of the machinery, the scale on which operations are to be carried on, &c. Nowhere have the factory-system and the employment of machinery been carried further than in America. In Cincinnati, for instance, one establishment has produced 200 dozen chairs a week, another 1000 bedsteads, most of the work being done by machinery; and one boot and shoe factory has used 600 bushels of shoe-pegs. Even the killing of pigs is done on this grand scale, one firm at Chicago killing and packing 373,725 hogs in four months.—Factories cannot succeed in great numbers except in localities where the population is sufficiently dense to afford a sufficient choice of hands, and also to cause a comparatively low rate of wages. Other conditions of a good locality for factory production are abundance of water-power or the presence of coal for steam power, nearness to the raw material, and good communications.

While the rise and extension of the factory system, when looked at from the point of view of material economies, must be pronounced a decided improvement, it cannot be denied that, socially and politically considered, it has its dark side. The greater the capital and the training necessary for carrying on an extensive establishment, the less prospect the workman has of ever raising himself to independence. The chasm that separates the mill-owner from his dependants is infinitely greater than that which exists between a master artisan and his journeymen. The hope of gradual advancement afforded in the last case supplies a powerful moral support and means of discipline; the impassable gulf in the other acts as a stumbling-block and temptation. Factory-workers are especially disposed to enter heedlessly into marriage, as they require to make no provision for a workshop, tools, and other outlay once necessary for entering life; while they have the prospect of the wife, and soon of the children, as contributors to the support of the family.

It may, at all events, be affirmed, that the increase and accumulation in masses of the class called *proletaires*, who have no provision for a week but the labor of that week, is favored by the factory-system. Moreover, the employment of wife and child as fellow-laborers endangers the bonds of the family; the father can no longer remain master of the house of which he is no longer the sole support; and how much the family affection is thus weakened, is painfully exhibited in the ill-treatment of the younger children, who are prematurely put to labor. At the same time, it cannot be allowed that these evils are incapable of remedy; nor must it be forgotten that the evil is not peculiar to factory labor, but is a feature of the whole of our more recent in-

dustrial economies. The very circumstances that give rise to the evils afford the means of obviating them, if they were only taken advantage of; for, the larger the establishment, the more good can an owner do for his people, and the less it is possible to conceal abuses.

FACTORY ACTS. The development of the textile industries towards the end of the 18th century led to the employment of a great many children, sent by the Poor Law authorities from the southern agricultural counties to the water-abounding districts of Derbyshire, Nottinghamshire, and Lancashire. These children were so ill looked after, and the mills generally so overcrowded, that a Board of Health, appointed in 1796, attributed the prevalence of epidemic fevers about Manchester to this cause. The subject was taken up by the elder Sir Robert Peel, who in 1802 passed the Morals and Health Act. The introduction of steam led to the Cotton Mills Act of 1819, which fixed the working age of children at nine, and the working week for them as 72 hours. The Saturday half-holiday did not come until Sir John Hobhouse's Act of 1825. Richard Oastler, the 'Factory King,' was now spreading through the woolen districts of Yorkshire the agitation for the Ten Hours Bill. The Cotton Industry Act of 1831 may be called the first Factory Act; but it was carried out very imperfectly, the men being often compelled to support a fund, out of which the employers' fines were paid. Tom Sadler's Ten Hours Bill of 1832 was lost through the opposition of the manufacturers; and Lord Ashley's Bill, which restricted the working hours of adults, was met by the appointment, under Whig auspices, of a Royal Commission. The report of this Commission (1833-4) took the view of the capitalists, that such a restriction would so diminish production as to put them at the mercy of foreign competition. On its recommendations was based Lord Althorp's Act (3 and 4 Will. IV. c. 103), which first made the distinction between children and young persons, and began the system of working children in relays, so as to permit of daily education. A very singular division of political parties took place on the factory question at this time; the Chartists and the Conservative protectionists favoring the demands of the artisan class against the Whig capitalists and the Anti-Corn-Law League.

The first fruit of Lord Ashley's Children Employment Commission was the Mining Act, 5 and 6 Vict. c. 99, which prohibited work underground to women and boys under ten. The alternate day system (with an extension of the hours for schooling) was further developed in the important Factory Act of 1844. A uniform working day, from 6 A.M. to 6 P.M., with a fixed 1½ hour for meals, was at last established for all protected persons by the Act 13 and 14 Vict. c. 54. The children's working day was still regulated by the Act of 1844; and as this interfered with education under the 'alternate day' system, the anomaly was removed by the Act 16 and 17 Vict. c. 104. Manual work had been diminishing in many trades; and in 1861 several restrictions were placed on lace factories and on bake-houses. The next general movement, however, was entirely due to the great Commission of Inquiry, the appointment of which Lord Shaftesbury moved in 1861. Their recommendations were well received by the employers, who were now more alive to the advantages connected with sound sanitary conditions for labor. The pottery trade was first dealt with by the Act 27 and 28 Vict. c. 48. It was some time before the piece-work of pottery labor was adjusted to the 'half-time' system for children. The Commission also made thorough inquiry into the question of small shops and work-rooms used in connection with larger establishments. The metal (hardware) industry, the great machine manufactories, paper-mills, glass-works—all presented special evils; and many minor trades were found to be very much behind the factories under statutory regulation, the children requiring protection from the greed and brutality of their parents. It was, however, thought necessary to maintain the distinctions between factories and workshops, and accordingly the legislation which resulted from the Commission's labors took the double form of a Factory Act Extension Act, 1867, and a Workshops Regulation Act, 1857. Of these Acts it has been said: 'For the first time it was thereby declared, for the whole extent of the United Kingdom, that all work done for wages by young persons and women shall be placed under supervision and subject to distinct regulations.' Similar provisions were soon extended to cotton print, bleaching, and dyeing works by the Act 33 and 34 Vict. c. 62. The local authorities in England had shown so much opposition to the enforcement of the Workshops Act of 1867, that it became necessary to strengthen the hands of the inspectors by the Factory and Workshop Act, 1871. The rules relating to hours of employment and refreshment were further developed by the Act 37 and 38 Vict. c. 44; and the present state of legislation on the subject, under the Consolidation Act of 1878, is stated in the article **FACTORY ACTS**. It must be borne in mind that the success of the statutory supervision of labor depends greatly on the energy and wisdom of the inspectors, and that much of the good done in Great Britain is due to such men as Messrs. Redgrave and

Baker.—Among the authorities on this subject, besides the great Parliamentary reports of 1841-2, 1862-6, and 1875, may be mentioned Von Plenier's *Die Englische Fabrikgesetzgebung*, of which Mr. Mundella procured a translation in 1873; Engels, *Lage der Arbeitenden Classe in England*; Marx, *Das Capital*; Faucher, *Etudes sur l'Angleterre*; Alfred's *History of the Factory Movement*; Fielden's *Curse of the Factory System*; Sadler's *Factory System*.

In 1876 the Royal Commission on Factory and Workshop Acts reported that previous legislation had been to a large extent successful; and that, while some occupations were still undoubtedly unhealthy in spite of the sanitary regulations of these acts, the cases in which young children were employed in labor unfitted for their years, or in which young persons and women suffered physically from overwork, had become uncommon. The commissioners, however, had proposed large changes in the law, and in particular they proposed the consolidation of the law, which was then dispersed through fifteen statutes, one of them, passed in the year 1802, requiring all apprentices in cotton and woollen factories to be instructed in the principles of the Christian religion. This has been accomplished by the Factory and Workshop Act, 1878, 41 Viet. c. 16, which deals with five classes of works: (1) Textile factories, which remain very much under the regulations enacted by the Factory Acts of 1844, 1861, and 1874; (2) Non-textile factories, which include the occupations enumerated in the Factory Acts Extension Act, 1864, and the Workshops Act, 1867, whether using mechanical power or not, and also occupations, not named in these acts, in which mechanical power is used; (3) Workshops, or all unnamed occupations, in which mechanical power is not used, except those named in the acts of 1864 and 1867; (4) Workshops in which women above the age of eighteen are employed; (5) Domestic workshops, in which the work is carried on in a private house, room, or place in which the only persons employed are members of the same family dwelling there. In class (1), where power is used, and the large majority of workers are women and children, the highest degree of regulation is reached. In class (2), where the labor is not so hard, or the strain of attendance on the moving power not so heavy, the statutory hours of work are somewhat relaxed, but education and sanitary provisions are still compulsory. In class (3) registers of children and young persons, and certificates of age and fitness, are, except in special circumstances, dispensed with. In class (4), the hours for work and meals may be changed, and the sanitary authority is responsible for the sanitary state of the shop. In class (5), there is still greater elasticity as regards hours for work and meals; the Medical Officer of Health inspects the sanitary condition, but the employment of women is entirely unrestricted. The chief textile factories are those for the manufacture of cotton, wool, hair, silk, flax, hemp, jute, tow, China-grass, cocoa-nut fibre, or similar materials, either separately or in combination, or of any fabric made from these materials. The chief non-textile factories are print works, bleaching and dyeing works, earthenware works, lucifer match, percussion cap, and cartridge works, paper-staining works, fustian-cutting works, blast-furnaces, copper and iron mills, foundries of all kinds, metal and india-rubber works, paper mills, (including mills for converting cotton-waste into half-stuff), glass-works, tobacco factories, letter-press printing works, book-binding works, and flax scutch-mills.

The expression non-textile factory also includes any premises in which manual labor is exercised in making, repairing, altering, ornamenting, or adapting for sale any article, and in which the manufacturing process is assisted by mechanical power. A workshop, again, is any premises, room, or place where manual labor is exercised for these purposes, and to which the employer of the persons working there has the right of access, or over which he has a right of control. The following premises or places are considered to be non-textile factories, if they have mechanical power to aid the manufacturing process; workshops, if they have not—namely, hat works, rope works (where mechanical power is not used to draw and spin the fibres), bakehouses, lace warehouses (where the process is entirely subsequent to the making of lace on a lace machine), ship-building yards, quarries, and pit-banks (not under the restrictions of the Coal Mines Regulation Act.) A place used closely as a dwelling, a part of a factory used solely for some purpose different from the process carried on in the factory, and a school, are not considered to be workshops or factories. Straw-plaiting, pillow lace-making, glove-making, and some other handicrafts of a light character, may be carried on by a family in a private house or room, without fixing on the premises the legal liability of a workshop. Again, if the manual labor is exercised only at irregular intervals, and does not furnish the principal means of living to the family, the house will not become a workshop. The Act does not apply to persons merely engaged to repair machinery in a factory.

In considering the main provisions of the Act of 1878, it must be kept in view that a 'factory' means a place in which machinery is moved by the aid of steam, water, or other mechanical power; a 'child' means a person under the age of 14 years; a 'young per-

son' means a person between 14 and 18 years of age; a 'woman' means a woman of 18 years and upwards; 'parent' includes the person having the custody or control of any child; 'night' means the period between 9 P.M. and 6 A.M. The general sanitary provision applicable to all factories and workshops is, that they shall be clean, free from effluvia, not overcrowded, and ventilated so as to render harmless, so far as practicable, the gases, vapors, dust, &c. which are generated in the process and are injurious to health. Where anything is wrong, the factory inspector gives notice to the sanitary (local) authority. Every factory is to be lime-washed once in 14 months, unless painted in oil once in 7 years, when it must be washed once in 14 months. The inspector may order fans to be used where dust is generated by grinding, glazing, or polishing on a wheel. Special provision is made for the painting of bakehouses, and for the protection of workers in the wet-spinning process. The obligation to fence factory machinery in an efficient manner applies to every hoist or teagle near to which any person is liable to be employed, every fly-wheel connected with mechanical power, every part of a steam-engine and water-wheel, and every wheel-race. The inspector may also require the fencing of any driving strap, or band, or other part of machinery which he considers dangerous, or of any vat, pan, or other structure filled with hot liquid or molten metal so as to be a likely source of danger to the protected classes.

Children must not be set to clean any part of the machinery while in motion; as regards young persons and women, the prohibition extends only to mill-gearing. No work is to be done between the fixed and traversing parts of a self-acting machine while moved by mechanical power. The general rules for the employment of young persons and women in textile factories are 6 A.M. to 6 P.M., or 7 A.M. to 7 P.M., except on Saturdays, and on Saturdays, 6 A.M. to 12.30 or 1 P.M. (according to time allowed for meals), or 7 A.M. to 1.30 P.M. Two hours (one of them before 3 P.M.) must be allowed for meals on every day except Saturday, on which half an hour is sufficient. The employment is not to be continuous for more than $4\frac{1}{2}$ hours without an interval of half an hour for meals. The variations on these rules for young persons and women in a non-textile factory, and for young persons in a workshop, are that the minimum time for meals is reduced to $\frac{1}{2}$ hour, and the period of continuous employment is extended to 5 hours. As regards children in textile factories, they must be employed on the system of morning and afternoon sets, or on that of alternate days. Their morning set ends at 1 P.M., or dinner-time, if that is earlier; the afternoon set begins at 1 P.M., or after dinner, if that is later. The Saturday hours for children are the same as for others. Neither set is to be continued more than seven days, and no child may be employed on two successive Saturdays. Under the alternate day system, the hours for employment and meals are the same as for young persons. In workshops in which neither children nor young persons are employed, the hours for women are 6 A.M. to 9 P.M., with $4\frac{1}{2}$ hours for meals and absence for work; and on Saturdays, 6 A.M. to 4 P.M., with $2\frac{1}{2}$ hours for these purposes. As regards domestic workshops, the most important speciality is that the alternate system for children may not be used. The actual times for work and meals are not fixed, but overtime is prohibited, and the shops remain under the sanitary supervision of the local authority. The two points fixed by statute with reference to meals in factories and workshops generally are: That the three classes of children, young persons, and women must have their meals at the same hour; that during that hour none of them is allowed to remain in a room where the manufacturing process is being carried on. In every factory and workshop the period of employment, prohibitions, meal hours, and system of children's labor, must all be published in a notice put up within the premises. Employment of children under ten, and of any of the protected classes on Sunday, is prohibited. The occupier is also bound to give eight half-holidays in every year besides (in Scotland) the sacramental fasts. In trades carried on in connection with the retail business, the Home Secretary may authorize the giving of separate holidays to different classes of workers; and in other cases (e.g. in provincial towns where Saturday is the market day) he may substitute another week-day for the Saturday half-holiday.

A child, employed on the morning and afternoon set, must give one school attendance on each work day, and, if employed on the alternate day system, two attendances on each non-working day. The penalty is that the child cannot be employed in the following week before the deficiency in attendances has been made up. It is the duty of the employer to get every week from the teacher a certificate of attendance. He may also be obliged to pay to the school-manager a sum not exceeding 3d. a week, or one-twelfth part of the child's weekly wages. A child of 13, however, on obtaining a certificate of proficiency, will be treated as a young person. No child or young person under the age of 16, is to be employed in a factory for more than seven days without a certificate of the age and physical fitness granted after personal examination by the medical officer or certifying surgeon of

the district. When an accident occurs in a factory or workshop which causes loss of life, or prevents the person injured resuming work within 48 hours, notice must be given to the inspector and the medical officer or certifying surgeon, the latter of whom must go at once to the premises and report to the inspector on the nature and cause of the death or injury.

It is impossible to mention all the special restrictions which the Act imposes. For instance no children or young persons are allowed to work at silvering mirrors by the mercurial process, making white lead, melting or annealing glass. Children must not be employed in dipping lucifer matches, or dry grinding in the metal trade. Girls must not be employed in making or finishing bricks or salt. In glass and earthenware works and others, certain parts of the works must not be used for taking meals. The Home Secretary has power to extend such restrictions to other unwholesome occupations. Again, where the customs and exigencies of a trade require it, the Home Secretary may alter the hours of labor to 8 A.M. and 8 P.M. or even 9 A.M. and 9 P.M. Of the first class, lithographic printing, envelope making, biscuit making, and bookbinding are examples; of the second, the straw-hat making at Luton, and warehouses in London and elsewhere.

The administration of the Act is carried on by inspectors, appointed and paid by government. They have large powers of entering factories, work-shops and schools, of asking for documents, of examining persons on oath. A special warrant is required to enter a dwelling-house. The inspectors report to government annually. The certifying surgeons appointed by the inspectors are entitled to charge for their statutory duties certain fees, which are paid by the employer, but which he may deduct from wages.

FA'CULÆ (Lat. *facula*, a torch) in Astronomy, are spots, brighter than the rest of the surface, which are sometimes seen on the sun's disc. See **SUN**.

FA'CULTIES, COURT OF, a court established by 25 Hen. VIII. c. 21, s. 4, whereby authority is given to the Archbishop of Canterbury and his successors to grant dispensations, faculties, &c., by himself, or his sufficient and substantial commissary or deputy, for any such matters not being repugnant to the Holy Scriptures and the laws of God, whereof before such dispensations, &c., had been accustomed to be had at the see of Rome. Up to the time of passing this act, the pope, notwithstanding the statutes which had been passed restraining his authority, continued to exercise his power, and to draw a considerable revenue for indulgences, &c. The chief officer of the court is called *magister ad facultates*. The sittings of the court have always been held at Doctors Commons (q. v.). On its first institution, there were various matters in which the dispensing power was called into exercise—such as the power to hold two or more livings (see **PLURALISM**), and the permission to eat flesh in Lent, &c. But of late years the matter which has chiefly occupied the court has been the granting license to marry without publication of banns. See **LICENSE, MARRIAGE, DISPENSATION**.

FACULTY. See **UNIVERSITY**.

FACULTY, a name applied to certain aptitudes or powers of the mind, especially those of the intellect. Reid considered that the characteristic of a faculty was its *primitive* character, as opposed to the acquired powers, or habits. Sir W. Hamilton remarks on this distinction as follows: 'Powers are *active and passive, natural and acquired*. Powers natural and active are called *faculties*. Powers natural and passive, *capacities or receptivities*. Powers acquired are habits, and habit is used both in an active and passive sense.'—Reid, p. 221. Hence, in discussing the intellect, whatever are considered its primary or fundamental functions, are its faculties. Perception, Memory, Reasoning, Imagination, are the leading intellectual faculties, according to the older metaphysicians, who followed the popular classification. These would not now be considered as giving the ultimate analysis of the intellect. Conscience, or the moral sense, has sometimes been called the *moral faculty*. See **INTELLECT**.

FACULTY, GRANT OF, BY THE ORDINARY, an order by the bishop of a diocese to award some privilege not permitted by common law. A faculty is necessary in order to effect any important alteration in a church, such as the erection of a gallery or of an organ. Without a faculty, a person is not entitled to erect a monument within the walls of a church. But a monument having been put up, though without a faculty, cannot be removed till a faculty or order to that effect has been obtained. By the common law of England, every parishioner is entitled to a seat in church, but no one has a claim to any particular seat, unless the right has been given by a faculty. See **PEWS**.

FACULTY OF ADVOCATES. See **ADVOCATES**.

FÆCES, or SOLID EXCREMENTS, are the matters which an animal ejects from the lower end of the intestinal canal, and in greater part, consist of those portions of food which, on passing through the alimentary canal, have been rejected as compara-

tively worthless in the office of nutrition. In the higher animals, the faeces generally contain about three-fourths of their weight of water, the remaining one-fourth consisting, in greater part, of organic remains; in the case of the ox, sheep, and other herbivorous animals, of undigested woody fibre. In the human subject, the quantity of faeces yielded daily by an average healthy man is 5 to 6 ounces; the peculiar brown color is due to the presence of decomposing biliary matter, and the odor to partially changed nitrogenous substances resembling casein. The following table gives the composition of human and ox faeces:

Human.		Ox.	
Water.....	73.3	Water.....	70.00
Organic remains.....	7.0	Woody fibre.....	22.50
Biliary and nitrogenous matter.....	14.9	Wax.....	0.76
Albumen.....	0.9	Sugar.....	3.00
Extract.....	2.7	Albumen.....	2.00
Salts.....	1.2	Resin and Salts.....	1.74

For use as manure, these faeces are of little value as compared with guano, dissolved bones, or superphosphates, and indeed, the principal effete matters of importance to the agriculturist are resident in the urine or liquid excrement of the higher animals. In the case, however, of birds and reptiles, the urine and faeces are voided together more or less moist, and hence the richness of such excrementitious matter, and its high agricultural value. See **GUANO**. The following table gives the composition of the faeces of the boa constrictor:

Uric acid.....	90.16
Ammonia.....	1.70
Potash.....	3.45
Sulphate of potash.....	0.95
Phosphate of lime, &c.....	0.80
Mucus and coloring matter.....	2.94

100.00

FAED. JOHN, a popular Scottish painter, was born in 1820 at Burley Mill, in the stewartry of Kirkcubright, where his father was an engineer and millwright. His love of art was manifested at an early period, and when hardly entered on his teens, he was in the habit of making tours through the villages of Galloway, painting miniatures. In 1841, he came to Edinburgh, where his talents ultimately won him a high reputation. The first picture of F.'s that obtained great popularity was 'The Cruel Sisters' (1851). Since then, F. has executed, among other works, 'Shakespeare and his Contemporaries,' 'The Cotter's Saturday Night,' and 'The Soldier's Return,' and since coming to London in 1864, 'The Wappenschaw,' 'The Old Style,' 'Tam o' Shanter,' 'Haddon Hall of Old,' 'The Stirrup Cup,' 'John Anderson my Jo,' 'The Gamekeeper's Daughter,' and 'The Hiring Fair.'

FAED. THOMAS, brother of the preceding, was born at Burley Mill in 1826, and has also followed the career of an artist. One of his earliest efforts was a drawing (in water-colors) from the *Old English Baron*. In 1849, he became an Associate of the Royal Scottish Academy, and shortly after executed a very attractive work, entitled 'Scott and his Friends at Abbotsford.' In 1852, he removed to London, where his 'Mitherless Bairn,' exhibited in 1855, was declared by the critics to be 'the picture of the season.' Of his subsequent works, we need only mention 'Home and the Homeless,' 'The First Break in the Family,' 'Sunday in the Backwoods,' 'From Dawn to Sunset,' 'Baith Faither and Mither,' and 'The Last o' the Clan.' F. was made A.R.A. in 1859, R.A. in 1864, and elected an honorary member of the Vienna Royal Academy in 1875.

FÆ'NZÀ, a town of Italy, 20 m. S.W. of Ravenna, is on the left bank of the Lamone, in a beautiful plain. It is built in the form of a square divided by four great streets, which meet in the center. Among the chief buildings are an imposing cathedral, a fine market-place surrounded with arcades and adorned with a fountain, and numerous palaces and ecclesiastical edifices. Its manufacture of glazed and colored earthenware vessels, in Italy called 'Majolica,' and in France 'Faience' (q. v.), has declined in importance, and its chief industry now is the making of silk, linen, and paper. Pop. (1872) 36,299.

F., the ancient *Faventia*, was at one period a town of the Boii, was afterwards a *municipium* under the Romans, and was annexed to the States of the Church in the 15th c. by Pope Alexander VI., in which condition it remained till 1860, when, with the Emilia provinces, it was annexed to the kingdom of Italy under Victor Emmanuel.

FÆGGING is the name given to a usage peculiar to the great public schools of England, the nature of which will be presently described. The origin of the practice cannot be traced. No school statutes refer to it, no school traditions speak of a time when it was not. The statutes of Eton College rather indicate precautions against it, for they ordain that there be thirteen poor

youths in the establishment to work for the college; but in Edward IV.'s time the college was much impoverished by royal depredations—the fellowships were cut down from ten to seven, and these *pauperes juniores* abolished. However, be the origin what it may, the institution, as we have said, exists, and in very nearly the same form, in all the public schools—that is to say, Eton, Harrow, Westminster, Winchester, and Rugby. Its main features are in every case much as follows: In each school there are two limits: the upper limit extending to the bottom of the first one or two forms (the public school designation of classes), below which a boy may not fag; and the lower limit, comprising the last four or five of the lowest forms, above which a boy may not be fagged. The boys between these limits, as also those who, although comprised within the lower limit, have been more than a certain time in the school, are devoid alike of rights and duties in connection with this practice.

The services of a fag are two kinds—the one comprising his duties to a special master, to whom he has been assigned; the other consisting of those due to the whole of the upper boys. The former comprise such tasks as preparing his master's breakfast, stoking his master's fire, carrying his master's messages, and smuggling into the house little forbidden delicacies for his master's consumption, and in this instance, if detected, bearing his master's punishment. Those services which a lower boy owes to the whole of the upper boys, consist of attendance at the games. In the cricket season, the fags perform the functions of a net, and stand behind the wickets to stop the balls while their seniors are practicing; and at all seasons they are liable to the drearier task of waiting attendance on the racket-players, and retrieving the balls which have been 'skied' out of the court. All cases of difficulty arising out of fagging are within the jurisdiction of the head-boy in the house, or the head of the school, and are settled by reference to him. Such are the main features of fagging at the present day—the idea pervading the institution being, that no boy should be liable to the performance of any duties really menial, but only such as, in the absence of the practice, would naturally be performed by each boy for himself. Many of the abuses of this practice which have from time to time been discovered and suppressed, afford whimsical illustrations of the peccant ingenuity of boy-nature. In one school, a senior boy once had a study, but was not studious; he might have let it out to a younger boy in want of a crib to read in at a rent of some five or ten shillings a term, but his mind soared beyond such paltry dealings; he conceived vaster and grander ideas of the management of his property: he set up a tap. He smuggled into his room a nine-gallon cask, called a 'governor.' There was a rapid succession of governors, and a brisk demand for beer; so he appointed his fag, a fine, stout lad, as deputy-tapster to receive the coppers. The deputy grew attached to both his governors, and flourished long and happily in the faithful discharge of his duties. Another instance consisted of an equally whimsical and widely different exercise of power. A sixth-form boy, of High Church principles, made his fags, two very nice well-conditioned young scholars, get up early and come to his room every morning before school for prayers.

So prominent a feature in the constitution of English public schools as the institution of fagging, has, of course, received much criticism from educational reformers. The well-known author of the letters from Paterfamilias to the *Cornhill Magazine*, himself an Etonian, and one of those rare instances of a public-school man dissatisfied with the recollections of his school-life, speaks of the practice with the greatest bitterness. 'Fagging,' says he, 'now happily almost obsolete, was also based upon the breeches-pocket question. I used often to doubt, when called off from my studies, whilst a lower boy at Harehester, to mend my master's fire, to prepare his meals, or to brush his clothes, whether a system which permitted and upheld such practices could really be beneficial to him or to me; but I never had any doubt that it was very beneficial to our tutor, inasmuch as it spared him the wages of some two or three servants whose menial work was performed by the lower boys.'

'Of course, the ingenuity of our masters discovered plenty of excellent arguments in support of practices so convenient to themselves; our parents used to be told that carrying coals for the upper boys, and toasting their muffins, made us helpful and docile, and took the nonsense out of bumptious lads; but such arguments would have applied just as aptly towards establishing the propriety of setting young noblemen and gentlemen to assist the scullion, or to sort out the dirty linen for the wash.' These are certainly sharp words, but doubtless many persons may be found to sympathize with a great deal of the censure contained in them. They will tell us that much vigilance is necessary to prevent the abuse of the power of exacting casual service on the part of the senior boys, and that the rules of fagging, such as they are, give no adequate security against serious vexation and waste of a small boy's time. They say that the favorite apology, on the ground of its taking the conceit out of those who have

been spoiled at home, is fallacious; that football and parsing are sufficient curatives of this evil tone of mind; and that if the necessity to render service to a senior takes the conceit out, the subsequent privilege of the early exercise of power only too rapidly pours it in again. They deny, also, the validity of one very favorite assertion of the upholders of the system, that the relation between master and fag often, and indeed generally, gives rise to very pleasant intimacies between the upper and the lower boys, and intimacies very beneficial to the latter. On the contrary, they maintain that no case of attachment between master and fag can be pointed to which would not have existed under any circumstances, and that this relation may often be found to have marred what would otherwise have been a very friendly recollection. The advocates of the system tell us, on the other hand, that the attendant evils are greatly exaggerated, and in some cases purely fictitious, while it is in many respects of very great, if not essential, service to the existence of a public school. They deny that it has been originated and upheld by the tutors from purely commercial considerations, as asserted by Paterfamilias; for, as has been already said, no really menial services are exacted of any boy, but only such as each boy might reasonably be expected to perform for himself, inasmuch as, in point of fact, many men at the university—not choosing or not being able to afford a gyp—do really prepare their own breakfast, stoke their own fires, and go on their own errands. That while abuses do occasionally occur, everything is against the probability of their frequency or extent, as the utmost facility exists on the part of the juniors for bringing their grievances before the proper authorities, and obtaining speedy redress. They say that, as a fact, the services of a fag are so light that he does not care or think about them, and they appeal in support of this statement to the tone in which the boys themselves are in the habit of referring to the subject. See the *Etonian*, a periodical published by some Eton boys 30 or 40 years ago; and the *Triumvirate*, a similar and more modern periodical from Harrow School. But the principal argument in the defence of the system must always rest, its supporters tell us, upon the security afforded by it against bullying.

In public schools, where the ages of the boys vary from ten to twenty, a much greater liberty is given to the boys, and much greater confidence is reposed in them, than in private schools—the idea being, that their characters can only be truly formed by as unrestricted intercourse as possible among themselves, not hampered by the constant presence of a superior. This constant presence of a master is, therefore, replaced by the traditions and constitution of the school, in which each boy has his assigned position, and his definite rights and duties; a constitution, therefore, which each boy feels a personal interest in upholding. Such a society necessarily requires a provision for the relation between older and younger boys, between the weaker and the stronger; for, in the absence of this, the ordinary aspects of barbarism would be presented, and brute force be alone predominant. Such a provision, acceptable and intelligible to the boys, and reasonable in itself, is believed to be found in the fagging system. By this system, it is affirmed, provision is made alike for the claims of age and intellect, inasmuch as it is scarcely possible that any very stupid boy should fag, while no very old boy ever can be fagged.

These are the chief features of the fagging system at public schools, and the principal arguments for it and against it. See PENNANISM.

FA'HRENHEIT, GABRIEL DANIEL, the improver of the thermometer, was born at Danzig about the end of the 17th c., and was originally designed for the commercial profession. His inclination for natural philosophy induced him to quit that business, and having traveled through Germany and England for the purpose of enlarging his knowledge, he settled in Holland. In 1720, he first conceived the idea of using quicksilver instead of spirits of wine in the construction of thermometers by means of which the accuracy of the instrument was very much improved. See THERMOMETER. In 1724, F. was elected a Fellow of the Royal Society of London; and the *Philosophical Transactions* of that year contain several papers by him on points in natural philosophy. He died in 1740.

FAIENCE, or FAYENCE, a general term for all sorts of glazed earthenware and porcelain. The origin of the name is disputed. Some derive it from Fayence, a small town of Provence, others from Faenza, a city of Italy; while certain writers consider that the isle of Majorca is at least the place where it was originally manufactured, in proof of which they appeal to the fact, that the Italians still call Faience *Majolica* or *Mayolina*.

FAI-FO, a seaport of Anam (q. v.), is one of the more considerable marts of the empire. It stands on a river near its mouth, communicating with Turon, 15 miles to the north, by means of a canal. It exports sugar and cinnamon, its principal trade being with China. It contains 15,000 inhabitants, who are mostly Buddhists.

FAINEANTS ROIS (the 'Do-nothing Kings'), the sarcastic designation of the later Merovingian sovereigns of France, under whose name the famous Mayors of the Palace really governed the country. The first of the Do-nothing Kings was Thierry III., nominally monarch of Burgundy, Neustria, and Austrasia; the others were Clovis III., Childbert III., Dagobert III., Chilpéric II., Thierry IV., and Childéric III. The last of these was dethroned in 730 A.D., and he being shut up in monastery, Pepin le Bref, Mayor of the Palace, caused himself to be formerly proclaimed king. This was the end of the Merovingian dynasty; it is curious that Louis V., the last of the Carolingians, and a descendant of Pepin le Bref, also received the contemptuous epithet of *Fainéant*, as those monarchs had who were dethroned by his ancestors.

FAINTING, or **SYNCOPE** (Gr. *syn*, and *kopto*, I fall down), is a condition in which, from a sudden mental or bodily impression, the circulation of blood is temporarily arrested or very much diminished in force and volume, the respiration and the functions of the nervous system being likewise suspended. The indications of fainting to a bystander are chiefly a sudden pallor, accompanied by loss of power over the limbs, with disappearance of the pulse and movements of respiration; the eyes are commonly half open or closed, the countenance bloodless, but quite at rest, and not indicative of suffering or disturbance; the flaccid, motionless condition of all the limbs also tends to distinguish simple fainting from epilepsy, and the other diseases attended with spasm; whilst the vanishing of the color, and the suppression of the pulse, make a marked distinction between fainting and Catalepsy (q. v.), and other forms of Hysteria (q. v.); with which disorders, however, fainting may in some cases be associated. The mode of origin of fainting, and the study of its phenomena, alike lead to the conclusion that it is primarily an impression upon the nervous system, very much of the same nature as the Collapse, or shock of a severe bodily injury; this reacts, in the first instance, on the heart, and through the circulation on all the other functions of the body. Fainting may end in death, if too prolonged, or if associated with disease of the internal organs, and especially of the heart; hence a particular variety of fainting has been separately studied, and named *Syncope anginosa*, or otherwise *Angina pectoris*. See **HEART, DISEASES OF THE**. Ordinarily, a person who faints from mental emotion, a hot and close atmosphere, or other transient cause, is readily restored by being laid on the back with the head low, and surrounded by abundance of cool fresh air. Any tight articles of dress should be loosened, and a stream of cold air, or a little cold water, should be directed to the face and neck, so as to rouse the respiratory movements. It is common, also to apply ammonia or aromatic vinegar to the nostrils; but a more effective way of exciting the respiration is to compress the ribs, and allow them to expand again alternately, so as to imitate the natural movement. Care should be taken to ascertain that there is no obstruction in the throat or air-passages, as suffocation from mechanical causes has been mistaken for fainting, and the real origin of the mischief overlooked, with fatal consequences. Should all other means fail, Galvanism (q. v.) will sometimes succeed in restoring the respiration and heart's action.

FAIOM. See **FAYUM**.

FAIR. See **FAIRS**.

FAIR or **BENMORE HEAD**, a promontory of the north coast of Antrim, Ireland, opposite Rathlin Isle, which is four miles to the north-west. It rises 636 feet above the sea. The lower 300 feet consists of carboniferous strata, overlaid by greenstone columns, 20 to 30 feet thick, and rising 280 to 300 feet high. It is perpendicular to the sea, but slopes to the land. The table-land on the top is covered with rich pasture, and presents fine views of the neighboring coast, Rathlin Isle, and the Argyleshire Highlands, 16 m. distant. On the promontory are two small lochs, 500 ft. above the sea.

FAIR ISLE, a solitary isle in the Atlantic, 25 m. S.S.W. of Shetland. It is 4 by 2½ m. in extent, and rises 708 feet above the sea, with high rocky cliffs and promontories. It affords copper ores, and hand-shaped sponges, called 'trowie gloves.' Pop. (1871) 226, chiefly fishers. At Stromceiler Creek, was wrecked, in 1588, the Duke of Medina Sidonia, admiral of the Spanish Armada. He escaped, after most of his crew were murdered. From the Spaniards on this occasion, the natives of Fair Isle acquired a knowledge of the art of making woollen articles, such as caps, mittens, and stockings, in divers colors, the preparation of which is still a staple employment in the island for the purposes of export.

FAIRBAIRN, SIR WILLIAM, Bart., was born at Kelso, in Roxburghshire, in 1789. Having learned a little reading, writing, and arithmetic at the parish school of Mullochy, in Ross-shire, and afterwards got some six months' instruction from an uncle, he was apprenticed to an engine-wright at Percymain Colliery, North Shields. When his apprenticeship terminated, F., wrought for two years in London, and then visited many places in England,

Wales and Ireland, working a short time at each, in order to observe the various practices of different localities. Eventually, he commenced business on his own account in Manchester in 1817. It was a struggle in which, without money or connections, only great abilities and perseverance would have succeeded. The first great improvement introduced by F. was the substitution of iron for wood in the shafting of cotton-mills, and the substitution of light for heavy shafting where metal was already in use. This exchange economized the cost of machinery, and enable the motion to be speeded from 40 to 160 revolutions per minute. F. was amongst the earliest of the iron ship-builders, and has originated various improvements in their construction. The firm has built more than a hundred vessels, varying from the smallest size up to the war-frigate of 2600 tons.

In 1834—1835, F. and Mr. E. Hodgkinson were invited by the British Association for Advancement of Science to seek out the cause of certain supposed defects in the iron produced by hot-blast furnaces, and a very interesting report thereon appears in the *Transactions* of the Association. Nearly at the same time, F. tested the strength of the various kinds of iron of Great Britain, the report of which appears in the *Transactions* of the Philosophical Society of Manchester, and contains much useful information for engineers. Another report, published in the *Transactions* of the Royal Society, gives the tenacity of boiler-plates of various thicknesses, and determines the best mode of riveting. He also made a long series of experiments on the resistance of hollow tubes or cylinders to collapse from outward pressure, leading to valuable practical results.

The first idea of a tubular bridge across the Menai Strait is due to Robert Stephenson, but its realization is due to F. more than to all other men. Stephenson's idea was a circular tube, supported by chains; but the Britannia and Conway bridges are rectangular structures, strengthened by a series of cells at the top and bottom, and without chains or any other support from pier to pier. The present form results from a long series of experiments upon model tubes—circular, egg-shaped, and rectangular, which were conducted entirely for a long time by F., and latterly with the aid of Mr. E. Hodgkinson, as a mathematician, to deduce a law from the tabulated results of experiments. F. erected more than a hundred bridges upon this principle. See **TUBULAR BRIDGE**. F. was a Fellow of the Royal Society; Corresponding Member of the Institute of France, and of the Royal Academy of Turin; LL.D. of Edinburgh; was president of the British Association for the Advancement of Science, 1861—1862; was a chevalier of the Legion of Honor; and was created a baronet in 1869. His son Thomas was chairman of the Art Treasures Exhibition at Manchester, 1857; was a Commissioner for the Exhibitions of 1851 and 1862; was high-sheriff of Hampshire, 1870; and was in 1857 offered the honor of knighthood, which he declined. F., amongst other works and papers, published: *On Canal Steam Navigation*; *The Strength and other Properties of Hot and Cold Blast Iron*; *The Strength of Iron at Different Temperatures*; *The Strength of Locomotive Boilers*; *The Effect of Repeated Meltings on the Strength of Cast Iron*; *The Irons of Great Britain*; *The Conway and Britannia Tubular Bridges*; *Useful Information for Engineers*, 1st, 2d, and 3d series; and *A Treatise on Mills and Mill-work*. He died in August 1874. See *Life of Sir William Fairbairn, Bart.*, by W. Pole (London, 1877); and Smiles' *Lives of the Engineers*.

FAIRFAX, EDWARD, the translator of Tasso's *Jerusalem Delivered*, was a natural son of Sir Thomas Fairfax of Denton, in Yorkshire. The year of his birth is not known. He spent his life at Fyeston, in the forest of Knaresborough, in the enjoyment of many blessings which rarely befall poets—competence, ease, rural scenes, and an ample command of the means of study. F. was alive in 1631, but he is supposed to have died shortly after. His celebrated translation of Tasso was made in the reign of Queen Elizabeth, to whom it is dedicated. The first edition bears the date of 1600. For poetical beauty and freedom, it has been the theme of universal praise. Dryden ranked F. with Spenser as a master of English, and Waller said that he derived from him the harmony of his numbers. F. also wrote a treatise on *Demonology*, in which he was a believer—a credulity which was probably of no little use to him in the translation of a work full of the machinery of enchantment. Hence Collins says regarding him—

Prevailing poet, whose ndoubting mind
Believed the magic wonders which he sung.

This treatise is still in manuscript.

FAIRFAX, THOMAS, LORD, general of the parliamentary troops in England during the civil wars under Charles I., was the son of Ferdinand, Lord Fairfax, and was born in 1611, at Denton, in Yorkshire. He studied at St. John's College, Cambridge, and afterwards served as a volunteer in Holland, under Lord Vere, whose fourth daughter, Anne, he married shortly after his return to England. On the outbreak of the civil war in 1642, F. warmly espoused the cause of the parliament, and was appointed

cavalry-general under his father, who commanded the parliamentary forces in the north. He distinguished himself so much by his valor, prudence, and energy, that in 1645, when the Earl of Essex resigned his office of general of the parliamentary forces, F. was appointed in his room. In a short time, Cromwell, who had been appointed lieutenant-general, obtained unbounded influence over him; and from this time, although nominally head of the parliamentary forces, he really played a secondary part. At last, in June 1650, he refused to march against the Scots, who had proclaimed Charles II. king, and Cromwell was appointed commander-in-chief in his stead. F. now withdrew into private life, and did not come forward again until after the death of Cromwell, when he showed a zeal for the restoration of the king, gathered troops for that purpose to assist General Monk against Lambert; and was appointed one of the delegates despatched to the Hague in 1660 to promote the return of Charles II. He died at Bilburgh, near York, 12th February 1671. F. had a slight turn for literary pursuits, and wrote several works, prose and poetic; among others, one entitled *Short Memorials*, which was published in 1699.

FAIRIES, ELVES (Ger. *elbe*, or *elfe*; Sw. *elf*; Dan. *ellefolk*; Old Norse, *alfr*; all allied apparently to Lat. *alb(us)*, white, and signifying a bright, benign spirit; Fr. *fée*; Ital. *fata*), supernatural beings, generally of diminutive size, a belief in whom has been among the superstitions of the greater portion of the European nations. The etymology of the word *fairy* is doubtful; some derive it and the Fr. *fée* from a Celtic word *faer*, to charm or bewitch; others associate the Fr. *fée* and the Ital. *fata* (a friendly goddess or spirit) with Lat. *fatum*, fate; others, again, trace *fairy* to the *peri* of the Persians (pronounced *feri* by the Arabians), holding it to have been brought to Europe by the Crusaders. Be this as it may, the Celtic fees or fairies are undoubtedly relics of those *matres* and *matronæ*, which appear on Gallo-Roman inscriptions as objects of popular belief. After the transfusion of the Teutonic and southern nations, the northern elves (which were originally of two kinds—the light elves, or elves proper, and the dark elves, or dwarfs) became mixed up with their Celtic kindred the fairies in inextricable confusion.

It is generally difficult to give any scientific definition of the nature of a superstition, because its phenomena are continually varying according to time, place, and other conditions. The fairy superstition especially defies definition, because it was the peculiarity of the creatures to whom it referred that they followed no regular law, human or divine, but obeyed the impulse of their own caprice; hence every fairy tale differs from another.

Still, there are distinctions and specialities that can be made out from the examination of a large number of these narratives. In the first place, the superstition peculiarly belongs to modern Europe. We find nothing like it among the idolatries of the heathen referred to in Scripture, nor does the word occur in the English Bible, or its equivalent in the original texts. In classical mythology, there is nothing nearer to it than the nymph of the fountain or grove among the Greeks. In the next place, it may be determined that the varieties in the superstition correspond, in some measure, with those of the physical geography of the districts in which it prevails. In those parts of the world where there are mountains, mists, dangerous morasses, cataracts, and stormy oceans, all superstitions, being a belief in supernatural agencies, are naturally exaggerated, and, from the dangers to which the people are liable from the agencies they deem supernatural, the belief takes deep root in their minds. Accordingly, in flat and well cultivated countries like England, the fairy superstition is simple and homely, connecting itself with matters of domestic routine, such as the sweeping of the dwelling-house, the skimming of the milk, the preservation of the butter, and the like; while in Scandinavia and the Highlands the fairy people are connected with storms and convulsions, betray people to their death, fly away with them into the infinite cloud-land, or lead them through endless caverns within the earth. It has been observed, as a further distinction, that the fairies of the German or Teutonic tribes are more harsh, fierce, uncomely, or deformed than those of the Celtic nations, which have a tendency rather to the aerial and the graceful. Still, there is so great an amount of common characteristic in the superstition throughout Europe, and its peculiarities have been found so much more emphatically displayed in Scandinavia than elsewhere, as to have suggested to some the view, that the superstition is a remnant of the old mythology of the northern nations, communicated by them to a greater or less extent in all the countries over which their vikings carried their ravages.

There is a further distinction—at least in this country—between the fairies of poetic and heroic literature and those of popular belief—the former being princes and princesses of chivalry, only distinguished from human beings by their superhuman superiority in all the qualities which elicited respect in the age of chivalry; while those of popular belief are small in stature, sometimes de-

crepit, and endowed with dispositions generally more allied to malignity than magnanimity. It is common to all classes of them to be deemed under the condemnation of the religion of the gospel, and to be either conditionally or unconditionally excluded from the abodes of the righteous in the next world.

In Ireland and the Highlands, they have been spoken of as a wandering remnant of the fallen angels. It is sometimes a symptom of geniality and kindness in a people when their fairies are supposed to be capable of earning their own redemption. Sometimes they are supposed to be human beings, metamorphosed or disembodied, and this form of the superstition has made fairyland a place of purgation for those whose sins have condemned them to it. The analogy is carried out in the belief that the services of the living can extricate the souls so situated; but it is rather through dexterity and courage than pure piety that the feat is achieved, and the rescues from fairyland form some of the most wild and exciting of the elfin narratives—as, for instance, the strange, wild ballad of *Tamlane*.

There is still another broad distinction into those that dwell in the upper air and those that dwell within the bowels of the earth, while a third class frequent the waters. The surface of the earth on which mankind reside is not deemed the proper place of any class except on special occasions. The Scandinavians called the fairy inhabitants of the air white elves; those of the earth, black. Whatever was genial, light, playful and benevolent in the superstition, clustered round the former; the latter did all the work that was dark, cruel, and rapacious. Naturally enough, the black or subterranean kind frequented mining districts, where they might be seen extracting the ore for themselves, and thus unwittingly leading the miner to rich veins of metal. They might be seen in an occasional peep through an aperture of a hill in their underground retreats, in chambers supported on jasper columns, where they were stowing away their hampers of gold and silver—for they were generally held to be very affluent. Some of the most exciting tales about the German gnome, and the Irish leprechaun, who was a creature of the same kind, are founded on the efforts of adventurous mortals to get possession of their riches. There exists a legend, occurring in nearly identical terms in several countries, which connects some piece of valuable plate belonging to a church with the underground fairies. The story of the horn of Oldenburg is a type of these narratives. The pictures of it represent it as a beautiful drinking vessel, in the shape of a horn, exquisitely decorated with the finest fanciful silver-work, in the style contemporary with the richest Gothic architecture. The legend is, that one day, Otho of Oldenburg, being exhausted with hunting, and very thirsty, exclaimed: 'O God, would that I had a cool drink!' Thereupon there appeared before him, as if coming out of the rock, a lovely maiden, who offered him a drink in the fairy horn. He made off with it, and saved himself from evil consequences by bestowing it on the church. Hence these relics are generally in churches; but one of them is, or lately was, in the possession of an English family, and as their prosperity was traditionally believed to depend on retaining it, it was called 'The Luck of Eden Hall.'

Puck and the pixies belong to the same class of beings. Of the ell-folks of Scandinavia, the male is old and ill-favored, but the evil element in the ell-woman or ell-maid consists in her beauty, which enables her to be very dangerous to foolish young gentlemen, whom she waylays either by her own proper charms, or by personating the objects of their affections.

In Ireland, and also in the border country of Scotland, the fairy superstition has been the theme of innumerable poetic legends and mystic traditions. T. Crofton Croker, in his *Fairy Legends and Traditions of the South of Ireland*, 3 vols. 1828, presents a full and amusing account of the Irish fairies or elves, which he describes as 'a few inches high, airy, and almost transparent in body; so delicate in their form that a dew-drop, when they chance to dance on it, trembles indeed, but never breaks. Both sexes are of extraordinary beauty, and mortal beings cannot be compared with them.' They do not live alone, or in pairs, but always in large societies, and are governed by a queen. The same author adds: 'They are invisible to man, particularly in the day-time, and as they can be present and hear what is said, the peasantry never speak of them but with caution and respect, terming them the good people, or friends. They have their dwellings in clefts of rocks, caves, and ancient tumuli. Every part within is decorated in the most splendid and magnificent manner; and the pleasing music which sometimes issues from thence in the night, has delighted those who have been so fortunate as to hear it.' There are Irish fairies, however, of more special character. Among these are the Banshee, or female spirit who watches a particular family; the Cluricaune, an elf of evil disposition, who usually appears as a wrinkled old man, and has a knowledge of hidden treasure; and the Phooka, a spirit of diabolical disposition, who sometimes appearing as an eagle or a black horse, hurries the person he gets possession of to destruction. Of similar varieties are the Scottish elves: the Brownie, or domestic spirit

nearly corresponding to the Banshee; the Kelpy, a kind of water-horse, being little different from the Phooka; and the Cluricaune being as regards figure somewhat analogous to the being sung by Leyden in his charming ballad, 'The Court of Keilder' (*Minstrelsy of the Scottish Border*):

'Brown dwarf, that o'er the muirland strays,
Thy name to Keilder tell!
'The Brown Man of the muirs, who stays
Beneath the heather-bell.'

According to Irish as well as Scottish fairy superstition, the elves, though in the main harmless, or at most tricky, have had the bad reputation of stealing away young children from the cradle, and substituting for them a changeling who bears a resemblance to the stolen infant, but is an ugly little creature and never thrives. On this theft of a female infant, who is carried to Fairyland but in the course of years returns to her parents, James Hogg founded his fine ballad of 'Kilmeny' (*Queen's Wake*). It need hardly be added, that in the progress of general intelligence, the fairy superstition has disappeared in Scotland as well as in the greater part of Ireland, and now is as little a matter of credence as is the belief in England of that useful drudging fiend, Robin Goodfellow. Besides being embalmied in imaginative literature, the fairy has a perpetual memorial in the small exquisitely shaped arrow-heads found so abundantly in northern countries, where they were long known as elf-arrows, or bolts with which the more malignant fairies sometimes slew or injured cattle and human beings; thus, when a poor man's cow or heifer was suddenly affected with some deadly and incomprehensible illness, it was said to be 'elf-shot.' See ELF-ARROWHEADS.

For the most comprehensive account in the English language of the various shapes assumed by this superstition, the reader is referred to *The Fairy Mythology*, by Thomas Keightley.

FAIRS (Fr. *feire*, from Lat. *forum*, a market place, or *feriæ*, holidays), great periodical markets, some of which are chiefly devoted to one kind of merchandise, while others, of a wider scope, afford opportunity for most of the sales and purchases of a district. Fairs have long been regularly held in most parts of Europe, and in many parts of Asia; but as they belong rather to a state of things which is passing away, than to modern civilization, they have not been established or have not acquired the same importance in America. In Europe, they appear to have originated in the church festivals, which were found to afford convenient opportunities for commercial transactions, the concourse of people being such as took place upon no other occasion. This origin of fairs is commemorated in their German name *Messen*, which is derived from the word employed to denote the most solemn part of the church service. See MASS. Some festivals, from circumstances of place and season, speedily acquired a much greater commercial importance than others, and began, therefore, to be frequented by buyers and sellers even from remote parts of the world. When the ordinary means of communication between countries and of the exchange of commodities were very limited, fairs were of great use. Princes and the magistrates of free cities found it to their advantage to encourage them, and many privileges were granted to them, which in some places still subsist. Courts of summary jurisdiction—commonly called *pie poudre*, from the dusty feet of the suitors—were established distinct from the ordinary courts of the county or city, for the determination of questions which might arise during the fair. In connection with all this, the practice was necessarily adopted of publicly proclaiming the commencement and duration of the fair, and this still subsists where scarcely any other vestige remains of the old privileges of fairs, and where they have ceased to be of any real use to the community, and might, perhaps, with advantage to all the interests of society, be now abolished, as in the case of some of the annual fairs still held in the great cities of Britain.

In Western Europe, the goods exposed for sale at fairs are chiefly those in respect of which there is a frequent change of fashion. Provisions are seldom an article of merchandise in them; and while in some parts of the continent persons of all ranks still wait for the great yearly fairs to make their principal purchases of clothing and of manufactured articles of every description—such things as corn, wine, spirits, tea, coffee, sugar, tobacco, oil, &c., are seldom seen in them. It is otherwise, however, in places on the outskirts of civilization; and almost all the produce of great provinces is sold, and all that their inhabitants require is bought at such fairs as those of Kiachta and Nishnij-Novgorod.

The British fairs really of much use at the present day are chiefly those at which cattle are exposed for sale: of these some held on the borders of the Scottish Highlands, and elsewhere in Scotland, are frequented by buyers and sellers from all parts of the kingdom, and bring together the breeders of cattle and the graziers, by whom the animals are to be fed for the butcher. Such are the fairs or trysts, as they are called, at Falkirk, Donnie, Edinburgh, &c. At other great yearly fairs in the south of Scotland, lambs and wool are sold; and fairs chiefly for the sale of

the annual produce of pastoral districts are common in almost all parts of the world.

The greatest fairs in the world are the Easter and Michaelmas fairs at Leipzig. These are not to be confounded with the Leipzig Book-fair, which is chiefly an occasion for the settlement of accounts among booksellers and publishers. Next to the Leipzig fairs, those of Frankfurt-on-the-Maine are the most important in Germany. The fairs of Frankfurt-on-the-Oder, and of Brunswick in Germany, of Zurich in Switzerland, Pesh in Hungary, Sinigaglia and Bergamo in Italy, Beaucare and Lyon in France, and Nijni-Novgorod (q. v.) in Russia, are among the most important in Europe. After the great fairs of Leipzig, that called the Fair of St. Peter and St. Paul at Nijni-Novgorod is the greatest in the world, and is frequented by buyers and sellers from different parts of Europe, and of Northern and Central Asia. The fairs of Tanta in Upper Egypt, of Kiachta in the south of Siberia, of Irbit, also in Siberia, of Mecca in Arabia, and of Hurdwar in Western India, are also of very great importance, and are the most considerable fairs out of Europe. That of Kiachta is a sort of barter-market, where almost all the commercial transactions between the Russian and Chinese empires take place. The fairs in Britain have latterly sunk for the most part to insignificance, and in many instances have entirely disappeared. They were gatherings adapted to a comparatively backward state of society, when the provincial stores of goods were few, and the means of communication defective. The prevalence of good roads, populous towns with dealers in miscellaneous wares, and other tokens of advancement, have superseded the necessity for the ordinary class of fairs, and in consequence they have in some cases degenerated into scenes of merriment, such as Bartholomew Fair, London, now extinct; also Greenwich Fair, Glasgow Fair, and Donnybrook Fair, near Dublin; this last being likewise either extinct, or nearly so. The boisterous merriments at these fairs were of old the devices employed as likely to attract a great concourse of people; hence each fair had its sport or drollery—football, wrestling, yawning, cudgel-playing, throwing at cocks, sack-races, flying dragons, grinning through horse-collars, mock-giants, monstrous fishes, soaped pigs, smoking-matches, eating hot hasty-pudding, whistling, wheelbarrow races. M. Bottin, the author of a statistical *View of the Fairs of France*, says that on examining his work it will appear that they were placed for the most part on the frontiers of the kingdom, or on the marches of ancient provinces; or at the foot of high mountains, at the beginning or end of the snow-season, which for months shuts up the inhabitants in their valleys; or in the neighborhood of famous cathedrals or churches frequented by flocks of pilgrims; or in the middle of rich pastures. A fair in the north of Scotland, held in June, when the nights are very short, began at sunset, and ended an hour after sunrise: it was called 'Sleepy Market.'

FAIRY RINGS are spots or circles in pastures, which are either more bare than the rest of the field, or more green and luxuriant. Frequently a bare ring appears, like a footpath, with green grass in the center, and the circle which the ring forms, or of which it might form a part, is often some yards in diameter. These rings began to attract the attention of men of science in the latter part of the last century, and various hypotheses were suggested to account for them. Some imagined that they might be the effect of lightning. Dr. Withering appears to have been the first to ascribe them to the growth of fungi. Dr. Wollaston further investigated the subject, which has more recently been very fully investigated by Professor Way; and it is now perfectly ascertained and universally admitted, that fairy rings result from the centrifugal development of certain kinds of fungi, especially of *Agaricus oreades*, *A. gambosus*, *A. coccineus*, and *A. personatus*. The Common Mushroom (*A. campestris*) shows a tendency to grow in the same manner. Probably the spot where the agaric has already grown is unfitted for its continued nourishment, and the *mycelium* (spawn) extends outwards to new soil, the fungus unfitting the soil to which it extends for the immediate nourishment of grass, but enriching it afterwards by its own decay. The *mycelium* of many fungi has certainly a tendency to extend outwards from a center; and decayed fungi, containing not a little of the phosphate of potash, are a highly stimulant manure for grasses. Fairy rings of large size sometimes occupy the same situation for many years. The circle is almost always imperfect, some accidental circumstance having arrested the growth of the *mycelium* on one side.

FAITH is used by theologians in various senses. It is sometimes taken to denote the mere assent of the understanding to a set of facts or of propositions set before it; it is now peculiarly used to express the living reception by the heart of the 'truth as it is in Christ.' Some divines have enumerated no fewer than four kinds of faith: 1. The faith of miracles, or that immediate persuasion of the Almighty presence and power of their Master, which enabled the early Christians to work miracles—a persuasion, apparently, which might exist and issue in astonishing re-

sults without being associated with moral excellence. 'Though I have all faith,' says St. Paul, 'so that I could remove mountains, and have not charity, I am nothing.' 2. Historical faith, or the assent of the understanding to truth the evidence of which is irresistible, such as we have described above. 3. Partial or temporary faith, such as our Lord implies in his exposition of the parable of the Sower, and as appeared to animate those who, after having followed after Christ turned back and walked no more with him; and 4. Saving faith, or the persuasion of Christian truth wrought in the heart by the Holy Spirit.

These distinctions are rather theological refinements than anything else; the proper and characteristic meaning of the term faith in Scripture has little to do with any of them except the last.

Faith,' says the writer of the Epistle to the Hebrews, 'is the substance of things hoped for, the evidence of things not seen.' It is a vision, quality, or capacity of soul whereby spiritual truth is apprehended, and spiritual life engendered. The distant is brought near by it, and substantially appropriated; the unseen is felt to be a reality. Faith is the organ by which the soul passes beyond the present and the visible to the eternal and the invisible. Still more characteristically, perhaps, faith is the living affection which binds the Christians to Christ as a *Saviour*. 'Faith is a saving grace whereby we receive and rest upon Christ alone for salvation, as he is freely offered to us in the gospel.' This is its highest and most comprehensive meaning, out of which all the others come. 'What shall I do to be saved?' asked the Philippian jailer of Paul. 'Believe on the Lord Jesus Christ,' he replied, 'and thou shalt be saved.' And it is remarkable how frequently it is Christ or God—a living person—rather than any mere truth or series of truths which is represented as the proper object of Christian faith. 'Ye believe in God; believe also in me.' 'We believe in him that raised up Jesus our Lord from the dead.' 'Abraham believed God, and it was accounted to him for righteousness.' 'Come unto me all ye that labor and are heavy laden, and I will give you rest.'

Faith, therefore, in this its highest view, is nothing but trust in God and in Christ. This is the faith which 'worketh by love,' and 'overcometh the world'—the faith of which St. Paul and St. John alike speak. The faith mentioned by St. James in apparent conflict with works is different; it seems to have been a mere religious distinction. 'Thou hast faith, and I have works.' One party put forth faith as their religious badge—another works. The spiritual or true meaning of either the one or the other was little regarded.

Faith, in the distinctively Christian sense, can only exist by the operation of God's Holy Spirit. 'For by grace are ye saved, through faith; and that not of yourselves; it is the gift of God.' Orthodox divines greatly insist on the necessity of this operation of the Spirit of God, yet not so as to exclude the active co-operation of man. The Pelagian and Antinomian extremes respectively throw out—the former the divine, the latter the human element. Orthodoxy combines the two, attributing to God the effective agency, but to man a real and voluntary concurrence. Some of the principal theological controversies connected with faith, and not here already mentioned, will be noticed under JUSTIFICATION.

FAITHORNE, WILLIAM, a very eminent English engraver, was born in London in the early part of the 17th c., but the exact date is not known. He was a pupil of Mr. (afterward Sir Robert) Peake, printer and printseller. On the outbreak of the civil war, he followed his master, who had taken up arms for King Charles. Both were taken prisoners at Basing-House. F. was sent to London, and imprisoned in Aldersgate, but after some time was released, and obtained permission to leave the country. He went to France, where he increased his proficiency in the art of engraving, and returning to England about 1650, commenced business as a printseller near Temple Bar. He also engraved steadily for the booksellers at the same time. About 1680, he gave up his shop, but still prosecuted his art, besides executing portraits in crayon, and painting in miniature. He died in May 1691. F.'s engravings are for the most part portraits. Walpole has given a pretty full list of them, a few of which we may mention, such as the portraits of 'Thomas Hobbes,' etat 76; 'Henrietta Maria,' 'Cromwell,' 'Prince Rupert,' 'Sir Thomas Fairfax,' and 'John Milton,' etat 62. At first F. imitated the Dutch and Flemish manner of engraving; but his residence in France appears to have considerably modified his earlier style. F. is also an author, having published in 1662 a treatise on engraving, dedicated to his old master, and entitled *The Art of Graving and Etching, wherein is expressed the true Way of Graving in Copper. Also the Manner and Method of that famous Callot and M. Borse in their several Ways of Etching*.

FAKIR, a word derived from the Arabic *fakhar* (poor), and designating a member of an order of mendicants or penitents, chiefly in India and the neighboring countries. In Persia and Turkey, the word is also used for Moslem priests and dervishes

(see **DERVISH**). The origin of Fakirism, an institution which reaches back to the most remote antiquity, is lost in mythical darkness. The common account of the son of a mighty rajah, who, expelled from his home and country by the cruelty of his father, made a vow, half in revenge, and half in contrition, henceforth to roam a beggar through the world, and to win proselytes to a life of poverty and self-mortification, as the one most befitting in man, and most pleasing to the Deity, can hardly be called historical. The same yearning for rest, for peace, and pious contemplation, for escape from the noise and turbulence of the world, which has everywhere and always led still and pensive minds into seclusion and solitude, must naturally have been more powerful here, in a land which yielded almost of itself, and in abundance, all that was necessary for the sustenance of man—in a climate of flower and sunshine, where a hermit's calm retreat might well rise before the wearied eye in all the soft sunset hues which surround the abode of the recluse in the Ramayana, or in the Sakootala. But constant seclusion and ceaseless meditation here, as elsewhere, produced in all but exceptional minds their sad results. Piety is no longer enough; sanctity is the goal. Thus, abstinence becomes mortification and self-torture; mental repose, mystic self-absorption, or frenzied exaltation.

This leaning of the Hindus to a life of asceticism was fostered by their primeval religion, which enjoins various exercises of penance and mortification upon the three higher castes in general, but upon the Brahmins in particular. These, having passed through different stages of regeneration, end by becoming Sanjyasis ('who have left everything'), and are dead to the law. The world and its usages have no more any claim upon them; even religious ceremonies are no longer necessary to the 'United with God.' They go naked, or in filthy rags, receive the meanest food only, and that without either demand or thanks. Their ethical code consists in the observance of truth, chastity, internal purity, constant repentance, and contemplation of Deity. After these models Fakirism seems chiefly to have been framed, and its adherents were not only pious men, but occasionally saints, workers of miracles, and healers of all ills, especially epilepsy and sterility. The halo which from the first surrounded Fakirism, and the ready worship offered by the people, attracted to its ranks, at a very early date, many whose motives were anything but pure, and who, under a garb of humility and mendicity, collected fabulous treasures. Strabo already distinguishes these vagabonds from the more honest members of their class, and if we may trust the travelers of our own day, the more respectable element has now altogether disappeared. Their number is variously stated. In the time of Tavernier's visit, there were more than 1,200,000 Hindus, and 800,000 Mohammedan fakirs in the East Indies, and their present number is said to exceed 3,000,000. Papi describes the Mohammedans as guilty of the greater follies. At times, especially in their return from distant pilgrimages, they are even dangerous, as the killing of an unbeliever is supposed to be an infallible introduction to the glories of paradise. They live either separately as hermits or solitary mendicants, or unite in large gangs, carrying arms and a banner, beating drums, and sounding horns as they approach a town or village. Their appearance is disgusting in the extreme; they go naked, besmeared with the dung of the holy animal, the cow. Some bedeck themselves with the skins of serpents, some with human bones; others array themselves in the garb of women. Their fearful shrieks, and the hideous rollings of their eyes, add to the disgust of their appearance. Imitating madmen, they generally end by becoming madmen. The height to which self-torture is frequently carried by these wretched fanatics, and of which we meet with signs even so far back as the Ramayana, where a penitent is described as perpetually sitting with upraised arms between four fires, the sun forming the fifth, is so appalling that human nature shrinks from the mere description. Some pass their whole lives in iron cages, laden with heavy chains; some clench their fists till their nails grow through the hand; others hold aloft both their arms till they become like withered branches; while others, again, tie their hands and feet together, and roll head over heels for thousands of miles. Not the least sad feature in all this is, that these religious antics are not confined to men, but that youths, and even children of tender age, are occasionally initiated therein.

FALAISE, a town of France, in the department of Calvados, is situated on a lofty platform bordering on a precipice, or *falaïse*, whence its name. It is situated on the Anté, a feeder of the Dive, 22 miles south-south-east of Caen. It has three suburbs, one of them, Guibray, a mile to the east, rivals the town itself in size and population. The buildings of interest are the ecclesiastical edifices, the hospital, the public library, and, more than all, the old and ruined castle, once the seat of the dukes of Normandy, and the birthplace of William the Conqueror. In the castle, the chamber in which the Conqueror was born is still shown, as well as a tower called 'Talbot's' Tower, which is supposed to have been built by Talbot when Lord Warden of the district, after the

capture of F. by Henry V. of England. F. has manufactures of cotton, hosiery, and bobbin-net. At Guibray, an important annual fair is held, at which great numbers of horses and cattle are sold. It takes place between the 10th and 25th of August. Pop. (1876) 8120.

FALCHION. See **SWORD**.

FALCON (*Falco*), in the Linnaean zoology, a genus of birds, including all the diurnal birds of prey, now known as the family of *Falconidae*; but in its present use as a generic name, limited to nearer accordance with its popular use, as a designation of those species which, in the language of falconry, were styled *noble birds of prey*. The true falcons are characterized by a bill curved from the base, the upper mandible hooked at the point, and the cutting edge of the upper mandible furnished with a strong projecting notch, or *tooth*. The claws are also sharp, curved, and strong; and in accordance with all this powerful armature, the whole frame is very robust and muscular. The legs are rather short, and have great power in striking or seizing prey. The keel of the sternum (oracastbone) is very large, and adapted for the attachment of powerful muscles; the furcula and coracoid bones (see **BIRDS**) are also very strong, so as to afford a sufficient resisting base for very powerful action of the wings. The wings are long and pointed, the first and third quill-feathers of equal length, the second rather the longest, the first and second quill-feathers emarginated near the tip. The true falcons are bolder in proportion to their size than any other *Falconidae*—even eagles. Their acuteness of vision is wonderful; and they have very great powers of flight. A F. is known to have traversed the distance between Fontainebleau and Malta, not less than 1350 miles, in 24 hours. The speed attained by a F. in pursuit of its prey has been calculated to be at the rate of 150 miles an hour. They soar to a prodigious height in the air, always endeavoring to outsoar any bird of which they may be in pursuit, and to swoop down upon it from above; although it is far more difficult for them to rise vertically in a calm atmosphere than for birds of short and rounded wing, and they either rise obliquely—often also making their onward flight in series of arcs—or avail themselves of the wind, and by flying against it, are borne aloft as a boy's kite is. The species are pretty numerous; some of them are of very wide geographic distribution, whilst others are peculiar to certain countries or climates.

The British species are the **GYRFALCON** (q. v.), or Jerfalcon (*F. Gyrfaeo*); the Iceland Falcon (*F. Islandicus*); the Greenland Falcon (*F. Greenlandicus*); the **PEREGRINE F.** (q. v.), (*F. peregrinus*), of which the female is *par excellence* the F. of falconers (see **FALCONRY**), and the male is the Tercel, Tiercel, or Tercelet; the **HOBBY** (q. v.), (*F. subbuteo*); the Red-Footed F., or Red-legged F. (*F. rufipes*), a small species, much resembling the Hobby; the **MERLIN** (q. v.), (*F. aesalon*); and the **KESTREL** (q. v.), or Windhover (*F. tinnunculus*). For the species chiefly used in falconry see **FALCONRY**.

Very closely allied to the true falcons are the species constituting the genus *Hierax*, very small, but remarkable for strength and courage, natives of the East Indies. The upper mandible has two notches. In the *Harpagons* (*Harpagus* or *Bidens*) of South America, both mandibles have two notches. None of these, however, are equal to the true falcons in length of wing.

For particulars regarding the *Falconidae*, as subservient to field-sports, see **FALCONRY**.

FALCONER, WILLIAM, an eminent Italian battle-painter, born at Naples in 1600. A fellow-student of Salvator Rosa's at Spagnoletto's studio, he himself subsequently became the founder of an academy of much resort. In accordance with his turbulent impulsive nature, he flung himself into the political struggles of the times, and during Masaniello's outbreak, organized his numerous scholars and dependants into a secret band, which inflicted deadly retaliation on the Spaniards. On the suppression of the insurrection, F. fled to France, but subsequently returned to Naples, where he died in 1663. The works of this painter, representing chiefly military scenes, are few in number, and costly in price; they are prized for their extreme fidelity to nature, as much as for their harmony and brilliancy of color, and their variety of expression.

FALCONER, WILLIAM, was born in Edinburgh in 1732, and was one of a family of whom all, excepting himself, were deaf and dumb. He went early to sea, serving his apprenticeship on board a merchantman; and before he was 18 years of age he was second mate, in a vessel in the Levant trade, which was shipwrecked off Cape Colonna, himself and two others being the only portion of the crew saved. He published *The Shipwreck* in 1762, and during the next year he entered the navy as midshipman in the *Royal George*. When peace came, he resided in London, where he wrote a satire on Wilkes, and compiled a *Nautical Dictionary*. He proceeded to sea in September 1769, as purser in the *Aurora* frigate; reached the Cape of Good Hope in Decem-

ber; and perished with his companions—the *Aurora* having gone down—in the Mozambique Channel.

F. wrote several poems, but *The Shipwreck* is the one on which his fame rests. It abounds in nautical language, and has the rare merit of being interesting. It is not a great poem, but it has always had its readers and admirers. In the second edition, the author added the characters of Albert Rodmond, Palemon, and Anna—characters bearing the same relation to actual sailors that Alexis and Chloe bear to actual shepherds and shepherdesses—and to some extent destroyed that singleness of impression which was the chief merit of his work.

FALCONET, a name used in the 15th and 16th centuries for the smallest class of cannon. The ball weighed from 1 lb. to 3 lbs., and the gun from 5 cwt. to 15 cwt.

FALCONIDÆ, a family of diurnal birds of prey (see **ACCIPITRES**), corresponding with the Linnaean genus *Falco*, and exhibiting those characters of muscular vigor, armature of beak and talons, and power of flight, which are to be found in their highest perfection in the true Falcons (q. v.), and in a scarcely inferior degree in the Eagles (q. v.). The species are numerous; the British Museum alone contains specimens of almost 200 unquestion-



Head and Foot of Brazilian Eagle.

ably distinct species; but very many supposed species have been named and described by ornithologists, which, in the progress of science, have been ascertained to owe their distinctive characters merely to age and sex. The female is generally larger than the male, and the plumage of the young different from that of the adult. There are, in the different groups, considerable diversities in the curvature and strength of the bill, which also has the cutting edges of the mandibles either notched, festooned, or plain; the legs and toes also exhibit diversities as to length, strength, feathering, &c.; and in some groups, the wings are much longer, and at the same time more pointed, than in others. This is particularly the case with the true falcons, as contrasted with eagles, hawks, buzzards, kites, harriers, &c., and, in the language of falconry, the former—having the second quill-feather longest, and the first nearly equal to it—are called *noble birds of prey* (see **FALCONRY**), being those usually domesticated and trained for the service of man; the latter—having the fourth quill-feather longest, and the first very short—are called *ignoble birds of prey*, even Eagles receiving this designation. The F. are distributed over all parts of the world; and almost all kinds of vertebrate animals, except the largest quadrupeds, are the prey of some of them. Some also devour insects. Like the *Felidæ* among ravenous quadrupeds, the F. do not willingly feed on carrion, but generally seize and kill their own prey. As in the *Felidæ*, also, there is a provision for the preservation of the claws from being blunted by unnecessary contact with the ground, or with any hard substance, the F. contracting the toes so as to elevate their claws. The F. generally live in pairs.

The Lämmergeier (q. v.) connects this family with the Vultures; the Secretary (q. v.), whilst in many respects agreeing with the F., is peculiar in some of its characters.

FALCONRY, the term applied to the art of training certain of the falcon tribes to the pursuit and capture, on the wing, of birds such as the heron, partridge, lark, rook, magpie, wild-duck, pigeon, &c. In ancient times, this sport was called **HAWKING**, a term still preserved in many places, and which, perhaps, is the more strictly correct of the two. Now-a-days, *Falconry* is the term applied to the sport and all that pertains to it; *Hawking* to its actual practice in the field. F. is of very ancient origin, and has been traced back, as an Eastern sport, to a period anterior to the Christian era. In Britain, it seems to have been followed before the time of the Heptarchy; and in the celebrated Bayeux tapestry, Harold is figured with a hawk upon his hand. It seems, however, to have been practised in Eastern countries and in Cen-

tral Europe, long before it became established in Great Britain; and to such a height did the sport reach in Germany, that nobles, and even kings, seem to have devoted to it the greater part of their time. As an instance of this, the Emperor Frederick II. of Germany was a passionate admirer of the sport, and is said to have written a treatise on F., published by J. G. Schneider in 1788 (2 vols. Leip.). In England, after the Norman Conquest, F. seems to have taken rapid strides, being much indulged in by kings, nobles, and ladies; and in those days the rank of the individual was indicated by the particular species of hawk carried on his wrist. Thus, an earl carried a Peregrine Falcon. In the 17th c., the sport declined; in the 18th c. it partially revived, but again fell off about the year 1725, when the art of shooting birds on the wing came into fashion. In the present day, an attempt is being made in several quarters in England to restore this noble sport, and already its restoration is being attended with growing success. In India, Persia, and other Eastern countries, F. is still eagerly practised, the methods there followed being for the most part nearly similar to those of Great Britain.

In F., two distinct kinds of hawks are used—the long-winged or true falcons, and short-winged. The first (noble birds of prey) are represented chiefly by the Gyrfalcon and Peregrine; the second by the Goshawk and Sparrow-hawk; and though for certain purposes the male is superior, as a rule the *females* of each species are much more highly esteemed for sporting purposes, from their being larger and more powerful. 'Long-winged' hawks may also, as a rule, be distinguished from the 'short-winged,' by their having a 'tooth' or notch on the upper mandible; from the second feather of the wing being either longer, or as long, as the third; and from their impetuous 'stoop' at their prey.

The Gyrfalcon (q. v.) is the largest species, but from its extreme rarity in the British Islands, is seldom used. The Peregrine Falcon is the bird in greatest favor with falconers, and if taken from the nest, as is usually the case, and carefully trained, affords better sport than any other British species. We shall therefore confine our remarks, for the most part, to the sport as it is practised with this bird.

No hawk is fit for sporting purposes until it has undergone a careful process of training. The young hawk is more easily trained than that which has been caught in a wild state, but in either case, a number of operations require to be gone through before the sportsman ventures to take his falcon into the field.



Fig. 1.—Leg and Foot of Hawk, showing the method of attaching the Bells and Jesses :
a, the end of leash; b, the jesses; c, the bell; d, the bewit; e, the varvels of silver, with owner's name and address engraved.

Taken from her nest on some high and dangerous cliff when nearly fledged, the *eyess*, or young falcon (with her companion-fledglings, usually two in number), is carefully conveyed to the falconer's home; there she is kept in an open shed in a nest of straw, and fed several times a day upon fresh beef, with an occasional change of birds or rabbits. At this somewhat critical period, she should never be handled, except to put on the *jesses*

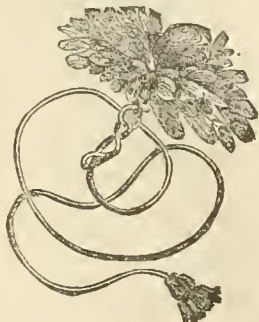


Fig. 2.—The Lure.

and *bells* (see fig. 1), which afterwards become permanent fixtures. Her powers of flight, too, being as yet very limited, she depends

upon her master for regular supplies of food, and soon learns to come for her meals at his call. Her meat is usually fixed to an apparatus termed the *lure* (see fig. 2), and thus the hawk is early accustomed to that important instrument, the further uses of which are explained below. By degrees her powers of flight are strengthened, and she is permitted to fly at large (returning to the lure at her master's will to be fed, or in hawking language, to remain *at hack*) for several weeks, during which time her meals are



Fig. 3.—Hooded Peregrine Falcon on its block :
One end of the leash is attached to the jesses, the other to a ring driven into the side of the block; and thus the hawk is prevented from escaping.

gradually reduced to one a day. While at *hack*, she sometimes becomes wild, wanders far from home, and kills game for herself; and when this is the case, she is usually caught by enticing her to a bow-net, close to which a pigeon or some meat is fastened to the ground. After being 'taken up' from *hack*, she is kept at the *block* (see fig. 3)—the stand upon which she sits—for a few days before her regular training begins. At this time, also, hawks require a bath twice or thrice a week.

The first of the principal operation in training is *hooding*, an operation which, if successfully performed by the trainer during his earlier efforts, paves the way for overcoming many subsequent difficulties. It demands the greatest patience and the tenderest manipulation. The hood is a cap of leather (see fig. 3), made to fit the head of the falcon in such a manner as totally to obscure the light, a single aperture only being left, through which the beak protrudes, and a slit behind, through which are passed the braces or ties that secure the hood to the head. By shutting out the light, the hood is serviceable in tending to make the hawk quiet and tractable, but to accustom the falcon to submit to its use requires much time and great management.

When, after great perseverance, this is achieved, the hawk is said to be '*made to the hood*,' during which process she also learns to sit balanced upon the fist. Besides tending to induce docility by hiding the light, the hood is of further service in shutting out from view any object which might cause the hawk to flutter or bait off the fist or *cadge* on its way to and from the field, &c. Hence the hawk is carried always hooded—the short-winged only being exempt. To the falcon's legs are attached two small hollow globes of thin metal, called *bells*; these, again, are fixed to their place by leather straps called *bewits*; and both, together with the jesses, become permanent fixtures even during the bird's flights. *Jesses* are two leathern straps, five or six inches in length, attached to each leg immediately below the bells; the jesses, again, are themselves attached to another leathern strap, called the *leash*, about four times the thickness of a boot-lace (see fig. 1), by two rings or *varvels*; and the bird being thus caparisoned, the falconer winds the leash through his fingers, and so prevents the falcon's escape while on his wrist. Instead of *varvels*, some falconers follow the Dutch plan of using a swivel; the former method, however, is now considered the best. A long cord, called the *creance*, is further attached to the leash, and is used for the

purpose of giving the bird greater freedom during her training than that afforded by the leash alone.



Fig. 4.—Tabur stycke.

The *lure* is a bunch of feathers attached to a cord and tassel, and in the center of the feathers is usually a piece of spliced wood, to which a piece of meat may be attached. By accustoming the hawk to feed off the lure, or to come to it at a certain call or whistle to be fed when on the wing, the lure becomes an important adjunct to the falconer's apparatus, as by it he is enabled to entice his bird back after an unsuccessful chase. On such occasions, the falconer reclains his bird by swinging the baited lure round and round his head, accompanying the action by some well-known call. Four wings tied together make a good lure. The *tabur stycke* and *draver* were formerly used for the same purpose as the lure, but were made in the form of a stick.

In Europe hawks are carried on the left wrist (while in the East they sit upon the right), and to protect the falconer's hand from being injured by the bird's claws, a glove of stout buckskin leather is used. And here it may be remarked, that the claws and beak of wild caught or *haggard* falcons, are usually pared or *coped*. If the bird to be trained, instead of being a nestling, happens to be a wild one, the difficulties of training are immeasurably increased, and can only be overcome by days and nights of unwearied exertion. If it proves unusually restless and difficult to tame, it is kept on low diet, is prevented from sleeping for several days and nights, and has cold water poured upon it by means of a sponge, &c. By these and other means, the falcon gradually loses much of its restiveness, and submits with tolerable readiness to the processes of training.

For training the *eyess*, or young falcon, to the lure, as preparatory to entering at game, Sir John Sebright says: 'Take the hawk out while very hungry, and let an assistant swing the lure round his head steadily, and at full length of the cord; upon this the falconer casts off his hawk with the usual whistle or halloo, still holding the *creance*, and the assistant suffers the lure to fall to the ground, for fear of injury to the hawk, by striking it in the air with the two strings attached. When this lesson is perfect, the assistant, instead of suffering the lure to fall, withdraws it, and disappoints the hawk, which flies by him, and then returns, when he may be suffered to strike the lure and feed upon it. In process of time, the *creance* may be removed, and the hawk enticed to the lure from a considerable distance, and may then strike it in the air (if the lure is a light one), while swinging round the head of the assistant. After a still greater time, the hawk becomes so perfect that she will circle round the head of the falconer, waiting for the lure to be thrown, and is then said to "*wait on*" perfectly. When the hawk is feeding on the lure, the falconer should encourage her, and suffer her to finish without alarm, by which she will be shown that she may do so without fear, and will readily suffer herself to be taken after flying. She should also be accustomed to horses, men, and dogs.'

Having 'made the hawk' to the *jest*, the *hood*, and the *lure*, she is next 'entered' at her game (the *quarry*). This is done by tying a long cord or *creance* to the varvels of the jesses, and flying the hawk from the hand at a bird thrown out to it, also restrained by a cord. The hawk is next flown several times without a *creance* at birds *shortened in their flight*, after which it is ready to be entered at wild quarry. In case of failure, however, a live bird, similar to that at which she has flown, should be carried to the field, and thrown out to her in a *creance* by way of encouragement.

The heron is, and always has been, a favorite object of pursuit in British F., the period of the year best adapted for the sport being the breeding season. Having previously ascertained the feeding-place of that bird, the hawking party makes for the spot, usually towards evening, if possible in a direction *down-wind* from the heronry, so as to intercept the bird in its *up-wind* flight homewards. When a heron is seen to pass, a couple (a *cast*) of hawks are unhooded and 'cast off,' and the chase commences.

The heron, seeing the falcons approach, disgorges its food, to lighten itself, and immediately ascends in the air; the hawks, eager in pursuit, and quicker of wing, speedily make upon it, and strive to gain a greater elevation by a series of beautiful gyrations. When one of the hawks succeeds in rising above the heron, it *stoops*, that is, descends swiftly, and in a direct line, upon the game, aiming a stroke with its outstretched legs and talons at its body; this the heron almost always succeeds at first in eluding, by a rapid and sudden movement aside. The second hawk, which by this time has also soared, then stoops, while the first is regaining its former altitude; and so on for many successive times, till one hawk at length clutches the heron or *binds*, upon which her companion joins her, and the three, buoyant by the motion of their wings, descend gently to the earth. The falconer's imperative duty is now to be up or near the spot where the three birds are de-

scending, to divert the attention of the hawks before they reach the ground, and entice them from the quarry to him, by means of live pigeons as lures. This is very necessary, as the heron is extremely dangerous, and has been frequently known to injure the hawks with its sharp beak when on the ground, though it is all but perfectly harmless while in the air. When the heron's wounds have been dressed—for this bird is rarely killed in such encounters—a ring with the captor's name is usually affixed to its leg, after which it is set at liberty, and so becomes available for future sport. The falconer's usual cry of encouragement to his hawks upon the springing of the quarry, is 'Hoo-ha-ha-ha-ha!' His cry when the quarry is killed, is 'Whoop!' A falcon takes its prey either by tearing or *raking* it with the *hind* claw of each foot at the instant of passing, or by clutching the victim with its talons, and when she thus succeeds in binding to her quarry, she slowly descends with it to the ground. The supposition that the hawk strikes its quarry with the beak or breastbone in its swoop, is a mistaken one.

Besides the Peregrine Falcon, the Merlin is trained for F., and is extremely bold. This bird, however, is flown at small game, chiefly larks. The Goshawk, though it does not soar and stoop, flies direct at its game: it is used chiefly for pheasants, rabbits, hares, &c., in an enclosed country. The Sparrow-hawk, from its extreme boldness, is a great favorite, but is flown at smaller kinds of birds only, such as blackbirds and thrushes, &c. The Hobby is seldom or never used.

The following are the principal terms used in falconry. A falcon's legs, from the thigh to the foot, are termed *arms*; toes, *petty singles*; claws *pounces*; wings, *sails*; trail, *train*; crop, *gorge* lower stomach, *pannel*; feathers, hair, &c., ejected at the mouth, the *castings*. A young hawk from the nest is an *eyess* or *eyas*; one that can hop, but not fly well, a *brancher*; a nestling hawk reared at liberty, is a *hack-hawk*; a young hawk able to take game, a *soar-hawk*; a mature wild hawk is a *haggard* or *bluc hawk*; young hawks taken in their migrations, are *passage-hawks*, or *red hawks*—the term *red* being applied merely as a title of distinction between the young hawk and the eyess or nestling, the colors of the two being in reality the same. The training of the passage-hawk and haggard is termed *reclaiming*; fluttering, is *baiting*; fighting with each other, *crabbing*; sleeping, *jouking*. The prey is termed the *quarry*.

When the hawk strikes her quarry in the air and clings to it, she *binds*; when she flies off with it, she *carries*; when she plucks it, she *deplumes*. Dead game is the *pelt*. *Stooping* or *swooping* is the act of descending with closed wings from a height at prey. Direct flight, without soaring, is *raking off*; changing from one bird to another, *checking*. When game flies into a cover, it *puts in*. When the hawk is moulting her feathers, she is *mevring*; after her first moult, she is *intermevred*; with complete plumage, *summed*; when in good condition, she is *enseamed*; when out of condition, *seamed*. Mending the feathers artificially (an operation frequently performed when one has been accidentally broken) is termed *imping*; blunting bill and talons, *coping*. When the falcon is obediently flying round in the air, she *waits on her master*; flying long-winged hawks from the wrist, is termed *flying out of the hood*; a couple of hawks is a *cast*. The *cadge* is a frame of wood with four legs. It is carried by means of straps, which pass over the bearers' (the cadgers') shoulders, and is used, when there are several casts of hawks, to be taken to the field. The *block* (see fig. 3) is a round piece of wood, such as would be made by sawing a foot of wood out of a felled larch-tree of some twenty years' growth; and upon this the hawk sits when out of doors. Through the bottom of the block runs an iron spike, which being driven into the ground, secures the block to its place, and so prevents the hawk from dragging it away. Falcons are very pugnacious, and if not carefully kept separate, would soon kill each other. The *screen* or *perch* is a perch guarded by a falling piece of canvas, to support the hawks in case of their leaping down; upon this, the hawks are placed at night in an apartment called the *mews*.

The best works on the subject are those of Turberville and Latham, respectively, as old treatises; and that of Sir John Sebright, as comparatively modern. Of the more recent treatises, *Falconry in the British Isles*, by Salvin and Brodrick; and *Falconry, its Claims and Practice*, by Freeman and Salvin, are standard authorities. See also Stonehenge's *British Rural Sports* (Lond., Warne & Co.).

The village of Faleonswaerd, near Bois-le-Duc, in Holland, has for many years furnished falconers to almost all Europe. Sir John Sebright says: 'I have known many falconers in England, and in the service of different princes on the continent, but I never met with one of them who was not a native of Faleonswaerd.'

FALE'MÉ, one of the most important tributaries of the Senegal (q. v.), into which it falls, in lat. about 14° 40' N., and long. 11° 48' W. Its course has not yet been fully explored.

FALE'RII, a city of ancient Etruria, was situated west of the Tiber, and north of Mount Soracte. Its earliest historical appearance is in 437 B.C., when, according to Livy, the inhabitants (who were called Falisci) joined with those of Veii in assisting the Fidenates against the Romans.

The Falisci were among the most dangerous enemies of Rome, and were the last of the Etrurians who submitted to its power. Their city was at last destroyed by the Romans (241 B.C.), and they themselves were compelled to choose a new site a few miles off. Here a Roman colony was settled in the time of the triumphs, whence the place took the name of *Colonia Junonia Faliscorum*. But this Roman F. does not appear to have ever acquired any importance, for the temple which anciently attracted so many pilgrims, stood on the site of the older town. During the middle ages, however, a new city sprang up on the ruins of the Etruscan F., which finally obtained the name of *Civita Castellana* (q. v.). Ruins of the Roman or later F., consisting of a part of the ancient walls, are still visible.

FALE'RNIAN WINE, so called from *Fulernus Ager*, the district in which it was grown—and which lay in the northern portion of Campania, between the Massian Hills and the northern bank of the Volturnus—was one of the favorite wines of the Romans. It is described by Horace as, in his time, surpassing all other wines then in repute. In the time of Pliny, however, Falernian wine had already, owing to a want of care in its cultivation, begun to decline in quality.

FALIE'RI, MARINO, a celebrated Venetian, was born about the year 1284. He was elected in 1354, at the age of 70, Doge of Venice, and was the third of his name called to this supreme dignity. At the siege of Zara, in 1346, he defeated an army of 80,000 Hungarians, vigorously pursuing at the same time extensive siege-operations, and in the course of the war, having assumed the command of the fleet, captured Capo d'Istria. Subsequently, he became ambassador of the republic to Rome and Genoa. Of an ungovernable and implacable temper, his bitter resentment seems to have been aroused by a grossly offensive libel on his fair and youthful wife, the author of which, a young patrician named Michele Steno, owed some grudge to the doge. The punishment awarded to the young noble by a patrician tribunal seemed to F. wholly inadequate to the offence by which his ducal dignity had been outraged, and in order to avenge this double slight, he organized an audacious plot, with the object of overthrowing the republic, and massacring the heads of the aristocracy, to be followed by his own assumption of sovereign rights. The conspiracy was, however, revealed on the eve of its execution, and F. was arrested. He suffered death by decapitation on the 17th of April 1355. In the hall of the great council, which contains the portraits of all the doges, the space allotted to that of F. is draped with a veil of sable, and bears the following inscription: 'Hic est locus MARINI FALLETRO, decapitati pro criminibus.' A faithful representation of the plot, and of its chief confederates, is given in Byron's drama of *Marino Falieri*.

FALKIRK, a Scottish parliamentary burgh, finely situated on a rising ground in the midst of a populous mineral and manufacturing district in Stirlingshire, and overlooking an expansive 'Carse,' through which the river Forth, with its beautiful landscapes and constant life of sailing-vessels, slowly winds its devious way. F. consists principally of a long, irregular street, where there is an equestrian statue to the Duke of Wellington, erected by public subscription in 1854. In 1859, a commodious Exchange was built, in which a well-attended stock-market is held every Thursday. In 1868, excellent country buildings were erected, as well as also a new prison and county police-office. A hall, with accommodation for prosecuting various studies, was opened in 1878, for the Falkirk School of Arts. A little to the south of the town, the Union Canal passes through a tunnel nearly half a mile in length. Pop. (1881) 15,599. In 1600, F. was made a burgh of barony by King James VI., in favor of Alexander Lord Livingstone, afterwards Earl of Callander, in whose favor also it was in 1646 created a burgh of regality by King Charles I. In 1715, it passed to the crown by the forfeiture of the Earl of Linlithgow and Callander; and it was not till the passing of the Reform Bill in 1832 that it was made a parliamentary burgh, and received a municipal constitution, with a council of twelve, including a provost, three bailies, and seven councillors. It unites with Airdrie, Hamilton, Lanark, and Linlithgow, in sending a member to parliament. It has nine yearly fairs, an extensive inland trade, various local manufactures, and charitable institutions. Its parish church—the Eglais Birec, *Varia Capella*, or Speckled Kirk of our chartularies and of local tradition—has one or two monuments of some antiquity, but was itself rebuilt in the year 1810. The church, church lands, and barony belonged of old to the Abbey of Holyrood. Near F., in 1298, Sir William Wallace made his masterly retreat from the disastrous battle (see **FALKIRK, BATTLE OF**), in which he lost his brave companions in arms, Sir John Graham and Sir John Stewart, both said to be

interred in the parish churchyard. The inscribed stone alleged to cover the grave of Sir John Graham, is apparently more modern than his time. In 1746, the neighborhood of F. was the scene of another battle, in which the royal troops were defeated by those of Prince Charles Edward. It is now chiefly noted for its cattle-trysts (cattle fairs), at which stock is yearly sold to the value of about £1,000,000. In the immediate vicinity are the Carron Iron-works. F. is a station on the North British Railway, and has water communication by the Forth and Clyde Canal.

FALKIRK, BATTLE OF. Wallace had followed up his victory over the English near Stirling in 1297, by taking possession of some of the more important fortresses of Scotland. In the following year, King Edward, having returned from Flanders, summoned a great army to meet him at York, and marched northward to Roxburgh, and thence along the east coast of Scotland and the shore of the Firth of Forth. It was not till the day of battle, the 22d July 1298, that Edward first saw the enemy.

The Scottish infantry, much inferior in numbers to the English, were arranged in four circular bodies on a small eminence near Falkirk, and were armed with lances, and with bows and arrows. The cavalry, numbering only 1000 men, were placed in the rear. This array was charged by the English cavalry. The Scottish footmen bravely withstood the onset of the well-appointed English horse; but the cavalry, disunited by the preponderating numbers of the enemy, rode from the field without striking a blow. Thus left without support, the spearman and archers were compelled to yield, and the retreat became general. The loss on the Scottish side is said to have amounted to 15,000 men. The results of this defeat were, that the military power of Scotland, such as it was, was broken; and Edward returned to England master of all the important strongholds of the south.

FALKLAND, a royal burgh of Scotland, in the county of Fife, is situated at the north-eastern base of the Lomond Hills, Hills, 22 miles north of Edinburgh, and 10 miles south-west of Cupar. The east Lomond Hill rises so abruptly behind the town as to intercept the rays of the sun from it for several weeks during winter. F. was in early times a manor of the Earls of Fife. It passed from them to the crown in 1425, and was made a royal burgh by James II. in 1458. Within the town are the remains of Falkland Palace—a large tower (in the same style as the north-western tower of Holyrood) above a vaulted doorway leading into the courtyard, built about 1500, and two sides of a quadrangle, built between 1530 and 1550, fine and interesting examples of Scottish architecture. The palace was a favorite residence of King James IV., and after his death, in 1513, his widow, the impetuous sister of King Henry VIII. of England, was here kept in restraint for a season. Here her son, King James V., died in 1542. The last king who occupied the palace was Charles II., who passed a few days in it in 1650. Of the more ancient castle in which David, Duke of Rothesay, was imprisoned and starved to death by the Duke of Albany, in 1402, no traces now remain. F. is frequently alluded to in the verses of Sir David Lindsay. Pop. (1881) 1068, who support themselves mainly by handloom weaving.

FALKLAND, LUCIUS CARY, VISCOUNT, was born, it is believed, at Burford, in Oxfordshire, in 1610, and educated first at Trinity College, Dublin—his father, Henry Cary, Viscount Falkland, being at that time lord-deputy of Ireland—and afterwards at St. John's College, Cambridge. Even during his father's lifetime, he enjoyed an ample fortune, left him by his grandfather. His early years were wholly devoted to study, and to the conversation of learned men, among whom he himself, by all accounts, must have occupied a first place. His residence (Burford) was only ten miles from Oxford, and here, according to Clarendon, 'he contracted familiarity and friendship with the most polite and accurate men of that university.' The praise which that historian bestows on him is extraordinary; but F. is one of those historical personages whose character and abilities we must take on the word of friends and panegyrists, if at all, for his deeds and writings are not equal to his fame. In 1633, he was made one of the gentlemen of the privy-chamber to Charles I., and took part in the expedition against the Scots in 1639.

In 1640, he entered parliament as member for Newport in the Isle of Wight, and was at first distinguished by his patriotic zeal for the laws and constitution of his country. Against such men as Strafford and Finch he exhibited great severity of speech, though even in their case his almost finical love of the forms of legal procedure was manifested. Shortly after, he conceived it to be his duty to assume quite a different political stand-point, and to oppose what seemed to him the excesses and illegalities of the popular party. On the breaking out of the civil war, he consequently took part with the king, though mourning deeply the miseries which his country was about to suffer. He died a soldier's death at the battle of Newbury, September 20, 1643. F. was quite unfitted to play a practical part in the sanguinary politics of his time; but his genuine love of England and of the rights of the nation, which burned in him so strongly when a royalist as when

attacking Strafford and the bishops, enables us to understand, better than we might otherwise have done, the deep indignation that possessed the English gentlemen who represented the Commons, at the arrogant and unprincipled policy of Charles's advisers. F. wrote various treatises, &c., the principal of which is *A Discourse on the Infallibility of the Church of Rome*.

FALKLAND ISLANDS, the only considerable cluster in the South Atlantic, lie about 300 miles to the east-north-east of the Strait of Magellan, stretching in S. lat. from 51° to 52° 30', and in W. long. from 57° 40' to 61° 20'. After having successively belonged to France and Spain, they have, since 1771, formed part of the British empire; and in 1833 they began to be settled, being, as a whole, the most southerly of the organized colonies of England. These islands number about 200, presenting a total area of about 6500 square miles. The two largest members of the group, East Falkland and West Falkland, comprise between them more than half the surface; and of the remainder, the chief ones are Great Swan, Saunders, Keppel, Pebble, Eagle, and Jason. This possession is valuable mainly from its position with respect to the Southern and Pacific Oceans, being in this connection all the more valuable on account of its many excellent harbors. Both the soil and the climate are much better adapted to pasturage than to cultivation. While the natural grass is extremely luxuriant, scarcely anything but a few vegetables is grown in the settlement. The coasts teem with fish, more especially with cod; and in certain seasons of the year, penguins and seals are killed in great numbers for the sake of their oil. The temperature is very different from that of the corresponding parallels in the south of England, being both lower in summer and higher in winter. The mean of the former season is about 53° F., and of the latter, about 40°. These averages considerably exceed the vague estimates of early navigators, who, coming suddenly down from the tropical heats, appear to have here felt, by comparison, something of hyperborean cold. Though there is no timber worthy of the name, yet peat abounds to the depth of ten feet. Pop. (1871) 803; (1880) 1336, of whom only 577 were females. Revenue of the colony in 1880, £5520; expenditure, £5607. The annual value of imports varied in 1877-80 from £33,000 to £39,000; of exports (chiefly wool, with oil, hides, tallow, and seal skins), from £51,000 to £88,000. There is some gardening near Stanley, the seat of government; and a little barley and oats is cultivated.

There is only one indigenous quadruped found, a kind of fox. Large cattle are now numerous. The sheep are chiefly Cheviots and Southdowns, of which the mutton finds a ready market on the spot. There are deposits of guano on West Falkland. The governor, the executive council, and the legislative council of the F. I. are all appointed by the crown.

FALL. The doctrine of the Fall is the doctrine of the historical introduction of evil into the world, as described in the third chapter of the book of Genesis. The statement of this chapter in its natural and obvious meaning is to this effect, that the serpent, which 'was more subtil than any beast of the field which the Lord God had made,' tempted the woman to eat of the tree of knowledge of good and evil, regarding which the Lord God had said, 'Thou shalt not eat of it: for in the day that thou eatest thereof thou shalt surely die.' In contempt of this command and warning, 'the serpent said unto the woman: "Ye shall not surely die: for God doth know that in the day ye eat thereof, then your eyes shall be opened, and ye shall be as gods, knowing good and evil."' And when the woman saw that the tree was good for food, and that it was pleasant to the eyes, and a tree to be desired to make one wise, she took of the fruit thereof, and did eat, and gave also unto her husband with her; and he did eat.' The result of this was, that their eyes were opened, and they knew that they were naked; and when they heard the voice of the Lord in the garden, they hid themselves; and on being summoned, they acknowledged their transgression, and were driven forth from Eden. Separate punishments, also, as the consequence of the transgression, were denounced against the serpent, the woman, and the man. The first was cursed above all cattle, and condemned to go upon its belly, and to eat dust all the days of its life. Enmity was to be put between it and the woman, and between its seed and her seed; 'it shall bruise thy head, and thou shalt bruise his heel.' The woman was to bring forth children in sorrow, and to be subject to her husband, to whom her desire was to cleave. The ground was cursed for the man's sake, and he was to eat of it in sorrow all the days of his life; in the sweat of his face he was to eat bread till he returned to the ground.

Such is the narrative of Genesis, upon which the doctrine of the Fall is based. The doctrine assumes various forms, according to the interpretation which the narrative receives. Some theologians interpret the narrative more literally—although none can be said to do so quite literally—and others interpret it more figuratively; while others reject it altogether as a narrative, and look upon it merely as a mythical story of the early time—mirroring the lapse from a primitive golden age, or age of innocence.

1. Even the most orthodox theologians so far spiritualize the narrative, or regard it figuratively. The serpent, for example, is with them the devil, although the text in Genesis itself gives no hint of such an interpretation. The enmity between the serpent and the woman is the enmity between the devil and mankind; and the bruising of the head and the heel is supposed to represent the victorious conquest—although not without wounds and bruises—of Jesus Christ, as the Messiah, over the devil.

The doctrine of the Fall, according to the most common mode of interpretation, may be stated in the following terms: 'Our first parents being seduced by the subtlety and temptation of Satan, sinned in eating the forbidden fruit. By this sin, they fell from their original righteousness, and communion with God, and so became dead in sin, and wholly defiled in all the faculties and parts of soul and body.' They being the root of all mankind, the guilt of this sin was imputed, and the same death in sin and corrupted nature conveyed to all their posterity, descending from them by ordinary generation.'—*Westminster Confession of Faith*, c. vi. The Fall, in this view, is the temptation of our first parents to eat by the devil, and the inheritance of this act by their natural descendants. This may be said to be the orthodox doctrine of the Christian church.

2. Other theologians consider the third chapter of Genesis to be in the main allegorical—representing a picture of the violence of appetite in our first parents. In this view, the serpent is a mere imaginary accessory—the emblem of temptation; the supposed interview between God and our first parents is of the same character—the emblem of the voice of conscience following unlawful indulgence; the tree of the knowledge of good and evil represents some form of sensual indulgence. The only realities in the picture are the moral realities, conscience and temptation in some carnal form—realities which were no more powerful in the case of our first parents than they are in the case of all their descendants who yield to unlawful indulgence, as they did. The doctrine of the Fall, according to this interpretation, is simply the doctrine of the abuse of free will in our first parents; and the question of the relation of this primary sin to all subsequent sin, is variously regarded by this class of theologians. All of them would repudiate any formal imputation of it; yet all or most all allow some actual transmission or inheritance of corrupted will, as the consequence of the original abuse of it.

The Pelagian theory maintained, indeed, that the race was not the worse of Adam's fall; but that, as our first parents 'were to blame for yielding to a temptation which they might have resisted, so all of us, by a proper attention in cultivating our natural powers, may maintain our innocence amidst the temptations with which we are surrounded; and, therefore, that we fall short of that which it is in our power to do, if we do not yield a more perfect obedience to the law of God than Adam yielded.' The Arminian theory, again, contended that the chief loss of the race, as the consequence of the transgression of our first parents, was the subjection to death thereby incurred, and the moral disadvantages arising out of the fear of death. Others, more orthodox than either, contend that the spiritual unity of the race necessarily implies that the depraved will of our first parents has descended to their posterity as their unhappy portion.

3. The opinion of those who look upon the chapter in Genesis as a mere myth or fable, representing a dream of the religious imagination, without any special moral meaning, cannot be said to come within the pale of Christian theology. The doctrine of the Fall is with them only a devout idea, inconsistent with their principles of philosophy and history, and which, accordingly, they dismiss from their speculation or concern altogether.

FALL OF THE LEAF. See **DECIDUOUS TREES** and **LEAVES**.

FALL RIVER, a remarkable stream of Massachusetts, in the United States, is only about two miles long. Throughout nearly the whole of its course, it tumbles between lofty banks over a rocky bottom, descending in its last half mile fully 130 feet. This lower section of the torrent is literally crowded with mills, which scarcely leave room for air and light between each other, though now mostly driven by steam. It falls into the Taunton River, near its mouth, in the eastern arm of Narraganset Bay. The city of F. R. is a port at the mouth of the Taunton River, with a good harbor. Its inhabitants (26,766 in 1870; 49,006 in 1880) are engaged in the manufactures of woollens, cottons, and ironware. F. R. contains more cotton spindles than any other city in the United States.

FALLACY. The incorrect performance of the process of reasoning, so as to lead to error, is said to be a fallacy. The science of Logic reduces sound reasoning to certain rules, and when any of these rules is violated, a logical fallacy is the result. There is always included in logical treatises a chapter on fallacies, in which the several kinds are classified and illustrated. In the old writers, there was always a division into two classes, according as the error lay in the *form* of the reasoning, or in the *matter*; the former were entitled *in dictione*, or those appearing in the expres-

sion; the material were entitled *extra dictionem*, implying that the fault could not be detected from the language, but must be sought in a consideration of the meaning or subject-matter. As some of the designations employed in detailing these various kinds of erroneous reasoning have passed into common use, we shall first give a short notice of the ancient classification.

The formal, or those *in dictione*, were direct breaches of the laws of syllogism, or of argumentation from premises.

The fallacy of *undistributed middle* is one of the cases where what is called the middle term of a syllogism is used in two senses. 'A term is said to be "distributed" when it is taken universally, so as to stand for everything it is capable of being applied to; and, consequently, is "undistributed" when it stands for a portion only of the things designated by it. Thus, "all food," or every kind of food, are expressions which imply the distribution of the term "food," "some food," would imply its non-distribution.' In such a proposition as 'all food is obtained from the vegetable or animal kingdoms,' the term is distributed, because it is meant to be affirmed of every article used as food, that such article is derived from one or other of these two sources. But when we say 'food is necessary for life,' we mean only a limited number of articles. Hence such a syllogism as the following: 'Food is necessary to life; corn is food; therefore, corn is necessary to life,' is faulty from undistributed middle; the major proposition, 'food is necessary,' &c., has the form of a universal proposition, with the reality of a particular one.

The *equivocatio*, or *ambiguous middle*, is the case where a word is used in two senses so different as to give properly no middle term, and, therefore, no connecting link between the premises and the conclusion. A favorite example of this is the following: 'Every dog runs on four legs; Sirius (the dog-star) is a dog; therefore Sirius runs on four legs.' This is merely playing with the ambiguity of a word. Dr. Whately has shown that this fallacy may often arise with words derived from the same root; but acquiring from usage different significations; thus, 'projectors are unfit to be trusted; this man has formed a project, therefore he is unfit to be trusted;' where the argument supposes that the meaning of 'projector' and 'one who has formed a project' is the same, which it is not.

The fallacy of *composition and division* arises by using a word distributively that is meant collectively; thus, 'five is equal to two and three; two and three are even and odd; therefore five is even and odd.'

The fallacy of *accent* was an ambiguity arising from pronunciation. Thus, by a false accent in reading the commandment, 'thou shalt not bear false witness against thy neighbor,' it might be suggested that subordination is not forbidden, or that anything false except evidence is permitted, or that false evidence may be given for him, or that it is only against neighbors that false witness is not to be borne.'

The *fallacia accidentis* is still a form of the ambiguous middle. It is when we conclude of a thing something that is only true of it accidentally, as, 'wine is pernicious, therefore it ought to be forbidden.' The premise is true only of the immoderate use, the conclusion refers to its use in every form. Another fallacy, the converse of this, is arguing *à dicto secundum quid ad dictum simpliciter* (passing from what is true in some respect to what is true absolutely). Of this the stock example is: 'What you bought yesterday you eat to-day; you bought raw meat yesterday, therefore you eat raw meat to-day.'

The most usually quoted of the second class of fallacies—*extra dictionem*—are the following:

Ignoratio elenchi, or 'ignorance of the refutation.' This means mistaking the point in dispute; or proving something that an opponent does not deny. This is common enough in controversy. See an example in point in ETHICS.

The *petitio principii*, or 'begging of the question.' This is when, instead of proving a position by some different position, something is assumed that is identical with what is to be proved. The most common form of this fallacy is what is termed *reasoning in a circle*, where we make two propositions mutually prove each other. The following would be an example of this mode of reasoning. Suppose we asked why smoke ascends, and any one were to answer, 'because it is light;' we then inquire how it is known to be light, and the reply is, 'because it ascends.'

The *non causa pro causa*. This is a fallacy of insufficient induction, or the inferring a connection of cause and effect where there is only a mere sequence or accompaniment; as when we allege that the prosperity of England is due to its having an aristocracy, or an Established Church, or any other circumstance that has attached to the country, without ascertaining that there is any real causation between the two facts. Empiricism in medicine is of this nature; such a one took a certain medicine, and recovered from an illness, therefore the medicine was the cause of the recovery. The *post hoc, ergo propter hoc*, is another expression for the same fallacy, which is one of wide range, and whose rectification far transcends the limits of scholastic or formal logic.

The *argumentum ad hominem* is a reference to the circumstances of the party addressed, and means that although a certain reasoning may be good in itself, such party is not entitled to urge it, having perhaps already repudiated the same reasoning in other cases, or acted in a manner inconsistent with the employment of it. (For a full exemplification of fallacies according to the foregoing enumeration, see De Morgan's *Formal Logic*, Whately's *Logic*, Sir William Hamilton's *Lectures on Logic*, &c.)

The subject of fallacies has received a much more comprehensive treatment in the work on Logic by Mr. J. S. Mill, who has enlarged the basis of the science itself, by placing Induction at the foundation of Reasoning, and by recognizing the necessity of laying down rules for the correct performance of that process. See INDUCTION. This enables him to give a proper place to some of the preceding fallacies, such as the *post hoc, ergo propter hoc*, which, although occurring in treatises of syllogistic logic, does not violate any rule either of syllogism or of any process included in such treatises. In fact, if we take a complete view of all the cardinal operations that enter into the establishment of truth by evidence, we ought to enumerate four such operations—Observation, including experiment; Definition, or the right use of general terms; Induction; and Deduction or syllogism. Now, any one of these operations badly performed would necessarily lead to a wrong result, in other words, a fallacy. But in addition to the mistakes arising from the admission of insufficient evidence at any point, there is a class of errors (as well as truths) that arise from our receiving propositions without any evidence at all, on the ground that they are self-evident. In every case of reasoning, we must come at last to something that does not need a reason, as, for example, the evidence of our senses, or our actual observation; but we may sometimes admit as self-evident what is really not so, owing, perhaps, to our having a strong sentiment in the matter on hand. It is usual to consider the existence of an external material world, altogether independent of our minds, as certain in itself without requiring any proof or reason for the belief. It is found that we often commit mistakes in this way, and the mistakes thence arising Mr. Mill illustrates under the title of Fallacies of Simple Inspection, or Fallacies *à priori*, which includes the whole of what may be termed Natural Prejudices. The other members of his classification follow his division of the processes concerned in the investigation of truth: they are Fallacies of Observation, Fallacies of Generalization, including Induction, and Fallacies of Ratiocination or syllogism. He remarks, moreover, that error does not often take the form of a deliberate infringement of the rules of good observation, induction, or deduction, but rather consists in a confused perception of the premises involved. In other words, it is the 'not conceiving our premises with due clearness, that is, with due fixity; forming one conception of our evidence when we collect or receive it, and another when we make use of it; or unadvisedly, and in general unconsciously, substituting, as we proceed, different premises in the place of those with which we set out, or a different conclusion for that which we undertook to prove. This gives existence to a class of fallacies which may be justly called Fallacies of Confusion; comprehending, among others, all those which have their source in language, whether arising from the vagueness or ambiguity of our terms, or from casual associations with them. It is in this group that Mr. Mill places the *petitio principii*, the *ignoratio elenchi*, and ambiguous language generally (*Logic*, Book v.).

The scholastic fallacies were considered mostly in the light of weaknesses or involuntary errors of the intellect, to be corrected by sound rules or a good method of procedure. The syllogistic logician made little count of the natural prejudices, or strong emotions and passions of mind, which forcibly pervert the intellectual views, and render men averse to sound reasoning. This grand omission was first effectively supplied in the immortal first book of the *Novum Organon* of Bacon, who, in a vigorous and telling exposition, set forth some of the most powerful prejudices of the natural mind, and their influence in corrupting science and philosophy, as well as the everyday judgments of mankind. Under the name of 'idola' he classed four different species of these moral sources of error, against which the mind had to be fortified, not by syllogistic rules, but by a self-denying discipline, and a highly cultivated perception of the true end of science, which was to increase human power in all the arts of life. His first class of idola were *idola tribus*, or delusions common to the human mind generally, such as errors of the senses, the over-susceptibility of the mind to impressions of sense, the limits of the human faculties, and the interference of prejudices and passions; a very comprehensive class, which even he has failed to do full justice to. The next class are *idola speciei*, idols of the den or cavern, by which he understands the peculiarities and idiosyncrasies of individuals. The third class, *idola fori*, idols of the market, are intended to include the abuses of language, or the various ways that our conceptions of things are distorted by names. The last class are the *idola theatri*, theatrical illusions, under which he rebukes the great system-builders of antiquity,

such as Aristotle, for introducing fanciful and irrelevant considerations into philosophy; and dwells especially on the corrupting influences of superstition and theology, and also the poetical tendencies of the mind, which are not satisfied with truth unless it can take on in addition a certain warmth or brilliancy of coloring.

FALLING BODIES. Owing to Gravity (q.v.), all terrestrial bodies, if unsupported, fall, or move towards the earth's center. When a falling body is absolutely without support, it is said to fall freely, as distinguished from one descending an inclined plane or curved surface. We shall here consider the two cases of free descent and of descent on inclined planes.

1. *Bodies falling freely.*—The first fact of observation regarding falling bodies is that they fall with a variable velocity; from this we infer that they are acted upon by some force. Again, on observing how the velocity varies, we find that its increments in equal times are equal; from this we conclude that gravity is a uniform force, which it is, at least sensibly, for small distances above the earth's surface. We have next to find a measure for this force. By experiment, it is found that a body in 1" falls through 16.1 feet, and that at the end of 1" it moves with such a velocity, that if it continued to move uniformly after the 1" expired, it would pass over 32.2 feet in the next second. Hence, 32.2 feet is the measure of the velocity which has been generated in 1", and is therefore the measure of the accelerating force of gravity; for the measure of accelerating force is the velocity which it will produce in a body in a second of time.

The quantity 32.2 feet is usually denoted by the letter g ; and it is proper to mention here that this quantity measures the accelerating force of the earth's attraction on all bodies. Experiment shows that under the exhausted receiver of an air-pump all bodies fall with equal rapidity, and that the difference of velocities of falling bodies in air is due entirely to the action of air upon them.

As the accelerating force is uniform, it follows that the velocity generated in any time, t , will be given by the formula $v = gt$. Since the force is uniform, it must generate an equal velocity every second. In t' , therefore, it must generate a velocity gt' , since it produces g in 1". In $2''$, a falling body will be moving with a velocity of 64.4 feet—i.e., were the velocity to become constant for the third second, it would in that second move through 64.4 feet.

We are now in a position to inquire more particularly how bodies fall, and to answer such questions as first: What time will a body falling freely take to fall through a given space? Second: What velocity will it gain in falling through a given space? Third: How high will a body ascend when projected straight up with a given velocity? &c. Let A be the point from which a body falls, and B its position at the end of the time t ; and let AB = S. Then we know that at B the body has the velocity gt . Suppose, now, the body to be projected upwards from B towards



A with this velocity gt —gravity acting against it, and tending to retard its motion. We know that at the end of a time t it will be again at A, having exactly retraced its course, and lost all the velocity with which it started from B, because gravity will just take the same time to destroy the velocity gt which it took to produce it. From this consideration we may obtain an expression for the space AB or S in terms of the time t . In the time t , the body rising from B with a velocity = gt would ascend, if not retarded, a height $(gt) \cdot t$, or gt^2 . But in the time t , gravity, we know, carried it through S; it will therefore, in the same time, by retarding it, prevent it going to the height gt^2 by a space = S. The space through which it actually ascends is then represented by the difference $gt^2 - S$; but this space we know to be AB or S. Therefore $S = gt^2 - S$; or $2S = gt^2$, or $S = \frac{1}{2}gt^2$. We may give this equation another form. For v being the velocity acquired in the time t , $v = gt$, $\therefore t = \frac{v}{g}$. Then $S = \frac{1}{2}g \cdot \frac{v^2}{g^2} = \frac{v^2}{2g}$. Hence $v^2 = 2gS$. From these formulæ, we see that when a body falls from rest under the action of gravity, its velocity at any time varies as the time, and the square of its velocity as the space described.

If the body, instead of starting from rest, has an initial velocity V; and if v , as before, be the velocity at the time t , then evidently v = the original velocity + that which is generated by gravity, or $v = V + gt$; and the space will be that which would have been described by the body moving uniformly with a velocity V + that which it would describe under gravity alone, or $S = Vt + \frac{gt^2}{2}$.

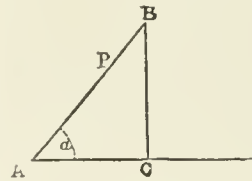
With regard to the last two formulæ, it is easy to see that they may be made to suit the case of a body projected upwards with a velocity V, by a change of signs; thus, $v = V - ft$, and $S = Vt - \frac{gt^2}{2}$; gravity here acting to destroy velocity, and diminish the

height attained. From the general formulæ in the case of an initial velocity, whether the body be projected upwards or downwards, we may express v in terms of S, as we did in the case of motion from rest. For $v^2 = (V \pm gt)^2 = V^2 \pm 2g(Vt + \frac{gt^2}{2}) = V^2 \pm 2gS$.

These are all the formulas applicable to the case of falling bodies, and by their means all problems in this branch of dynamics may be solved. It also appears that the formulæ above investigated apply to all cases of rectilinear motion of bodies considered as particles under the action of any uniform force. In all such cases, if f measure the accelerating force $S = \frac{1}{2}ft^2$, $v^2 = 2fS$, for the case of motion from rest; and $S = Vt \pm \frac{1}{2}ft^2$, and $v^2 = V^2 \pm 2fS$, for the case of an initial velocity.

The reader can easily frame examples illustrative of the formulæ for himself. We subjoin one: A stone falls down a well, and in 2" the sound of its striking the bottom is heard. How deep is the well? Neglecting the time occupied in the transmission of sound, the formula $S = \frac{1}{2}gt^2$ applies, or $S = \text{depth} = \frac{1}{2}g \cdot 2^2$, t being 2"; $\therefore$ depth = $2g$, or 64.4 feet.

2. *Bodies descending inclined planes.*—In this case the formulas already investigated apply with a slight change. In the figure, if P be a body on the inclined plane AB, descending under gravity,



we observe that only that resolved part of gravity parallel to AB is effective to make it descend, the other part at right angles to AB merely producing pressure on the plane. The angle of inclination of the plane being a , we know (see COMPOSITION AND RESOLUTION OF FORCES) that the resolved part of gravity parallel to the plane is $g \sin a$. The body, then, may be conceived to be descending

under a uniform accelerating force $g \sin a$. We obtain the formulæ, accordingly, for descent on inclined planes by substituting $g \sin a$ for f in the general formulæ given above. We notice, however, that in descent on inclined planes the velocity acquired is, as in the case of bodies falling freely, due solely to the vertical height through which the body falls.

By our formula, $v^2 = 2g \sin a \cdot S$ = where $S = AB$, if the body falls from B. This may be written $v^2 = 2g \cdot S \cdot \sin a$, or $= 2g \cdot AB \cdot \sin a$, or $= 2g \cdot BC$, since $AB \cdot \sin a = BC$. But this is the same as the velocity acquired by a body in falling freely through BC. In fact, it holds generally true, that the velocity acquired by a body falling down the surface of any smooth curve is that due to the vertical height through which it has fallen; which might be proved in various ways, but is sufficiently clear from this, that any curve may be considered as a succession of inclined planes, indefinitely short in length, and great in number; for the proposition being true, as above proved, for each of them, will be true for all, and therefore for the curve.

For an account of the variations of the value of g , due to the earth not being a perfect sphere, and other causes, see EARTH. The reader is also referred to the article ATWOOD'S MACHINE. The theory of the descent of bodies under gravity was first discovered and taught by Galileo.

FALLING SICKNESS. See EPILEPSY.

FALLMERAY'ER, JACOB PHILIPP, a German traveler and historian, was born 10th December 1791, at Tschotsch, near Brixen in the Tyrol; studied at Brixen, and in 1809 went to Salzburg, where he gave instructions to pupils in history and Latin. At the university of Landshut, he studied law, history, and philology. When Germany rose against Napoleon in 1813, he entered the Bavarian army, and took part in several engagements. After peace was concluded, F. returned to his studies. In 1826, he was appointed to the chair of history and philology at Landshut. In 1831, he accompanied the Russian general, Count Ostermann-Tolstoy, in a journey to the East, visiting Egypt, Palestine, Syria, Cyprus, Rhodes, Greece, Turkey, and Italy. During 1830—1840, he resided with Count Ostermann-Tolstoy at Geneva, and in the course of the next eight years twice revisited the East. The events of 1848 recalled him to Bavaria, and for a short time he sat as a deputy to the Frankfurt parliament, but after 1850 he lived privately in Munich. F. was a distinguished polyglott, and spoke a great number both of European and Oriental tongues. His principal works are, *Geschichte des Kaiserthums Trapezunt* (Münch. 1831), *Geschichte der Halbinsel Morea im Mittelalter* (2 vols., Stuttg. 1830—1836), and *Fragmente aus dem Orient* (2 vols. Stuttg. 1845). His views on the origin of the modern Greek language have excited the liveliest controversy both in Greece and elsewhere. A complete edition of F.'s works appeared at Leipsic in 1861, entitled *Gesammelte Werke von Jakob Philipp Fallmerayer*. He died in 1862.

FALLOPIAN TUBES, THE (so called after Fallopius, who is usually, but incorrectly, regarded as their discoverer), or oviducts,

are canals about four or five inches in length in the human subject, opening at their inner extremity into the upper angle of the uterus or womb, and at the other end, by a fringed funnel-shaped termination, into the cavity of the peritoneum. This fringed or fimbriated extremity at certain periods grasps the ovary, and receives the ovum, which is discharged by the rupture of the Graafian vesicle. See OVARIES. The ovum usually passes along the Fallopian tubes into the uterus, where it is either impregnated by contact with one or more spermatozoa, or is absorbed. Sometimes, however, the ovum becomes not only impregnated but retained, and further developed in the Fallopian tubes, thus giving rise to one of the forms of extra-uterine pregnancy.

FALLOPIUS, GABRIEL, a celebrated anatomist, born at or near Modena, about the year 1523 (this date, however, is very uncertain), and died in 1562. If the date we have assigned is correct, he was only twenty-five when he was promoted from the university of Ferrara to a professorship at Pisa, whence, after a few years, he was called to Padua, to succeed Vesalius, who had been compelled by the Inquisition to resign his office. See VESALIUS. Cuvier characterizes him as one of the three *savants* who restored rather than created the science of anatomy in the 17th c., the two others being Vesalius and Eustachius. After a short but brilliant career, he died at the age of 40, and was succeeded by his favorite pupil, Fabricius ab Acquapendente.

He published numerous works in various departments of medicine, of which the most important is his *Observationes Anatomicae, in libros quinque digestæ*, 1561, in which he corrects many errors into which his predecessor, Vesalius, had fallen. He was the first to describe with accuracy the ethmoid and sphenoid bones, and the minute structure of the ear (the canal along which the facial nerve passes, after leaving the auditory, is still known as the aqueduct of Fallopius); the muscles of the soft palate, and the villi and valvulae conniventes of the small intestines. In some of his supposed discoveries, he had been long anticipated; for example, the tubes passing from the ovary on either side to the uterus, and which bear his name, were known to, and accurately described by, Herophilus and Rufus of Ephesus, 300 years before our era. In addition to his anatomical fame, he had a considerable reputation as a botanist. He was the superintendent of the botanical garden at Padua; and a genus of plants, *Fallopia*, has been named after him. A complete edition of his works, in four folio volumes, was published in 1600.

FALLOUX, FRÉDÉRIC ALFRED PIERRE, COMTE DE, a French author and statesman, was born at Angers 11th May 1811. His family was distinguished for its legitimist zeal, and at the Restoration was rewarded by receiving letters of nobility. Young F. first drew attention to himself by two works penetrated by an ardent love of the old Bourbon order of things *L'Histoire de Louis XVI.* (Paris, 1840) and *L'Histoire de Saint Pie V., Pape de l'Ordre des Frères prêcheurs* (Paris, 1844). These indicate the level of his political and religious faith. In the elections of 1846, he was chosen deputy for the department Maine-et-Loire. In religion, he advocated the ideas of Montalembert; in politics, those of Berryer, but united with his legitimist sentiments a love of liberty and education strangely incongruous with the historic character of his party. After the revolution of February 1848, he exhibited much energy as a member of the Constituent Assembly, was one of those who organized the resistance to the insurrection of the 15th May, and, as reporter on the national workshops, pronounced for their immediate dissolution. He was also one of the most ardent promoters of the expedition to Rome.

After the election of Louis Napoleon to the presidency, F. was appointed Minister of Public Instruction, an office which he held only for ten months. After the events of the 2d December 1851, he retired from public life to a country-seat near Angers, where he occupies himself with agricultural pursuits. In 1857 he was admitted a member of the French Academy, and in the same year published at Tours his *Souvenirs de Charité*. He published in 1859 *Mme. Swetchine sa Vie et ses Œuvres*; in 1863, *Méditations et Prières*; in 1864, *La Convention du 15 Septembre*; in 1865, *Itinéraire de Turin à Rome*; and in 1866, *Lettres inédites de Mme. Swetchine*. In 1869 he attempted to re-enter the Assembly for the 3d circonscription of La Vendée, but was defeated by the official nominee.

FALLOW (from the same root as Ger. *fahl* or *falb*, Lat. *fulvus*, expressing a pale dun, tawny color). This word sometimes signifies waste, untilled land; but usually it is applied to land that is ploughed and otherwise stirred for a season without being cropped. The most of the wheat raised by the Romans was sown after the land was fallowed; indeed, the usual rotation was fallow and wheat alternately. It was only fertile soils that could long support such an exhausting system; hence resulted the decreasing produce which the later Roman agricultural authors so often speak of and lament.

The fallowing of land was introduced into all the countries which fell under the dominion of the Romans. During their sway in Britain, it soon exported large quantities of wheat; and

for centuries after the Romans left it, no other mode of cultivating the land was followed. It may here be observed, that wherever the system of fallowing, without giving manure to the crops, is practised, it necessarily supposes that the soil is at least moderately fertile. This system is most successful on argillaceous soils, which are retentive of organic manure. It must be borne in mind that the chief use of fallow is to liberate the plant-food which is already stored up in the soil as organic matter. The ploughing and stirring, by admitting air, promotes decomposition, in the same manner as the turning over of a dunghill does; it also destroys the roots of the weeds that impoverish and choke the crops.

It was long before fallowing was introduced to any extent in Scotland; but about the beginning of the present century, it was largely practised. Owing, however, to the draining of the soil, and the extension of the green-cropping system, it is now confined to the most retentive clay-soils, where it affords the only means of thoroughly cleaning the land. In a rotation of beans, clover, oats, fallow, wheat, and barley, each field is subjected to a process of fallowing once in every six, seven, or eight years, according to circumstances.

Fallow-fields usually receive a deep furrow in autumn. Lying exposed through the winter, the frost pulverizes the surface. In spring, when the weather becomes dry, the cultivator or the plough opens up the soil, and the process of extirpating the weeds goes on. Sometimes as many as three or four furrows are given in summer before the seed is sown in autumn. In old cultivated countries, land is commonly so much reduced in its organic matter, that fallows receive dressings of farm-yard manure, rape-dust, or guano, to obtain fertility.

Since the general introduction of green crops, the term fallow has departed in some measure from its original meaning. These crops are sown on what was formerly the fallow-bank, and are now often styled fallow-crops. The land, no doubt, receives in some measure a fallowing, as the green crops are cultivated by the plough during their growth. Bastard-fallowing is a term which is used in Scotland when hay-stubble is ploughed up in the end of summer, freed from weeds, and sown with wheat in autumn.

Where no express stipulation on the subject has been introduced into the lease, it has been held in Scotland, that, as the outgoing tenant might have taken a crop from the land, which, in accordance with the most approved principles of agriculture, he ought to leave fallow, and as the incoming tenant reaps the advantage in case of his abstaining from doing so, he is entitled to claim its value (*Purves*, December 3, 1882. See *Bell's Principles* s. 1263). 'This decision,' says Mr. Hunter (*Landlord and Tenant*, ii. p. 458), 'has been deemed to have fixed the law.' In conformity with the same principle, it has been ruled, that if the outgoing tenant received prepared fallow, the like should be left by him. A tenant who, on entering to his farm, had received a certain extent of fallow, prepared with manure, free of expense, was held bound to leave the same amount of fallow and manure as he had received, and to be entitled to claim payment only for the surplus (*Brown v. College of St. Andrews*, 11th July 1851). But where a portion of land has been expressly reserved in the lease for fallow and green crop, for which the tenant was to receive merely a certain sum per acre for ploughing, the rights of the parties are settled by the contract, and the tenant can claim no additional sum for fallow (*Sheriff v. Lord Lovat*, 18th December 1854).

FALLOW CHAT. See WHEATEAR.

FALLOW DEER (*Dama vulgaris* or *Cervus Dama*), a species of deer well known in Britain, being very commonly kept in parks, as it is also in most parts of Europe. It is probably a native of the countries around the Mediterranean, and has been introduced by man into the more northern parts of Europe, where it is, however, now in some places to be found wild in forests. It is doubted whether it has not been introduced by man, at a remote period, from the North of Africa even into the south of Europe, in all parts of which it is now at least completely naturalized. How far its geographic range extends eastward, is not very certainly known. It is represented in the sculptures of Nineveh. Its introduction into Britain is ascribed to James VI. of Scotland, who is said to have brought it from Norway when he brought home his queen, Anne of Denmark, and after his accession to the English throne, to have transported it to Enfield and Epping. Thousands of F. D. now exist in some of the English parks. They generally receive some attention and supplies of fodder in winter.

In size, the F. D. is smaller than the stag or red deer, from which it also differs in its broad palmated antlers, its longer tail, and its smoother and finer hair. In color, it is generally yellowish-brown in summer; darker, or even blackish-brown in winter; more or less spotted with pale spots, particularly in summer and when young; but in one variety the spots are very marked; in

another they are not to be observed even in the young. The but-ticks are white, and a dark line passes along the back. White F. D. are sometimes to be seen. The female has no horns. The male is called a BUCK (Fr. *daim*), the female a DOE (Fr. *daine*), the young a FAWN (Fr. *faon*). The name F. D. is derived from its color. See the article FALLOW, in Agriculture. When the



Fallow Deer (*Cervus Dama*).

F. D. and red deer are kept in the same park, the herds seldom mingle, nor do hybrids occur. The F. D. loves the woods. The flesh of the F. D. is one of the most esteemed kinds of venison. The remains of fossil species nearly allied to the F. D. occur in some parts of Europe. The great fossil Irish *Elk* (q. v.) is allied to it.

FALMOUTH, a parliamentary and municipal borough and seaport in the south-west of Cornwall, on a west branch of the estuary of the Fal, 14 miles north-north-east of Lizard Point, and 269 miles west-south-west of London. It chiefly consists of a narrow street, a mile long, on the south-west of the harbor, and of beautiful suburban terraces and villas on the heights behind. The harbor, one of the best in England, is formed by the estuary of the Fal, which is 5 by 1 to 2 miles in extent. It is 12 to 18 fathoms deep, and affords shelter to 500 vessels at a time. The mouth is defended on the west by Pendennis Castle, situated on a rock 193 feet high, and which resisted a siege by Cromwell for six months; on the east, by Mawes Castle, both built by Henry VIII. Pop. of the mun. bor. (1881) 4373; of the parl. bor., which includes Penryn, and returns two members, 17,561. F. was, till recently, one of the principal packet-stations for foreign mails. In 1880, the entries inwards were 1057 vessels, of 167,897 tons; and the clearances outwards 984 vessels, of 124,904 tons. There is a great pilchard-fishery off the neighboring coasts. The chief exports are tin, copper, pilchards, and fuel. Here orange and lemon trees yield plenty of fruit on open garden-walls. F. arose in the middle of the 17th c., Sir Walter Raleigh having at an earlier period drawn public notice to its capabilities; and it has been, since that time, a rendezvous for fleets and mail-packets proceeding abroad.

FALSE, RULE OF, or FALSE POSITION, is a mode of reckoning in cases where a direct solution of the question is impracticable. Any number is chosen at hazard, as that which is sought; this *false position* of course gives a false result, and from the amount ascertained by proportion what the assumption ought to have been. *Ex.* What number is that whose half exceeds its third by 12? Assume 96 at random; 48 — 32 gives 16, and which is too great; ∴ 16 : 12 :: 96 : 72, the number required. This method is now mostly superseded by the use of equations.

FALSE AND PRETENDED PROPHECIES, with intent to disturb the public peace, are punishable by several old statutes. By 33 Henry VIII. c. 14, this crime is made a felony; but by 3 and 4 Ed. VI. c. 15, continued by 7 Ed. VI. c. 11, and by 5 Eliz. c. 15, punishment is restricted to one year's imprisonment, and forfeiture of £10 for the first offence; and for the second offence, imprisonment for life, and forfeiture of all chattels. These statutes apply to a particular class of prophecies—viz., prophecies 'upon or by the occasion of any arms, fields, beasts, badges, or such other like things accustomed in arms, cognizances, or signets; or upon or by reason at any time, year, or day, bloodshed, or war, to the intent to make rebellion, &c.' This description refers to predictions founded upon the heraldic bearings of particular families, which, in the state of public feeling at the time when the statutes were passed, might have been productive of discontent and sedition. The statutes are unrepealed, but are not likely in the present day again to be put in force.

FALSE BAY, an inlet which may be referred either to the Atlantic, the Southern, or the Indian Ocean. It washes the east side of the mountainous district of South Africa, which terminates

in the Cape of Good Hope, and extends eastward along the coast as far as False Cape, measuring about 22 miles in length, and about the same in breadth. F. B. is, of course, sheltered from the north-west monsoon, to which Table Bay—the harbor of Cape Town—is exposed, an advantage which is more especially possessed by Simon's Bay, at its north-west extremity. Hence, besides periodically receiving trading-vessels from Cape Town for temporary protection, it is permanently the station of the naval force of the colony.

FALSE IMPRISONMENT. Every confinement of the person is an imprisonment, whether it be in a common prison or a private house, or in the stocks, or even by forcibly detaining one in the public streets (Coke, *Inst.* ii. 482). A man is liable for detaining the person of another, not only without cause, but without legal cause. Thus, where a man gives another in charge for committing an offence, the former is liable to an action for false imprisonment, if he fails to substantiate his case. Police-officers, also, are liable for apprehending a man without a competent warrant, or without reasonable suspicion. But where a felony has been committed, an officer is entitled to arrest on suspicion. Not only constables but private persons may arrest a man who commits a felony in their presence. A person who has falsely imprisoned another is liable to a criminal prosecution, and also to a civil action. In the former case, he may be punished by fine and imprisonment; in the latter, he must pay such damages as are awarded. Any one detained without sufficient cause is entitled to apply for a writ of *Habeas Corpus* (q. v.) to procure his liberation. In Scotland, this species of offence is called Wrongous Imprisonment.

FALSE NEWS or RUMORS. Spreading false news to make a discord between the sovereign and nobility, is a misdemeanor, and punishable by the common law of England with fine and imprisonment. By statute of Westminster the first. c. 34, this penalty is confirmed. This statute is said by Lord Coke to have been passed in consequence of the rebellion of Simon de Montfort (Coke, *Inst.* ii. 226). The law before the Conquest had been more severe, and required that the author and spreader of false rumors should have his tongue cut out, if he redeemed it not by estimation of his head (or capitation tax). One of the articles against Cardinal Wolsey was founded on this principle of common law. 'Also the said cardinal has lusted and endeavored himself by crafty and untrue tales against your nobles of your realm.'—Coke, *Inst.* iv. 92. The feeling of the present day is more in accordance with the axiom of Tacitus, *Convicia, si irasceris, tua divulgas, spreta excolescent* (If you seek to revenge slanders, you publish them as your own; if you despise them, they vanish).

FALSE PRETENCES, OBTAINING MONEY BY. By the common law of England, a man is not punishable as a criminal who has induced another, by fraudulent representations, to part with the property of money or goods, unless the loss occasioned by the deception be of a public nature. Larceny or theft was the only species of wrongful abstraction of articles of value which was recognized, and where the consent of the owner to the transaction was obtained, no matter how fraudulently, the loser was left to a civil action for his relief. To remedy this defect in the law, the 33 Henry VIII. c. 1 was passed, whereby it was enacted, that if any person should falsely and deceitfully obtain any money, goods, &c., by means of any false token or counterfeit letter made in any other man's name, the offender should suffer any punishment short of death, at the discretion of the judge. This statute, however, only reached the case of deception by use of false writing or token; the 30 Geo. II. c. 24 was therefore passed for the purpose of including all false pretences whatsoever. Further alterations were made by subsequent statutes, until, by 24 and 25 Vict. c. 96, the previous legislation on the subject was consolidated. This is now the ruling statute in regard to false pretences. The general principle is that, wherever a person fraudulently represents as an *existing fact* that which is not an existing fact, and so gets money, &c., that is an offence within the act (Reg. v. Woolley, 1. Den. C. C. 559). The false pretence must relate to some present fact, and therefore a promise merely to do some act is not such a false representation as will sustain a conviction. It is not necessary that the deception should be by words or writing, but any act tending to deceive, will bring a person within the statute. Thus, a man at Oxford wearing a cap and gown, in order to induce a tradesman, of whom he ordered goods, to believe that he was a member of the university, is sufficient to warrant a conviction.

The deception practised, however, must not be simply as to the *quality* of an article, for this is regarded as merely a dishonest trick of trade, and not criminally punishable; it is also necessary that the owner should be deceived by the pretence; and where a tradesman is induced to part with goods to a regular customer, making a false statement, not on account of the statement, but from his belief in the credit of the party, the transaction is not punishable under the act. By 24, 25 Vict. c. 96, ss. 88—90, it is enacted that it shall be no bar to a conviction that the crime, on

being proved, amounts to larceny, and that it shall not be necessary to prove an intent to defraud any particular person, that the delivery of money, &c., to another person, for the benefit of the party using the deception, and also the obtaining signature to, or destruction of, a valuable security, &c., by a false representation, shall subject the offender to punishment. The same statute, ss. 46 and 47, contains a salutary provision, that any person attempting to extort money by threatening to accuse another of certain felonies, or of an infamous crime, is liable to penal servitude for life.

In Scotland, this offence is known as Falsehood, Fraud, and Wilful Imposition. Each species of the offence which in England is punishable under the statute, in Scotland is indictable at common law. Thus, false personation, as where a man, in the assumed character of an exciseman, received money as a composition for smuggled goods, has been held to warrant a conviction of falsehood. So, also, where the deception consists in fictitious appearances; as where a man, by fitting his shop with false bales, induced another to trust him with goods. Obtaining money by begging-letters, and the common practice of chain-dropping, fall under this denomination of crime.

FALSE RETURN. ACTION FOR. Where a sheriff makes a false return to a writ, the party injured may maintain an action against him for damages. Thus, a return of *non est inventus* to a writ of *capias*, when the defendant might have been apprehended, or a return of *nulla bona* to a *fieri facias*, when there were goods which might have been seized, renders the sheriff liable in damages to the amount of loss occasioned by his negligence.

FALSE SIGNALS. By 7 Will. IV. and 1 Vict. c. 89, s. 5 the exhibiting any false light or signal, with intent to bring any ship or vessel into danger, is made felony, and punishable with death. The felonious intent may be proved by declarations made by the accused, or by circumstances which fairly lead to the conclusion of a guilty purpose. The punishment of death is recorded, but is not in fact carried out.

FALSE SWEARING. By 19 and 20 Vict. c. 79, s. 178 (Bankruptcy, Scotland), any person guilty of falsehood in any oath made in the pursuance of the act, shall be liable to a prosecution at the instance of the Lord Advocate, or of the trustee in the sequestration, with consent of the Lord Advocate. But in the latter case, the prosecution must be authorized by a majority of the creditors present at a meeting called for the purpose. The person, on conviction, is liable, in addition to the punishment awarded, to forfeit, for behoof of the creditors, his whole claim under the sequestration. In England a bankrupt is not put upon oath; but on making a false declaration, he is deemed guilty of a misdemeanor, and punishable with the penalty of perjury.

FALSE VERDICT. The remedy in cases where it was alleged that a false verdict had been returned, was formerly by means of a writ of attain. This writ originally lay only in cases where the jury had returned a verdict on their own knowledge of the facts, and proceeded on the assumption that, in returning a false verdict, they were necessarily perjured. The case was heard before twenty-four men, and in case the original verdict was found bad, the jurors incurred the penalty of infamy and forfeiture of their goods. By statute of Westminster the first, c. 34, a writ of attain was allowed upon an inquest; i. e., where cases had been decided upon evidence adduced. But the universal rule now established is, that though in most civil cases a new trial may be had for various causes, in no case can jurymen be punished, though finding a verdict against evidence. Writ of attain was abolished by 6 Geo. IV. c. 50, s. 60.

FALSE WEIGHTS AND MEASURES. The use of false weights and scales is an offence at common law in England, and punishable by imprisonment. In Scotland, by 1607 c. 2, the users of false weights are punishable by confiscation of movables.

FALSEHOOD. See FRAUD.

FA'LSET, or FALSE'TTO, a term in singing for the highest register of a man's voice, which joins the natural or chest voice, and which, by practice, may be so blended with the chest-voice as to make no perceivable break.

FALSIFY'ING RECORDS. The injuring or falsifying any of the documents of a court of justice is, by several modern statutes, made a serious offence. Any person obliterating, injuring, or destroying any record, writ, &c., or any original document belonging to any court of record or of equity, is guilty of felony, and is liable to be kept for three years in penal servitude, or be punished by two years' imprisonment, with or without hard labor, 24 and 25 Vict. c. 96, s. 30. By 24 and 25 Vict. c. 98, s. 28, any person employed to furnish certified copies wilfully certifying any document as a true copy, knowing the same is not so, is guilty of a felony, and subject to 7 years' penal servitude. This act does not extend to Scotland. By 1 and 2 Vict. c. 94, any person employed in a public record office certifying any writing to be a true copy, know-

ing the same to be false in any material part, is guilty of felony, and may be punished with penal servitude for life.

FA'LSTER, a Danish island in the Baltic, south of Seeland lies between lat. 54° 30' and 54° 58' N., and between long. 11° 45' and 12° 11' E. It is separated by the strait called the Grönsund from the island of Moen, and by that called the Guldborgsund from the island of Laaland, together with which F. forms the stift or province of Laaland, a province which contains in all 635 square miles, and which has about 200,000 inhabitants. F. is about 26 miles long, and 16 wide at its widest part, and has an area of about 178 square miles. It is flat, remarkably fruitful, and well cultivated, so that it resembles an attractive garden, and maintains in all about 23,000 inhabitants, who employ themselves chiefly in agriculture and cattle-breeding. The chief town is Nykjöbing, on the Guldborgsund. It is very old, has a castle and a cathedral, has some commerce and shipbuilding, and a population of about 4000. The only other place of any note is Stubbekjöbing.

FA'LUN, or FAHLUN (called also *Gamla Kopparberget*, i. e., the 'old copper-mine'), is a town of Sweden, capital of the län, or province, of the same name. It has long been famous for its copper-mines, though the quantity of ore now obtained is much smaller than formerly. In 1650, the yield was 3000 tons annually; this, however, declined, in 1690, to 1900 tons; while at present it is only about 400 tons. Gustavus Adolphus called the mines the 'treasury of Sweden.' The excavations extend for miles underground, containing vast chambers, where Bernadotte, the late king, gave splendid banquets, on which occasions the mines were brilliantly lighted up. F. is regularly built, and its houses are of wood, and blackened by the fumes of the numerous smelting-furnaces. Pop. (1880) 7305.

FALUNS, a term given by the agriculturists of Touraine to shelly sand and marl, which they use as manure, and applied by geologists to the deposits from which they are obtained. They are loosely aggregated beds of sand and marl, but occasionally so compacted by calcareous cement as to form a soft building-stone. The animal remains contained in them are chiefly marine, and of a more tropical fauna than that of the Mediterranean. A few land and fluviatile mollusca are found mixed with the oceanic forms and with these are associated the remains of terrestrial quadrupeds, as *Dinotherium* (q. v.), *Mastodon* (q. v.), *Rhinoceros* (q. v.), &c.

FA'MA (Gr. *Pheme*), the goddess of rumor, appears in the works of the earliest poets. Sophocles makes her the child of Hope; Virgil, the youngest daughter of Terra, the sister of Enceladus and Cæus.

FA'MA CLAMO'SA, in the ecclesiastical law of Scotland, is a wide-spread report, imputing immoral conduct to a clergyman, probationer, or elder of the church. A fama clamosa, if very clamant, may form the ground of process by a presbytery, without any specific complaint being brought before them, or there being any particular accuser. In these circumstances, the presbytery act for the vindication of their own order, and in behalf of the morals of the community. Should the inquiries of the presbytery lead them to the conviction that the rumor is not without foundation, they will serve the accused party with a libel, and thus bring him for trial before them. (Hill's *Church Prac.* 49; Cook's *Styles*; and Wood *On Libels*.)

FAMAGO'STA, or FAMAGUSTA, is a seaport on the E. coast of Cyprus, on the supposed site of ancient Arsinoë, about 35 miles from Lefkosia (q. v.), the present capital of the island. It was a place of importance in the crusades, and under the Venetians from 1489 to 1571 it became a rich and flourishing city, with a population of fully 30,000 inhabitants; now only a few hundreds find shelter amongst the filthy ruins, the wreck of its churches and palaces. On coming under the sway of the Turks after a siege of four months, it fell into a state of decay; an earthquake in 1735 completed its ruin.

The town is inclosed within well-built walls, constructed from the ruins of Salamis; but of its 300 churches, only one, that of St. Nicholas, remains. It is now used as a mosque, but contains many monuments of its former use, and is a fine specimen of mediæval architecture; in it Richard I. of England crowned Guy de Lusignan king of Cyprus in 1191. F. possesses a good natural harbor, about 8000 feet long, by 2000 feet wide, which would require to be cleansed before it could admit ships of the largest tonnage. The water in the bay exceeds 170 fathoms in depth. Under Turkish rule F. was simply regarded as a military fortress and occupied by the Sultan's troops; since Cyprus became a British possession, the affairs of the town and province have been administered by a resident civil commissioner and his assistant, with numerous native officials. About five miles north are the ruins of ancient Salamis. Chief exports of F. are corn and pomegranates, for which the district is famous.

FAMILIAR SPIRITS, a term employed to denote certain supernatural beings, in attendance upon magicians, wizards, witches, conjurers, and other skillful professors of the black art. The word 'familiar' is in all likelihood derived from the Latin *famulus* (a 'domestic,' a 'slave'). The belief in such spirits goes far back into the history of the race. We read of them in the time of Moses, who admonishes his countrymen to 'regard not them that have familiar spirits' (Lev. xix. 31), which would imply the prevalence of the superstition among the Egyptians. The word in the original rendered 'familiar spirits' is *oboth*; it is of frequent occurrence in the Hebrew Scriptures, and literally signifies 'leathern bottles'; thereby indicating the antiquity of the idea, that magicians were wont to imprison in bottles the spirits whom their spells had subdued (whence our 'bottle-imps' and 'bottle-conjurers'); the origin, again, of which grotesque belief is perhaps to be sought for in the circumstance that mystical liquids kept in vials have been immensely in vogue among the conjurers of all ages and countries. It is not clear, as some think, that we can include Socrates among those who shared this vulgar superstition, for although he spoke of his attendant 'demon' in very ambiguous terms, the opinion of all enlightened eritics is, that he meant by the word nothing more and nothing less than what Christians mean by the presence of a divine light and guide in the heart and conscience. But according to Delrio—a great authority on this subject—the belief in familiar spirits in the grosser and more magical form did exist among the ancient Greeks, who, he affirms, designated such beings *Paredii*, 'companions,' as being ever assiduously at hand. The story of the ring of Gyges, king of Lydia, as narrated by Herodotus, is held by Heywood (see *Hierarchy of the Blessed Angels*, &c.) to prove the existence of the belief in that country also; and it is quite certain that during the middle ages the belief in 'enchanted rings' containing familiar spirits was widely diffused throughout Europe, the magicians of Salamanca, Toledo, and those of Italy, being especially famous for their skill in thus subjugating and imprisoning demons. Asia, in fact, would seem to have been the original home of the belief in familiar spirits, which has long been established as a cardinal superstition of the Persians and Hindus, and which appears in perfection in the *Arabian Nights*. The 'slave of the lamp' who waits upon Aladdin is an example in point.

Whether the belief in familiar spirits sprang up independently among the nations of Western Europe, or was transplanted thither by intercourse with the East, does not clearly appear. A favorite form assumed by the familiar spirit was that of a black dog. Jovius and others relate, that the famous Cornelius Agrippa (q. v.), half philosopher, half quack, was always accompanied by 'a devil in the shape of a black dog' and add, that when he perceived the approach of death, he took a collar ornamented with nails, disposed in magical inscriptions, from the neck of this animal, and dismissed him with these memorable words: *Abi, perdita Bestia, quæ me totum perdidisti*—('Away, accursed beast, who hast ruined me wholly for ever') Butler, in his *Hudibras*, speaks highly of this animal:

Agrippa kept a Stygian pug
 In the garb and habit of a dog
 That was his tutor, and the car
 Read to the occult philosopher,
 And taught him subtly to maintain
 All other sciences are vain.

The readers of Goethe, too, will remember that Mephistopheles first appears to Faust and Wagner during their evening walk in this shape; but, in truth, the earliest instances of such transmigration are much older at least, if medieval tradition can be credited, for it assures us that Simon Magus and other ancient magicians had familiar spirits who attended them in the form of dogs. Curiously enough, in spite of the servitude to which the attendant imps were reduced by the potent spells of the magicians, they were popularly supposed, during the middle ages, to have their revenge at last, by carrying with them into eternal torment the souls of their deceased masters. This idea of divine retribution overtaking the practisers of magic is, however, not found out of Christendom. The Jews think not the less but the more of Solomon because he was, as they say, one of the greatest of magicians; and a similar feeling in regard to 'wonder-workers' pervades eastern nations generally, though it is to be noticed that the latter are often represented as using their power malignantly. See **MAGIC**.

FAMILIARS. See **INQUISITION**.

FAMILY (Lat. *familia*). Though we are in the habit of regarding the life of antiquity, and more particularly that of Greece, as less domestic than that of Christian Europe (and probably with reason), the idea of the family or house (Gr. *oikos*), as the nucleus of society, as the political unit, was there very early developed. Aristotle speaks of it as the foundation of the state, and quotes Hesiod to the effect that the original family consisted of the wife and the laboring ox, which held, as he says, to the poor the position of the slaves (*Polit.* i. 1). The complete Greek family then

consisted of the man and his wife and his slave; the two latter, Aristotle says, never having been confounded in the same class by the Greeks, as by the barbarians (*ib.*). In this form, the family was recognized as the model of the monarchy, the earliest, as well as the simplest, form of government.

When, by the birth and growth of children, and the death of the father, the original family is broken up into several, the heads of which stand to each other in a co-ordinate rather than a strictly subordinate position, we have in these the prototypes of the more advanced forms of government. Each brother, by becoming the head of a separate family, becomes a member of an aristocracy, or the embodiment of a portion of the sovereign power, as it exists in the separate elements of which a constitutional or a democratic government is composed.

But at Rome the idea of the family was still more closely entwined with that of life in the state, and the natural power of the father was taken as the basis not only of the whole political, but of the whole social organization of the people. In its more special aspects, the Roman idea of the family will be explained under **PATRIA POTESTAS**. Here it will be sufficient to state that with the Romans, as with the Greeks, it included the slave as well as the wife, and ultimately the children; a fact which indeed is indicated by the etymology of the word, which belong to the same root as *famulus*, a slave. In its widest sense, the *familia* included even the inanimate possessions of the citizen, who, as the head of a house, was his own master (*sui juris*); and Gaius (ii. 102) uses it as synonymous with *patrimonium*. In general, however, it was confined to persons—the wife, children, grandchildren, and great-grandchildren, if such there were, and slaves of a full-blown Roman citizen. Sometimes, too, it signified all those who had sprung from a common stock, and would have been members of the family, and under the potestas of a common ancestor, had he been alive. See **AGNATE**. In this sense, of course, the slaves belonging to the different members of the family were not included in it. It was a family, in short, in the sense in which we speak of 'the royal family,' &c., with this difference, that it was possible for an individual to quit it, and to pass into another by adoption. See **ADOPTION**. Sometimes, again, the word was used with reference to slaves exclusively, and, analogically, to a sect of philosophers, or a body of gladiators. See Smith's *Dictionary of Greek and Roman Antiquities*.

The whole social fabric is based on the grouping of human beings in families; an arrangement which is in harmony with all the conditions and wants of human life, and which tends to foster those habits and affections that are essential to the welfare of mankind. A prosperous community must be an aggregate of happy families; there being little true happiness in the world that is not intimately connected with domestic life. The formal bond of the family is Marriage (q. v.; see also **POLYGAMY**); and an essential condition of its right development seems to be a distinct abode, which shall be not a mere shelter, but a house or *home*, affording a certain measure of comfort and decency, according to the standard prevalent in the community. According to the views of many modern anthropologists, the family is historically posterior and not prior to the tribe. See **MARRIAGE**, and the books there named.

FAMILY OF LOVE. See **AGAPEMONE**.

FAMINE, PORT, an abortive settlement of Spain, on the northern side of the Strait of Magellan, is situated in lat. 53° 38' S., and long. 70° 58' W. It owes its name to the death, by starvation, of the Spanish garrison; and it is said to be now a penal colony of the republic of Chili. Some voyagers, however, have spoken of the neighborhood as 'covered with flowers,' and 'deco-
 rated with luxuriance,' and capable of being made, so far as soil is concerned, 'one of the finest regions in the world.'

FAN, an instrument or mechanical contrivance for moving the air for the sake of coolness, or for winnowing chaff from grain. In the East, the use of fans is of remote antiquity. The Hebrews, Egyptians, Chinese, and the miscellaneous population of India, all used fans as far back as history reaches. At the present day, it is customary, in the better classes of houses in India, to suspend a large species of fan from the ceiling, and keep it in agitation with strings, pulled by servants, in order to give a degree of coolness to the air. See **PUNKAH**. Among the oldest notices of winnowing fans are those in the Scriptures. There the fan is always spoken of as an instrument for driving away chaff, or for cleansing in a metaphorical sense; and such notices remind us of the simple processes of husbandry employed by a people little advanced in the arts. It was a long stride from the use of a simple hand-instrument for winnowing to that of the modern mechanism employed for a similar purpose. See **FANNERS**; **BLOWING MACHINES**.

As is observable from the collection of Egyptian antiquities in the British Museum, the fan as an article of female taste and luxury is of quite as old date as the instrument is for commoner purposes. Terence, a writer of Latin comedies, who lived in the

2d c. B.C. makes one of his characters speak of the fan as used by ladies in ancient Rome: *Cape hoc flabellum, et ventulum huic facito*—"Take this fan, and give her thus a little air." From this Roman origin, the fashion of carrying fans could scarcely fail to be handed down to the ladies of Italy, Spain, and France, whence it was in advanced times imported by the fair of Great Britain. Queen Elizabeth, when in full dress, carried a fan. Shakspeare speaks of fans as connected with a lady's 'bravery' or finery:

With scarfs and fans, and double charge of bravery.

It is proper to say, however, that the fan was in these and also in later times not a mere article of finery. There were walking as well as dress fans. The walking or outdoor fan which a lady carried with her to church, or to public promenades, was of large dimensions, sufficient to screen the face from the sun, and answered the purpose of the modern Parasol (q. v.). In old prints, ladies are seen carrying these fans in different attitudes according to fancy. The dress fan, which formed part of a lady's equipment at court ceremonies, drums, routs, and theatrical entertainments, was of a size considerably less than the walking fan, and altogether more elegant. Of these dress fans there exist numerous specimens bequeathed as heirlooms from one generation to another; indeed, there are few ladies who cannot show several different eras throughout the 18th c.; some being in good preservation, while in others the gilded stars and cupids which delighted the eyes of great-grandmothers have a mournfully tarnished appearance.

In the finer kinds of these old fans, the open part of paper is painted with pretty rural scenes and groups of figures in the style of Watteau (q. v.). All were probably of French manufacture. The more costly fan imported from China was and still is altogether of ivory, highly carved and pierced; but it wants the lightness and flexibility which were essential in the ordinary management of this article of the toilet. Strictly speaking, the fan was used less for the purpose of cooling than for giving the hands something to do, and also for symbolically expressing certain passing feelings. In the hand of an adept, the fan, by peculiar movements, could be made to express love, disdain, modesty, hope, anger, and other emotions. Gay, speaking of Flavia's accomplishments, says:

In other hands, the fan would prove
An engine of small force in love.

Considering the coarseness of language, even in the higher circles, in the early part of the 18th c., we cannot wonder that the fan should have been indispensable to a lady going into company. It was held up to shield the countenance when anything too shocking for female ears was uttered. Pope has an allusion to this use of the fan

The modest fan was lifted up no more,
And virgins smiled at what they blushed before.

Steele, in a paper in the *Tatler*, No. 52, August 9, 1709, gives an amusing account of Delamira, a fine lady, resigning her fan when she was about to be married. One of her female acquaintances, having envied the manner in which this charming and fortunate coquette had played her fan, asks her for it. Delamira acknowledges the wonderful virtues of the fan, and tells her that 'all she had above the rest of her sex and contemporary beauties was wholly owing to a fan (that was left her by her mother, and had been long in the family), which, whoever had in possession, and used with skill, should command the hearts of all her beholders; "and since," said she smiling, "I have no more to do with extending my conquests or triumphs, I will make you a present of this inestimable rarity." Two years later, Addison, in a paper in the *Spectator* (No. 102), gives a humorous account of the tactics of coquettes in the use of fans: 'Women are armed with fans as men with swords, and sometimes do more execution with them; then he goes on to describe how ladies are instructed to handle, discharge, ground, and flutter their fans—the whole being a pleasant satire on the fan-manceuvring in the reign of Queen Anne.

Later in the 18th c., fans served another important purpose. At dancing assemblies in London, Bath, and elsewhere, it was usual for the gentlemen to select their partners by drawing a fan. All the ladies' fans being placed promiscuously in a hat, each gentleman drew one, and the lady to whom it belonged was his allotted partner. Mrs. Montagu, in one of her letters, refers to this custom: 'In the afternoon, I went to Lord Oxford's ball at Mary-le-bone. It was very agreeable. The partners were chosen by their fans, but with a little *supercherie*.' Of the trick or fraud which this authoress delicately veils under a French term, the beaux of that period were far from guiltless. A lady's fan was almost as well known as her face, and it was not difficult, with a little connivance, to know which to draw.

At Edinburgh, where it appears to have been the practice to select a partner for a whole season, the fans of the ladies were care-

fully studied. Sir Alexander Boswell alludes to this species of stratagem in one of his poems:

Each lady's fan a chosen Damon bore,
With care selected many a day before;
For unprovided with a favorite beau,
The nymph, chagrined, the ball must needs forego.

In Italy, Spain, the West Indies, and also some parts of the United States, fans are largely in use for giving the sensation of coolness during hot weather, and for this purpose they may sometimes be seen in the hands of gentlemen as well as ladies. In Spain, the old fashion of fan-flirting appears to be still in vogue. A late traveler in that country says; 'I was vastly interested in the movements of the ladies' fans at church. All the world knows that Spanish fans are in perpetual motion, and betray each feeling, real or assumed, that passes through the mind of the bearer. I felt convinced I could guess the nature of the service at every particular moment by the way in which the fans were waving. The difference between a litaney and a thanksgiving was unmistakable; and I believed that minuter shades of devotion were also discoverable.'—*Vacation Tourists* (1861).

With other changes in manners, fans are no longer used in English fashionable circles for the frivolous purposes noticed in their past history; they still continue, however, to form an article of ceremonial dress at dinner and other evening parties. In embellishing them, foreign as well as native art is exerted on a scale commensurate with their price. From the superior kinds, composed of ivory and silk, costing twenty guineas, down to those of wood and paper, which are sold at 6d. or 1s., there are varieties to suit every toilet and pocket. Lately, fans made tastefully of feathers, also fans constructed of straw and variously colored ribbons, have been among the novelties of fashion. In the case of a general court mourning, ladies are enjoined to use 'black paper fans.' The manufacture of fans of various kinds is carried on in England, France, Belgium, Spain, and other European countries, likewise in the United States; and now, as formerly, the fan is an article of export from China to many parts of the world.

FAN PALM, a name common to all those palms which have fan-shaped leaves, as the species of *Mauritia*, *Lodoicea*, (Double Cocoa Nut), *Hyphane* (Doum Palm), *Corypha*, *Livingstonia*, *Chamærops*, &c. The only true European palm, *Chamærops humilis* (q. v.), is a F. P., as is also the North American Palmetto. The Talipot Palm (*Corypha umbraculifera*) is sometimes called the Great Fan Palm. The Palmyra Palm is another fan palm. The fan-shaped leaf is produced by an abbreviation of the midrib of a pinnated leaf.

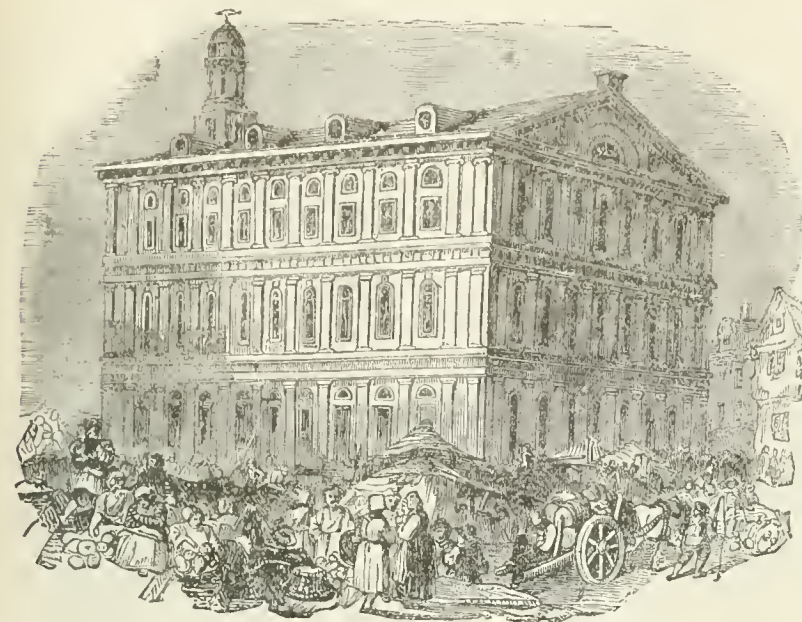
FANA'RIOTS, the general name given to the Greeks inhabiting the Fanar or Fanal in Constantinople, a quarter of the city which takes its name from the beacon (Gr. *phanarion*) situated in it. They first appear in history after the taking of Constantinople by the Turks, and appear to have been originally descendants of such noble Byzantine families as escaped the fury of the barbarians. Afterwards, however, the class was recruited by emigrants from different parts of the old Byzantine empire. Subtle, insinuating, intriguing, they soon took advantage of the ignorance of the Turkish governors, and made themselves politically indispensable to their rulers. They filled the offices of dragomans, secretaries, bankers, &c. One of them, named Panayotaki, at a later period, was appointed Dragoman to the Divan, and his successors obtained still greater honors. Through their influence, the lucrative office of Dragoman of the Fleet was called into existence, which gave them almost unlimited power in the islands of the Archipelago. Besides, from them were chosen, until the outbreak of the revolution in 1822, the Hospodars of Wallachia and Moldavia, while, in addition, the disposal of most of the civil and military posts under the Turkish government was in their hands. In spite of their power, however, the F. never exhibited much patriotism; they were animated by the petty motives of a caste, and when the war of liberation broke out among their countrymen, they took no part in it. In the present altered state of affairs in Turkey, they have no political influence. See Marco Zalloni's *Essai sur les Fanariots* (Marseille, 1824; 2d ed. 1830). Consult also Finlay's *History of the Greek Revolution* (Edin., Blackwood and Sons, 1861).

FANCY. See IMAGINATION.

FANDA'NGO, like the *Bolero*, is an old Spanish national dance, in 4 time. It is danced most gracefully in the country, usually to the accompaniment of a guitar, while the dancers beat time with castanets, a custom borrowed from the Moors. It proceeds gradually from a slow and uniform to the liveliest motion; and notwithstanding the simplicity of the *pas*, vividly expresses all the gradations of the passion of love, in a manner sometimes bordering on licentiousness. The people are so passionately fond of it that the efforts of the clergy have never been able to suppress it.

FANEUIL HALL, a spacious public hall in Boston, Massachusetts, erected in 1742 by Peter Faneuil, and presented by him to the town. In its original condition as so gifted, the building contained a hall for public meetings, with lesser apartments above, and a basement used as a market. In 1761 it was destroyed by fire, and rebuilt. During the revolutionary struggle with Eng-

land, the hall was so often used for important political meetings, that it became known as 'the cradle of American liberty.' In 1805, the building was increased in height by an additional story, and also increased in width. It is now an edifice about 80 feet square; the hall contains some fine paintings; and the basement is no longer used as a market.



Faneuil Hall.

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The cut here given, which is taken from an original drawing, represents this interesting historical edifice as it existed in 1768.

FANFARE is the French name of a short and lively military air or call, executed on brass instruments. It was brought by the Arabs into Spain, whence it passed into Mexico and the New World. *Fanfaron*, derived from *fanfare*, is the name given to a swaggering bully or cowardly boaster, probably because of the empty noise he makes when 'blowing his own trumpet,' or threatening timid people, and the term applied to his idle bragadocio and vaporing vaunts is *Fanfaronnade*.

FANG (A-S. a catching or grasp, from *fon*, to seize; pp. *fangen*; comp. Ger. *fangen*, to catch). In the terminology of the law of Scotland, a thief taken *with the fang* is one apprehended while carrying the stolen goods on his person. It is not very long since this word formed part of the common speech of Scotland:

Snap went the shears, then in a wink,
The fang was stowed behind a bink.

Morison's Poems, p. 110.

In England also, the verb *fang* was still in use in Shakespeare's time: 'Destruction fang mankind!' (*Timon of Athens*, iv. 3); and 'Master Fang,' in *Henry IV.*, is named after his office. We still use the phrase 'in the fangs,' for in the clutches; and the fangs of a dog or of a serpent are its teeth with which it catches or holds.

FANNERS, a machine employed to winnow grain. In passing through the machine, the grain is rapidly agitated in a sieve, and falling through a strong current of wind, created by a rotatory fan, the chaff is blown out at one end, and the cleansed particles fall out at an orifice beneath. The apparatus is composed chiefly of wood, and though ordinarily moved by the hand, it is sometimes connected with the driving power of a thrashing-mill. The fanners superseded the old and slow process of winnowing, which consisted in throwing up the grain by means of sieves or shovels, while a current of wind, blowing across the thrashing-floor, carried away the chaff. 'A machine for the winnowing of corn was, as far as can be ascertained, for the first time made in this island by Andrew Rodger, a farmer on the estate of Cavers in Roxburghshire, in the year 1737. It was after retiring from his farm to indulge a bent for mechanics, that he entered on this remarkable invention, and began circulating what were called *Fanners* through-

out the country, which his descendants continued to do for many years.'—*Domestic Annals of Scotland*, by R. Chambers, vol. iii.

Strangely enough, there was a strong opposition to the use of this useful instrument; the objectors being certain rigid sectaries in Scotland, who saw in it an impious evasion of the Divine will. To create an artificial wind, was a distinct flying in the face of the text, 'He that formeth the mountains, and createth the wind.'—Amos iv. 13. Apart from the folly of the objectors, who carried their fancies to the extent of petty persecution, we are amazed at their apparent neglect of the fact, that the winnowing of corn by artificial means, in which fans performed a conspicuous part, is mentioned repeatedly in the Old Testament. See FAN. The advantages in using the fanners soon overcame all prejudices on the subject, and the objections to the use of the machine are now remembered only by tradition, and by a passage in one of the imperishable fictions of Scott. In the tale of *Old Mortality*, Mause Headrigg is made anachronously to speak to her mistress about 'a newfaugled machine for *lighting* the corn frae the chaff, thus impiously thwarting the will o' Divine Providence, by raising wind for your leddyship's use by human art, instead of soliciting it by prayer, or patiently waiting for whatever dispensation of wind Providence was pleased to send upon the shieling-hill.'

FA'NO (Lat. *Fanum Fortunæ*, so called from the temple of Fortune which the Romans erected here in commemoration of the defeat of Asdrubal on the Metaurus) is the name of a town and seaport of Italy, in the province of Urbino e Pesaro, finely situated in a beautiful and fertile district on the shore of the Adriatic, 30 miles north-west of Ancona, and near the mouth of the Metaurus. It is well built, is surrounded with walls and ditches, has a cathedral dedicated to St. Fortunato, and numerous churches containing many valuable paintings, among which are several of the best works of Domenichino, and an excellent 'Annunciation' by Guido. The remains of a triumphal arch of white marble, raised in honor of Augustus, form perhaps the chief object of classical interest at Fano. Pop. 6500, who carry on considerable trade in corn and oil, and in silk goods. Here, in 1514, Pope Julius II. established the first printing-press with Arabic letters known in Europe. The port of F. was once well known to the traders of the Adriatic; its commerce, however, has declined, and the harbor became, to some extent, choked up with sand.

FANS, THE, a race of aborigines in Equatorial Africa, residing on the tributaries of the Gaboon river, and said to be cannibals; the accounts of this savage race are, however, still imperfect, and what is mentioned respecting them wants confirmation.

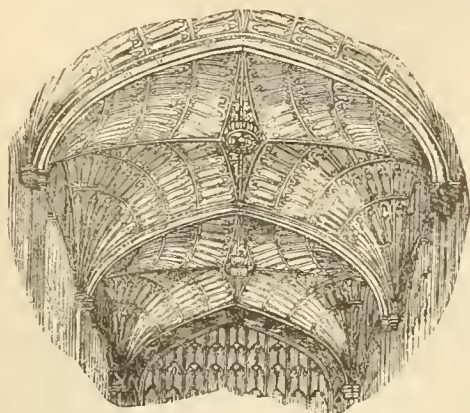
FANSHAWE, SIR RICHARD, was born in 1608 at Ware Park, in the county of Hertford; studied at Jesus College, Cambridge; and in 1626, became a member of the Inner Temple. On the outbreak of the civil war, he took part with the king; and in 1648, became treasurer to the navy under Prince Rupert. He was taken prisoner at the battle of Worcester; and on his release, withdrew to Breda in Holland, where Charles II. was holding his court in exile. After the Restoration, he was appointed ambassador at the court of Madrid, where he died in 1666. F. was an author of considerable reputation. His most celebrated work, now very rare, is a translation of Guarini's *Pastor Fido*, the lyrical passages of which are rendered with remarkable skill and elegance. The volume in which it appeared was published in 1664, and contains other pieces in prose and verse.

FANTA'SIA, in Music, the name of a composition of a similar character to the capriccio; also given to extempore effusions performed by a musician who possesses the rare gift of producing, as it were, off-hand music like a well-studied, regular composition. Hummel was more celebrated for his extempore fantasias on the pianoforte than even for his published compositions. Frederick Schneider was equally great for his free fantasias on the organ.

FANTOCCI'NI. See PUPPET.

FAN-TRACERY VAULTING, a kind of Late Gothic vaulting (15th c.), so called from its resemblance to a fan. The ribs or veins spring from one point, the cap of the shaft, and radiate with the same curvature, and at equal intervals, round the surface of a curved cone or polygon, till they reach the semicircular or polygonal ribs which divide the roof horizontally at the ridge level. The spaces between the ribs are filled with foils and cusps, resembling the tracery of a Gothic window; hence the name *fan-tracery*. The spaces between the outlines of the fans at the ridge level, are called by Professor Whewell (*German*

Churches) ridge lozenges. In Henry VII.'s Chapel, Westminster, one of the best examples of this kind of vaulting, these lozenges are occupied by pendants, which produce a most astonishing effect, looking like arches resting on nothing. They are, however, supported with great ingenuity by internal arches, rising high above the visible vaulting. This is one of the *tours-de-force* which astonish the vulgar, but are only adopted when art has



Fan-tracery:—From Klug's Chapel, Cambridge.

reached a low level, and has in a great measure given place to artifice. Fan-tracery is a very beautiful kind of vaulting, and is peculiar to England, where it originated, and where alone it was practised. Among the finest examples are Henry VII.'s Chapel at Westminster; St. George's, Windsor; and King's College Chapel, Cambridge. Fan-tracery is also frequently used in the vaulting of cloisters, as at Canterbury, Chester, &c.

FA'RADAY, MICHAEL, D.C.L., 1832, one of the most distinguished chemists and natural philosophers of the present century; a splendid instance of success obtained by patience, perseverance, and genius, over obstacles of birth, education, and fortune. He was born in 1791, near London, his father being a blacksmith. He was early apprenticed to a bookbinder; yet even then he devoted his leisure time to science, and amongst other things, made experiments with an electrical machine of his own construction.

Chance having procured him admission, in 1812, to the chemical lectures of Sir H. Davy (q. v.), then in the zenith of his fame, he ventured to send to Davy the notes he had taken, with a modest expression of his desire to be employed in some intellectual pursuit. Davy seems to have at first endeavored to discourage him, but finding him thoroughly in earnest, soon engaged him as his assistant at the Royal Institution. He traveled with Davy to the continent, as assistant and amanuensis. On their return to London, Davy confided to him the performance of certain experiments, which led in his hands to the condensation of gases into liquids by pressure. Here he first showed some of that extraordinary power and fertility which have rendered his name familiar to every one even slightly acquainted with physics, and which led to his appointment, in 1827, to Sir H. Davy's post of Professor of Chemistry in the Royal Institution. We shall give a brief summary of his more important discoveries and published works, arranging the different subjects according to their position in various branches of science, rather than in their chronological order.

In chemistry, we have his treatise on *Chemical Manipulation*, 1827; 2d ed. 1842, even now a very valuable book of reference. His *Lectures on the Non-metallic Elements*, and *Lectures on the Chemical History of a Candle*, delivered at the Royal Institution in 1860, were published shortly after. As discoveries or investigations of a high order in this branch of science, we may mention—New Compounds of Chlorine and Carbon, 1821; Alloys of Steel, 1822; Compounds of Hydrogen and Carbon, 1825; Action of Sulphuric Acid on Naphthaline, 1826; Decomposition of Hydrocarbons by Expansion, 1827; and the very valuable series of experiments made in 1829—1830, on the Manufacture of Glass for Optical Purposes, which resulted in one of his greatest discoveries, to be afterwards mentioned.

As practical applications of science, his Preparation of the Lungs for Diving, and Ventilation of Light-house Lamps, are conspicuous, as are also his celebrated letter on Table-turning, and his lecture on Mental Education.

To enumerate only the most prominent of his publications on physical science, we may commence with the Condensation of the Gases (already referred to); then we have Limits of Vaporisation, Optical Deceptions, Acoustical Figures, Regelation, Relation of Gold and other Metals to Light, and Conservation of Force. Of these, the condensation of gases into liquids and solids, though

previously effected by others (and F. has ever been the foremost to acknowledge another's priority), he has really made his own, not only by the extent and accuracy of his experiments, but by the exquisite experimental methods by which he effected the results. His ideas on regelation, and its connection with the motion of glaciers, have not met with universal acceptance, though (see HEAT, ICE, GLACIER) there is no dispute as to his being correct in his facts. In regard to Conservation of Force, there can be no doubt that he has been led into a fallacy, by mistaking the technical use of the word *force* (see FORCE), for in his article on the subject he describes experiments made with the view of proving the conservation of *statical*, not *dynamical* force, whereas the doctrine of conservation asserts merely the conservation of 'energy,' which is *not* statical force. He may be right also, but if so, it will be by a new discovery, having no connection whatever with 'conservation of energy.'

His Christmas lectures at the Royal Institution, though professedly, addressed to the young, contain in reality much that may well be pondered by the old. His manner, his unvarying success in illustration, and his felicitous choice of expression, though the subjects were often of the most abstruse nature, were such as to charm and attract all classes of hearers. Besides two sets (already mentioned) on chemical subjects, we have his *Lectures on the Physical Forces*, a simple work, but in reality most profound, even in its slightest remarks.

But the great work of his life is the series of *Experimental Researches on Electricity*, published in the *Philosophical Transactions* during the last forty years and more. Fully to understand all the discoveries contained in that extraordinary set of papers, would require a knowledge of all that has been discovered during that time as to Electricity, Magnetism, Electro-magnetism, and Diamagnetism. We may merely mention the following, almost all of which are discoveries of the first order. They are given in the order of publication, which is nearly that of discovery: 1. Induced Electricity, 1831, comprehending and explaining a vast variety of phenomena, some of which have already been applied to practice (especially as Magneto-electricity) to light-houses, electro-plating, firing of mines, telegraphy, and medical purposes. Electric currents derived from the earth's magnetism. 2. The Electrotonic State of Matter, 1831; 3. Identity of Electricity from Different Sources, 1833; 4. Equivalents in Electro-chemical Decomposition, 1834; 5. Electro-static Induction—Specific Inductive Capacity, 1838; 6. Relation of Electric and Magnetic Forces 1838; 7. The Electricity of the Gymnotus, 1839; 8. Hydro-electricity, 1843; 9. Magnetic Rotatory Polarization, 1846; effected by means of the optical glass already mentioned; 10. Diamagnetism and the Magnetic Condition of all Matter, 1846; 11. Polarity of Diamagnetism, and the Relation of Diamagnetism to Crystalline Forces, 1849; 12. Relation of Gravity to Electricity, 1851. This, as before remarked, is F.'s attempt to prove a conservation of *statical* force. 13. Atmospheric Magnetism, 1851. An attempt to explain the diurnal changes of the earth's magnetic force by the solar effect on the oxygen of the air; a very interesting paper.

F., who had received a pension in 1835, was in 1858 appointed a house in Hampton Court. In 1862 he gave his last discourse on 'gas-furnaces;' and advocated the use of magneto-electric light in light-houses. In 1865 he resigned the position of adviser to the Trinity House, also that of director of the laboratory of the Royal Institution. He died 25th August 1867. See *Life of Faraday*, by Tyndall (1869); and by Bence Jones (2 vols. 1870).

FARCE, a dramatic piece of a low comic character. The difference between it and comedy proper is one of degree, and not of kind. The aim of both is to excite mirth; but while the former does so by a comparatively faithful adherence to nature and truth, the latter assumes to itself a much greater license, and does not scruple to make use of any extravagance or improbability that may serve its purpose. It does not, therefore, exhibit, in general, a refined wit or humor, but contents itself with grotesque rencontres, and dialogues provocative of fun and jollity. The name is differently explained. In any case, it comes originally from the Latin *farciare*, to stuff; but while Adelung says that, in the middle ages, *farce* signified in Germany certain songs, which were sung between the prayers during divine service, others derive it from the Italian *farsa*, this from the Latin *farsum* (stuffed); while Paolo Bernardi states that it comes from a Provencal word *farsum*, meaning a *ragout*, or mess of different ingredients, an opinion which has this to say for itself, that the *dramatis personæ*, *Jack-pudding*, &c., were generally named after special dishes or mixtures. The first farces are said to have been composed by the society of the *Clercs de Bazoche* in Paris, about the year 1400, as a contrast to the ecclesiastical plays performed by the religious orders. The most widely celebrated and the oldest is the *Farce de Maître Pierre Pathelin*, which some consider to be a composition of the 13th c., but was more probably executed by one Peter Blanchet, about 1480. Subsequently, Molière elevated and re-

fined the farce into pure comedy, in his *Médecin Malgré lui*, *Malade Imaginaire*, *Les Fourberies de Scapin*, and other inimitable productions. In England, the origin of the modern farce dates from about the commencement of the 18th century. It then began, to be regarded as something distinct from comedy proper, and to constitute a special theatrical entertainment. Of all the numerous farces which have been performed before English audiences, only those of Samuel Foote have kept a place in literature.

FARCY in horses depends upon the same causes as Glanders (q. v.), which it usually precedes and accompanies. The absorbent glands and vessels, usually of one or both hind limbs, are inflamed, tender, swollen, hard, and knotted. The vitiated lymph thus poured out softens, and ulcers, or farcy buds appear. Unlike the ulcers of glanders, they are curable, but require time and care. They must be scarified with the hot iron, which, to prevent their spreading, may also be gently run over the adjacent sound skin. Good feeding and comfortable lodgings are essential, and if they do not interfere with the appetite, give tonics, such as a drachm each of sulphate of copper and iodine, repeated twice a day.

FARDEL-BOUND, a disease of cattle and sheep, consists of impaction of the fardel bag, or third stomach, with food, which is taken in between the leaves of this globular stomach, there to be fully softened and reduced. When the food is unusually tough, dry, or indigestible, consisting, for example, of overripe clover, vetches, or rye-grass, the stomach cannot moisten and reduce it with sufficient rapidity; fresh quantities continue to be taken up, until the overgorged organ becomes paralyzed, its secretions dried up, and its leaves affected with chronic inflammation. The slighter case so common amongst stall-fed cattle are 'loss of cud,' indigestion, and torpidity of the bowels.

In severer form, there is also fever, grunting, swelling up of the first stomach, and sometimes stupor or epilepsy. The overgorged stomach can, moreover, be felt by pressing the closed fist upwards and backwards underneath the false ribs on the right side. The symptoms often extend over ten days or a fortnight. Purgatives and stimulants are to be given. For a full-grown beast, give, in three or four bottles of water or thin gruel, $\frac{1}{2}$ lb. each of common and Epsom salt, 15 ground croton beans, a drachm of calomel, and two ounces of ginger. If no effect is produced, repeat this in 12 or 15 hours. Inject soap and water clysters every hour, withhold all solid food, and allow only sloppy mash, treacle and water, or thin linseed tea. An occasional bottle of ale, with an ounce or two of ginger, often expedites the action of the physic, and wards off nausea and stupor.

FAREHAM, a market-town and sea-bathing place in the south of Hampshire, on a creek at the north-west end of Portsmouth harbor, 12 miles east-south-east of Southampton, and 9 miles north-north-west of Portsmouth. It has manufactures of earthenware. Pop. (1881) 7171.

FAREL, GUILLAUME, one of the most active promoters of the Reformation in Switzerland, was born in the year 1489 in Dauphiné. He studied at Paris, and was first distinguished by his extravagant zeal for the practices of the Catholic Church. 'Truly,' says he in one of his letters, 'the papacy itself was not so papistical as my heart.' Intercourse with the Waldenses, and with his friend Lefevre d'Étaples, induced him to study the Scriptures; the result was his conversion to Protestantism, and F., who was by nature vehement even to indiscretion, immediately commenced to proselytize. The chief scene of his labors was France and Switzerland. At Basel, 15th February 1524, he opened his career of controversy and evangelization by publicly sustaining 30 theses on the points in dispute between Roman Catholicism and Protestantism. In less than two months, he was compelled to leave, mainly on account of a quarrel between himself and Erasmus, whom, on account of his moderate or trimming policy, F. had compared to Balaam. F. next went to Strasbourg, and afterwards to Montbelliard, where his iconoclastic way of preaching the gospel excited the alarm of his friends, several of whom, Gcolampadius among others, censured him sharply for his violence. His zeal was next manifested in the canton of Bern. It was also chiefly through his exertions that the towns of Aigle, Bex, Olon, Morat, and Neuchâtel followed the example of Bern in embracing the Reformation. In 1532, he went to Geneva, where his success was at first so great, that on account of the agitation excited, he had to leave the city. He returned in 1533, was again compelled to withdraw, but once more entered it in 1534. This was his year of triumph; the Reformers filled the churches, and the Catholic clergy, who had made themselves odious to the citizens by abetting the despotic schemes of the Duke of Savoy, retired to Lausanne and Fribourg.

In August 1535, the town council of Geneva formally proclaimed the Reformation. F., however, was a missionary, not a legislator, and the organization of the Genevan Church passed into the hands of Calvin (q. v.). The severity of the new eccle-

siastical discipline produced a reaction, and in April 1538, the two reformers were expelled from the city. F. took up his residence at Neuchâtel, where the reformed church was in a state of deplorable disorder. He composed its differences, and drew up a constitution, which it accepted, after long and stormy debates, in 1542. In September of the same year, we find him fighting the battle of the Reformation at Metz. After his return to Neuchâtel, he frequently visited Calvin, whose authority in Geneva had been completely restored. It was on one of these occasions that he was present at the burning of Servetus, and though not, comparatively speaking, a bigoted Calvinist, he allowed his orthodoxy on that occasion to choke his humanity, exclaiming, as the unhappy heretic uttered his last prayer to God from the flames: 'See what power the devil has over one who has fallen into his hands.' In 1557, along with Beza, he was sent to the Protestant princes of Germany, to implore their aid for the Waldenses, and on his return—inexhaustible in his activity—he sought a new sphere of evangelistic labor in the regions of the Jura Mountains. When trembling upon threescore-and-ten, he married a young wife, very much to Calvin's disgust, who sarcastically speaks of him under the circumstances as 'our poor brother.' But neither his newly formed domestic ties, nor the infirmities of age, could quench his missionary zeal. In 1560—1561, he proceeded to his native Dauphiné, and passed several months at Gap, preaching against Catholicism with all the ardor of his youth. In November 1561, he was thrown into prison, but was shortly after rescued by his friends. In 1564, he paid a visit to the dying Calvin; his strength, however, was now nearly exhausted, and on the 13th September 1565 he expired at Neuchâtel, leaving a son named Jean, who survived him only three years. F. was a man of extensive scholarship, and wrote largely, but his works very inadequately represent the genius of the man. Compare Kirchhofer's *Das Leben Wilhelm Farel's* (2 vols., Zurich, 1831—1833), and C. Schmidt's *Études sur Farel* (Strasbourg, 1834); also his *Wilhelm F. und Peter Viret* (1860).

FAREWELL, CAPE, the southern extremity of Greenland, lies in lat. 59° 49' N., and long. 43° 54' W. It is generally beset with ice, which, according to recent authorities, appears to come from the north-east, and to sweep round into Davis' Strait. Hence it is but little known; and, in fact, the Danish traders, in passing to and from the settlements on West Greenland, seem uniformly to maintain an offing of more than 100 miles.

FARIA Y SOUSA, MANOEL, a Portuguese historian and poet, was born of an ancient family at Caravella, in the province of Entre Minho e Douro, 18th March 1590, and studied at the university of Braga. For some time he was in the service of the Bishop of Oporto, but shortly after 1613 he went to Madrid, where, however, he did not long remain, as he found no opportunity there of improving his circumstances. In 1631, he obtained the office of secretary to the Spanish embassy at Rome, where his extensive acquirements procured him the notice of Pope Urban VIII. and of all the learned men of the city. After some time, he returned to Spain, and died at Madrid 3d June 1649. F.'s writings are partly in Spanish, and partly in Portuguese. Of the former, we may mention, *Disursos morales y políticos* (2 vols., Madr. 1623—1626), *Epitome de las Historias Portuguesas* (Madr. 1628), *Comentarios sobre la Lusitania* (2 vols., Madr. 1639), *Asia Portuguesa* (3 vols., Lisbon, 1666—1675), *Europa Portuguesa* (3 vols., Lisbon, 1678—1680), *Africa Portuguesa* (Lisbon, 1681), and the greater portion of his poems, which he collected under the title of *Fuente de Aganippe o Rimas Varias* (Madr. 1644—1646). These poems consist of sonnets, eulogues, canzones, and madrigals. F., however, composed about 200 sonnets and 12 eulogues in the Portuguese language; and it is mainly by these, and also by three theoretical treatises on Poetry, that he has influenced the development of the poetic literature of Portugal, in which he was long regarded as an oracle. His poetry exhibits talent and spirit, but is on the whole tasteless and bombastic. F. is not to be confounded with another Portuguese author of the same name, who was born at Lisbon in 1581, and died at Evora in 1655, and who was one of the most learned numismatists of his age.

FARINA is the term used by many writers on bees, instead of pollen, to denote the pollen of flowers collected by bees for feeding their larvæ. See BEE.

FARINA, a Latin name for meal or flour, which has been adopted into the English and other languages, and is very frequently employed both in scientific and popular works. The term farina is also frequently extended to many substances, which agree with the meal of the corn-plants or Cerealia (q. v.), in containing much starch, and food made of such substances is often called *farinaceous*, its qualities more or less resembling those of the food derived from the cerealia. Of the different kinds of farina, those produced by mere trituration of the seeds of grasses (corn), hold the first place for importance and usefulness. Most similar to them are those obtained in the same manner from certain other seeds. See CEREALIA. The farina of the different

kinds of Pulse (q. v.), or seeds of leguminous plants, has considerably different properties. For the quality, chemistry, commercial importance, &c., of the different kinds of meal, see MEAL.—Other farinaceous substances, consisting chiefly of starch, are obtained from roots—often from tubers—of plants of very different natural orders; some kinds, also, as sago, from stems. Cassava meal, which contains, along with starch, much vegetable fibre and protein or albuminous substances, is commonly called farina (*Farinha*) in many parts of South America, where it is a principal article of food.

Fossil farina, mountain milk, or Agaric mineral, is a deposit of silicified animalcules, obtained from China, &c. In 100 parts, it consists of silica 50½, alumina 26½, magnesia 9, water and organic matter 13, with traces of lime and oxide of iron.

FARINI, CARLO LUIGI, an Italian author and statesman, was born in 1822 at Russi, in Ravenna, in the north of Italy. Having, with great success, studied medicine at Bologna, F. first became known by several publications belonging to the science of medicine, and soon afterwards by contributions to various scientific periodicals. In 1841 and 1842, having mixed himself up with politics, he was obliged to leave the Roman States, and change his residence repeatedly until he finally settled at Turin. The amnesty following shortly upon the accession of Pio Nono, opened to F. not only his native country, but also a new career, through the liberal system inaugurated by the supreme pontiff. In 1847, he was called into the reformed ministry, as a substitute to the home secretary; in 1848, he was present in the suite of Carlo Alberto at Volta, and after the flight of the king, protested against the proclaiming of a republic. During the short ministry of the unfortunate Rossi (q. v.), F. was director-general of the sanitary and prison department at Rome, from which post, however, he retired as soon as the reaction under Antonelli began to be established. Upon the occupation of Rome by the French, F. became once more an exile, but for a short time only, for in Piedmont he found a home as well as public honors. In 1850, he held the seat of Minister of Public Instruction in the cabinet of Victor Emmanuel II., and on retiring from office, was named a member of the supreme council. When Central Italy resolved to annex itself to the kingdom of Victor Emmanuel, by means of universal suffrage, it was F. who directed the popular mind with such admirable success that, on the day of ballot, not one vote was delivered asking for a separate kingdom. As governor of Central Italy, he showed an undaunted courage against the threats of Austria, and exhibited a thoroughly consistent moderation against the unruly promptings of the Mazzinians. The same qualities accompanied his measures when the newly acquired kingdom of Naples was to be reorganized. In 1861, F. became minister of commerce and public works. In 1862, he took office as president of the cabinet, which he resigned in 1863. He died in 1866. It has been said that 'Farini was the mind of Italy, as Garibaldi was its sword.' Among his literary productions may be mentioned, *Il Stato Romano* (The Roman State), translated into English under the superintendence of the Right Hon. W. E. Gladstone (London, 4 vols. 1859); *Storia d'Italia* (History of Italy), a continuation of Botta's celebrated work. F. was also a contributor to Count Cavour's *Risorgimento*.

FARIS ECCHIDIAK, an Arab poet and litterateur, was born about the year 1796. In religion, he is a Syrian Christian. He studied at Cairo under the ulamas of the mosque of El-Azhar, and in 1836 procured for M. Fresnel some very valuable commentaries upon the poem of *Shanfara*. He was afterwards invited to Malta by an English missionary society, who wanted his services in their Oriental printing establishment. The dedication of a poem to the Bey of Tunis about 1847, induced that monarch to send a war-vessel to Malta, for the purpose of bringing F. to Tunis, where the poet obtained a distinguished reception, and many rich presents. Subsequently, he went to England, where he was employed in revising the text of a translation of the Bible into Arabic, by the Society for the Propagation of the Scriptures. In 1851, he published in London the New Testament in Arabic. He subsequently resided in France for a considerable time, and published there, along with M. G. Dugat, in 1854, a French grammar in his native tongue for the use of the Kabyles of Algeria. His principal work is entitled *La Vie et les Aventures de Fariak* (Paris, 1855); it contains a narrative of his own travels, with critical observations on the Arabs and other peoples whom he visited. Some of his own poems are also interspersed. F. returned to London the year before the publication of this work. On the outbreak of the Crimean War, the sultan appointed him one of his dragomans or interpreters, but he has never discharged the duties of his office. F. is said to possess in manuscript a collection of poems, called *The Divan*, which are highly spoken of by those who have seen them.

FARM (of uncertain derivation), the term usually employed in Britain to signify a piece of land, either in pasture or in cultivation, held in lease by a tenant from the proprietor. In the United

States, the term farmer is often applied to a person who owns as well as cultivates land. The tenure on which land is held by farmers varies in different countries. In some parts of continental Europe, the farmer hires the land on the principle of a kind of partnership with the proprietor. See METAYER. In England, much of the land is let for a certain annual rent, and mostly either by a yearly term, or at the good-will of the landlord. Leases of different durations have latterly been introduced. In Scotland, the process of land-letting is on a footing which has been advantageous for tenant and proprietor, and has served the best interests of agriculture. The greatly altered and improved system of husbandry of the last half-score years or so, demands something more for successful agriculture than the provisions of the ordinary lease contain. Under the Scotch 19-years lease, the farmer is encouraged to starve the land towards the close of the period of contract, in order to recoup himself as far as possible for his outlays in the shape of manure, by the expiry of the lease, should he have to quit the holding then. The practical result of this is that the land is in a fully productive state about half the duration of the lease. The vastly increased expenditure connected with farming, and the growing and already great necessity for the most being made of the limited land resources of this country, call for more security to the tenant's capital than the lease provides.

A strong desire has therefore lately sprung up in Scotland and England for compensation to outgoing tenants for permanent improvements, and even unexhausted manures. This is as much a tenant's as a landlord's question, as it will require more capital to enter a farm than is presently needed. The landlord presumably provides the houses for the farms, but the higher farming of recent years having rendered the former supply of buildings insufficient, considerable difficulty is experienced in obtaining proper house accommodation on many farms, on estates where the landlord's capital happens to be locked up by the keys of entail.

The method of paying rent for farms in Scotland is not uniform. In some districts the annual rent is a fixed sum; but in others, such as the Lothians and best wheat-growing districts, it is a common practice to pay partly a fixed sum, and to leave another portion to be paid in grain, or rather the money value of so much grain according to the average market prices each year, as determined by a jury in every county. See FIARS. This last plan is not so popular as it once was, and most farmers now prefer to pay a fixed sum. In whatever manner the rent is adjusted, it is stipulated to be paid, as nearly as possible, in two equal portions, at Whitsunday (May 15) and Martinmas (November 11), but in practice many of the landlords give three months' credit on each occasion—the Whitsunday rent being exigible at Lammas (August 4), and the Martinmas rent at Candlemas (February 2). At all times, however, the landlord has a right of Hypothec (q. v.) over the crops, and can take measures to avoid being defrauded of his proper claims. Usually good feeling subsists between landlord and tenant.

The landlord commonly binds his tenant to farm or cultivate the land according to the most approved systems in use in the district. Such a course may be necessary in some cases to prevent the abuses that might arise from negligence or ignorance; but the restrictions have often been carried too far, and have formed barriers in the way of improvements. So far as regards mere cropping, it would not be much amiss, however, on most arable farms, to forbid more than one-half of the land being in white crops during the last four years of the lease. Green crops prevent the land being overrun with weeds. It is perhaps not superfluous to observe here that leases should be written in clear and concise language, and as far removed from ambiguity as possible. There is much need of more simplicity and brevity in the agricultural lease.

The size of farms is regulated by many circumstances. On land adapted for green cropping, and remote from towns, large farms form good subjects for capitalists, and consequently prevail. Stiff clay soils are rather against extensive culture. Where crops are grown that require much hand-labor, farms become small in size. Flax, rape, vines, and market-garden produce all tend to lessen the size of farms. In new countries, too, where there is no slave labor, farms are mostly small. To the discomfiture of many a family, the custom was in Scotland, some twenty years ago, to enlarge the arable farms by grouping two or three into one. Bad on principle, however, this system has had its day, and the tendency of affairs is now if anything in the opposite direction. Grazing farms, whether in the Highlands or Australia, form good outlets for large capitalists.

Under the modern system of farming in Britain, from £12 to £18 of capital per acre is required to farm arable land; and if a heavy live-stock is kept, more capital is required. The rent of Highland grazing varies from 1s. 6d. to 6s. a head for each sheep kept; the value of each sheep being from £1 to £3, according to the kind and age of the stock.

The profits of farming fluctuate quite as much as those of any

other trade. Strict personal superintendence is one of the first requisites of success. Without this, the details will be neglected, and loss will ensue. 10 per cent. on the capital invested is a good return, but very few have so much. For several years back many farmers have lost money, while few have exceeded 3 per cent. profit on the capital invested. Better times, however, appear in store for the farmer. Skill and attention are the qualities which command success in farming as in other things.

A farmer necessarily possesses large numbers of animals—horses, cattle, sheep, pigs, and poultry. These have all to be reared and tended, and demand no little care and experience. Proper seeds must be selected; and the proper cultivation of the land for the different crops necessitates a succession of processes which require to be attended to. These, however, will be taken up under their respective heads.

FARM BUILDINGS. Each farm must possess a residence for the farmer, cottages for the servants, and buildings for the stock and crop. The *farm-house* should be commodious and plain, and of considerable extent. The cottages for the servants should also

Ventilation.—Without good ventilation, a covered homestead must be a nuisance. All the apartments are so arranged that, unless fresh air circulate through them, and they are kept perfectly clean, there must constantly be unwholesome effluvia in the interior—the foulness of one apartment being communicated to another. The system of ventilating this farmstead is certain to give most satisfactory results, if only ordinary care be taken to keep the different houses as clean as they ought to be. The arrangements are briefly as follows:

Under each feeding-passage is built a circular air-shaft, 30 inches in diameter; in connection with these there are feeding-mouths with gratings on the outside of the building; inside, there are numerous finely perforated gratings; by sliding-valves, wrought by a cord and pulley, the supply of air is regulated.

Besides these, there are gratings every 10 or 12 feet along the exterior walls, perforated so as to admit near the floor a considerable quantity of air. The roof, too, is provided with vertical spars, and openings are left here and there in the sarking, to act as induction and eduction tubes. The numerous perforated apertures throughout the building will admit twice the quantity of



Isometrical View of Covered Homestead.

be plain and roomy, and internal convenience should be more studied than outward ornament. A strong feeling is arising on this subject in Scotland, and a bill is now before parliament with the view of providing better cottage accommodation.

Proper offices are essential to the economical disposing of the produce of the farm. The corn crops are usually thrashed there, and a large portion of the green crops is consumed by stock, which must be well provided with shelter from the cold. When few turnips were raised, and few cattle fed, large open courts were best suited for converting the straw into manure. Now, however, in many cases, the excrements of the stock are sufficient for wetting all the straw, and hence has arisen the practice of feeding in covered courts and in boxes. In this case, the solid and liquid excrements are carted out along with the straw, which acts the part of a sponge. This is no doubt an excellent way of manufacturing home-made manure; it takes a considerable quantity of straw, however; and as more green crops are raised and consumed on the farm, sufficient straw cannot always be got to absorb all the liquid; hence, a saving of the straw is effected by stall-feeding, when the excess of liquid must be collected into tanks, and otherwise disposed of. When it is remembered that ammonia cannot be purchased in the market at the present time under £80 per ton, and that liquid manure contains a high percentage of ammonia, the utility of husbanding this material must be very evident.

Liquid manures should be absorbed by moss or soil, or be carted out, and distributed by pipes, when the plants are in a growing state, otherwise part will be washed out of the soil. Covered farm-yards are rapidly extending over the country. It is the cheapest and best way of erecting farm-offices. On some estates, new steadings have been erected on a too extravagant plan for the size and requirements of the farm. This is simply a burden on the holding. Landlords should not stick so rigidly to a uniform plan of steadings, irrespective of the extent and necessities of the different occupancies. Our cut represents a bird's-eye view of a 'farm-steadings' for a farm of 500 acres, and a model of which was commended by the judges of the Berwick cattle-show in 1854. The steadings are on the covered principle, all the various departments being under one roof. The food-preparing houses are ranged as convenient as possible to those in which the food is to be consumed, and the relative positions of every other department have been carefully studied. This is to be attended to in the formation of all homesteads.

air required for the respiration of the animals, and are so under command that they will neither admit flies in summer, nor too large a supply of cold air in winter. A covered steading, somewhat similar in construction to the above, has been erected at Glen, in Peeblesshire, where the ventilation of the enclosed cattle-courts, &c., is admirable, and within the last few years considerable numbers of courts have been covered with decided advantages.

To carry out this principle of ventilation is somewhat expensive. A cheap and yet efficient system of ventilation for cattle is to cover the yards with pan-tiles without plaster or lath. Those who wish to see farm-offices economically erected, at the same time combined with the most perfect ventilation, we would recommend to visit some on the property of Lord Kinnaird, Rossie Priory, Perthshire. For further information, see *The Book of Farm Buildings*, by Henry Stephens, F.R.S.E., and R. Scott Burn (Edin., Blackwood & Sons, 3d ed. 1871).

FARM-SERVANTS. The introduction of large farms caused a wide difference to arise between the condition of master and servant. The latter has no doubt had his condition meliorated, though something remains yet to be done. Large farms effect economy in the amount of labor, and where these superseded the small holdings or pendicles, a certain number of the population had to betake themselves to the towns or the colonies. This latter process had the effect of diminishing the population in the country districts. The general advance, however, which has taken place in the wages of the laboring-classes has been happily shared in by the farm-servants for some years, and they are now well paid if they were only better housed. Farmers complain of the comparatively inferior class of servants they get nowadays, even for the increased wage. In the strictly agricultural county of Dorsetshire, wages range from 14s. to 20s. a week. In the manufacturing districts, such as in Yorkshire, they are generally somewhat higher, ranging from 17s. to 20s. a week. In Scotland, plowmen are generally paid partly in produce, but taking everything into account, wages amount to from 18s. to 24s. a week all the year through for good hands. In the north of England, the best farm-servants are now receiving from 20s. to 24s. per week. For housing, see **BOTHY**. Female farm-servants receive from £12 to £18 a year, with food. Some get £12 even for the summer half-year.

FARMER, RICHARD, D.D., a well-known scholar of the last century, was born at Leicester, August 28, 1733, and was entered a pensioner of Emmanuel College, Cambridge, in 1753. In 1760, he took his degree of M.A., and was appointed classical tutor of his own college. It is not known when he took orders, but, while he held the office of tutor, he acted as curate, at Swavesey, a village eight miles from Cambridge. In 1766, he published his once famous *Essay on the Learning of Shakspeare* (reprinted in 1789 and in 1821), the purpose of which was to show the sources whence the great dramatist derived his knowledge of the ancients. F. proved that it was from translations, and that Shakspeare has often cited the phraseology, and even the errors, of the translators. In 1775, he was elected to the mastership of Emmanuel College, and in 1778, chief-librarian of the university. In 1780, he obtained a prebendal stall at Lichfield, but in 1788, resigned it for the office of canon residentiary of St. Paul's. He died September 8, 1797.

FARMERS-GENERAL (Fr. *fermiers-général*) was the name given before the Revolution of 1789 to the members of a privileged association in France, who farmed or leased the public revenues of the nation. This peculiar system of tax-gathering dates from an ancient period. For each class of imposts there was a special administrative board, presided over by one of the farmers-general, or by one of his assistants. At first, the leasing of the public revenues was based on the competitive system, and determined by the estimates handed in; but latterly, every formality, every preliminary guarantee of this nature disappeared, and the leasing wholly depended on the favor of jobbery of the government officials. The minister of finance selected the farmers-general at his pleasure, but his choice was always regulated by the present, or rather bribe (*pot-de-vin*) offered to him; and which, we may presume, was never inconsiderable, inasmuch as its value was fixed by the minister himself. Generally, shares in the concern were assigned by the king to his favorites, male and female. The number of farmers-general was ordinarily 40, but shortly before the Revolution it had risen to 60. The lease was signed by a salaried deputy, who was responsible to the king alone. The king occupied the position of a creditor towards the farmers-general, and could coerce them into payment of the stipulated sum as a just debt; the farmers-general, on the other hand, occupied a similar position towards their subordinates. The entire sum which it was necessary to place in the national treasury—or, in other words, the annual national revenues—amounted to 180 millions of livres. The rest was enormous profit, for we are certainly within the mark in estimating it at seven millions of livres. The powers, rights, and duties of the farmers-general were defined by special decrees; but however severe may have been the fiscal laws against fraud and contraband, it is notorious that, shortly before the Revolution, abuses of the most flagrant description had demoralized the system and the men. The consequence was inevitable. During the Revolution, most of these odious tax-gatherers perished on the scaffold, the innocent among them being occasionally confounded with the guilty—the real capitalists with the selfish and greedy adventurer. Even the virtues and the learning of the illustrious Lavoisier could not save him.

Farmers of the revenue are an institution of ancient origin. The Roman *publicani* (q. v.) were officers of this kind; and duties of various kinds were at one time farmed in Great Britain. See EXCISE.

FARMING'S ISLAND, an island reported to be in the North Pacific Ocean, north of the Sandwich Islands, in lat. 30° 49' N., and long. 159° 20' W., was formally taken possession of, for the Queen of England, on the 8th February 1861, by her Majesty's steamer *Albert*. The harbor was called English Harbor, and a point on which there is a settlement, was termed English Point.

FARNE, FEARNE, or FERN ISLES, or the **STAPLES**, form a group of 17 islets and rocks, some being visible only at low tide, two to five miles off the north-east coast of Northumberland, opposite Bamborough. On one of the islets is the tower of a priory, built to the memory of St. Cuthbert, who spent the last two years of his life here. There is a hole called the churn, through which the sea rises. The passage between the isles is very dangerous in rough weather. Two of the isles have each a light-house. Here the *Forfarshire* was wrecked in 1838 (see **DARLING, GRACE**); and here, in 1843, the *Pegasus* met the same fate, and 60 persons were drowned.

FARNE'SÈ, the name of an illustrious family in Italy, whose origin can be traced to the middle of the 13th c., when it possessed the castle of Farneto, near Orvieto. Many of its members have filled the highest offices in the church. In 1534, Cardinal **ALESSANDRO FARNESE** was raised to the papal see under the title of Pope Paul III. (q. v.) and as his great aim was the aggrandizement of his family, he erected Parma and Piacenza into a duchy, which he bestowed on his natural son, **PIETRO LUIGI**. Pietro was one of the most dissolute men of his period, and after many tyrannical attempts to limit the privileges of the nobles, he was

assassinated 10th September 1547. He was succeeded by his son **OTTAVIO** (born 1520, died 1585), who married a natural daughter of Charles V., and whose reign was marked by an unbroken peace, and by various efforts made for the good of his subjects.

ALESSANDRO FARNESE, son of Ottavio, was born in 1546. He served his first campaign under his uncle, Don John of Austria, and distinguished himself at the battle of Lepanto, in the year 1571. He afterwards followed his mother into the Low Countries, then in a state of insurrection, and aided in obtaining the victory at Gembloux, 31st January 1578. He was made governor of the Spanish Netherlands by Philip II., and carried on the war against the Prince of Orange. The ill success of the expedition against England, to the command of which he had been appointed by Philip II., grieved him the more from the contrast it presented to his former successes. On his return to the Netherlands, he was appointed commander-in-chief of the army despatched to the assistance of the Catholics in France, and compelled Henry IV. to raise the siege of Paris.

Being, however, ill supplied with provisions and money by Philip, and insufficiently supported by the League, he was forced to yield to the superior power of Henry IV., and died soon after at Arras, in 1592. F. was really an able warrior, and though severe in his discipline, was almost worshiped by his soldiery. **RANUCCIO**, his son and successor, did not possess the brilliant qualities of his father: he was sombre, austere, greedy, and proud. A conspiracy was hatched against him, and Ranuccio was seized, and thrown into prison. He died in 1622.—**ODOARDO**, a natural son of the preceding, was a prince remarkable for the elegance of his manners, and also, according to Muratori, for his magnificence, magnanimity, and liberality. He died in 1646, at the age of 34.—The family became extinct in the person of **ANTONIO F.**, who died in 1731.

The name of the Farnese family has been bestowed upon several celebrated works of art. These are—1. The *Farnese Palace* at Rome, an edifice raised by Pope Paul III., before his accession to the holy see, after the design of Antonio da San Gallo. It is in the form of a quadrangle, and was completed by Michael Angelo. The palace is one of the finest in Rome. The antique sculptures for which it was formerly renowned are now in the Museum at Naples; a few classic works, however, are still to be seen in the great hall. The gallery contains the frescoes of Annibal Caracci, which are very valuable, as exhibiting in the most complete manner the new line of art which he struck out. In a room adjoining the gallery, are some mythological fresco-paintings by Domenichino. 2. The *Farnesina* is a very elegant palace in Trastevere. It owes its celebrity chiefly to the frescoes of Raphael; but it also contains frescoes by Peruzzi, Sebastian del Piombo, and a colossal head in *chiaroscuro*, attributed to Michael Angelo. Among the antiques, formerly belonging to the Farnese family, now in the museum at Naples, are two which still bear the name of their original owners. 3. The *Farnese Bull* is the name given to a colossal group attributed to Apollonius and Tauriscus of Tralles, in Asia Minor, who probably belonged to the Rhodian school, and lived about 300 B. C. The group represents Dirce bound to the horns of a bull by Zethus and Amphilion, for ill usage of her mother—a subject which, notwithstanding the vigorous mode of treatment, is on the whole unsatisfactory. Pliny mentions the transference of the group to Rome, where it first adorned the library of Asinius Pollio, and afterwards the Baths of Caracalla. It was discovered anew in the year 1546, restored by Bianchi, and placed in the Farnese Palace. 4. The *Farnese Hercules*, copied by Glykon from an original by Lysippus. It exhibits the hero, exhausted by toil, leaning upon his club; the muscles and veins are still swollen, the head inclined, the expression melancholy; one hand rests upon his back, and grasps one of the apples of the Hesperides.

FA'RNHAM, a town in the west of Surrey, on the left bank of the Wey, 10 miles west-south-west of Guildford. It consists chiefly of one street running east and west. The principal feature is the stately old castle of the bishops of Winchester, first built by Bishop de Blois, brother of King Stephen. The castle was razed by Henry III., rebuilt and garrisoned by Charles I., and restored in 1684 to its present state by Bishop Morley. It is an embattled quadrangle of brick, covered with stucco. A new town-hall was erected in 1866. F. has belonged to the bishops of Winchester since 860, when Ethelbald of Wessex bestowed it on them. Some parts of the parish church were built in the 12th, 15th, and 16th centuries. The chief trade is in hops, a very fine variety of which is grown in the vicinity. Pop. (1881) 4530. William Cobbett was born and is buried here. The vicinity of Aldershot camp, which is only about 6 miles to the north of F., has increased the activity of the town.

FA'RO, a pleasant and wealthy episcopal city of Portugal, capital of the province of Algarve, is situated in a plain at the mouth of the Fermo, in lat. 37° N., and long. 7° 52' W. It has, on the whole, a modern aspect, but its houses are not hand-

some, and its streets are in general narrow. It is surrounded with walls, which are said to have been built by the Moors. The harbor of F. is somewhat confined, but the road formed by three islands at the mouth of the river affords good anchorage. F. has considerable exports of oranges, figs, anchovies, and cork. It has also a prosperous fishery. Pop. 7900. The number of blind people here met with is surprising, groups of five and six together being frequently observed. This is accounted for by the light sandy soil which prevails.

FARO, or PHARO, a game at cards of the nature of hazard, played chiefly at gambling establishments. See Hoyle's *Games*.

FARÖE ISLES (Dan. *Faar-Oen*, sheep-islands), a group of islands, 22 in number, of which 17 only are inhabited, belonging to Denmark, and lying nearly midway between the Shetlands and Iceland, between 61° 25'—63° 25' N. lat., and 6°—8° W. long. The principal island, Stromoe (capital, Thorshavn), is 27 miles long, and 8 miles broad; those next in importance are Osteroe, Vaagoe, Bordoe, and Sudaroe. Their entire area is nearly 500 square miles; population about 11,000. The F. I. consist of basaltic elevations, some of which attain a height of 3000 feet, and trap formations, covered with a thin vegetable soil, which yields pasturage to the cattle and numerous sheep which are reared in the islands. There are no considerable valleys or streams, but small fresh-water lakes are numerous. The coasts, which are steep and lofty, are broken by deep inlets, whirlpools, and rapids, which render navigation perilous. The furious hurricanes which prevail, prevent the growth of trees, or even of most of the ordinary vegetables and cereals; but the climate is so greatly modified by oceanic influences, that, notwithstanding the high latitude, snow rarely lies long on the ground, and the cattle can pass the greater part of the year in the open air. Peat and coal are used for fuel; traces of iron and copper, and opal, chalcodony, &c., are found.

The chief sources of wealth are flocks of sheep, and the multitudes of sea-fowl which frequent the rocks. The islanders show considerable skill in climbing the dangerous cliffs in search of birds, and they are also expert in fishing for seals and whales. Their manufactures are of the homeliest kind, but in return for the numerous articles supplied to them by the mother-country, they yield tallow, train-oil, feathers, skins, and butter, to the Danish markets. The people are of Norwegian origin, a vigorous, laborious, loyal, and religious race, and belong to the Lutheran Church. They are governed by a Danish *amtmand*, or bailiff, and a landvogt, or director of the police and municipal departments, and are represented in the Danish legislature by a deputy appointed by the king. The islands, which were discovered in the 9th c. by Norwegians, have belonged to Denmark since the incorporation of Norway with that kingdom by the Union of Calmar, and the language of the people is only a slightly modified form of the Old Norse. England held the islands from 1807 to the treaty of Vienna, in 1814. Some account of the Faröe Isles will be found in Professor Sir Wyville Thomson's book, *The Depths of the Sea* (Macmillan & Co., 1873).

FA'RQUHAR, GEORGE, was born at Londonderry in 1678, and received his education at the Dublin University, where, although he did not take any degree, he secured among his comrades the reputation of a wit who was a spendthrift of his witticisms. When he left the university, he was engaged as an actor by one of the Dublin theaters, but, like most dramatists who have figured on the stage, he proved but an indifferent performer. Playing a part in Dryden's *Indian Emperor*, and forgetting that he wore a sword instead of a foil, he accidentally wounded a brother-performer, and was so shocked by the occurrence that he at once quitted the boards. Accompanied by the actor Wilks, he proceeded to London, and shortly after received a commission in the regiment commanded by the Earl of Orrery, which was then stationed in Ireland. Urged by Wilks, and perhaps stimulated by the gaiety and leisure of a military life, he, in 1698, produced his first comedy, entitled *Love and a Bottle*, which proved a success. Two years afterwards, his *Constant Couple* appeared, which met with a brilliant reception, and to which he wrote a sequel, called *Sir Harry Wildair*. In 1703, he produced *The Inconstant*, founded on the *Wild-geese Chase* of Beaumont and Fletcher, a version in which all the coarseness, and none of the poetry, of the elder dramatists is retained. He married in the same year, and falling into serious pecuniary difficulties, he sold his commission, and struggling with adverse fortune, succumbed. He died of decline in 1707, leaving 'two helpless girls' to the care of his friend Wilks. During his last illness, he wrote the best of his plays, *The Beaux Stratagem*—in six weeks, it is said—and died while its wit and invention were making the town roar with delight.

F. is one of the finest of our comic dramatists, although Pope called him a 'farce writer.' He is less jolly brilliant than Congreve, and possesses on the whole more variety and character than any of his compeers. He had wit in abundance, but he had humanity too. He was a tender-hearted and somewhat melancholy

man, and—what was rare in his school and in his time—*tears* are found glittering among the brilliants of his fancy.

FA'RNWORTH, a town of Lancashire, two miles and a half south-east from Bolton-le-Moors, near the Tongue, a branch of the Irwell. It is a station on the Manchester and Bolton Railway. It has a picturesque embattled chapel, of the 15th century. The manufacture of sail-canvas, watches, files, &c., is carried on. Pop. (1871) 13,724; (1881) 19,380.

FARR, WILLIAM, M.D., F.R.S., an eminent statistician, was born at Kenley, in Shropshire, November 30 1807, became an assistant-surgeon at the Salop Infirmary in 1826, and after attending privately the medical and scientific classes of the day, went to Paris University in 1829, where he attended the lectures of the most eminent medical professors. In 1831, he returned to England, and became a member of the university of London, where he completed his professional curriculum. F. devoted himself mainly to a consideration of the important questions resulting from medical statistics. At first, he found it very difficult to draw the attention either of the public or of medical societies to the subject; but in the year 1837, his article, 'Vital Statistics,' in McCulloch's *Statistics of the British Empire*, obtained the notice and approval of certain influential persons. In the same year, the registration of all the deaths, and of the causes of death, was commenced in England, and in 1838, F. received an appointment in the General Registrar's Office. He was made superintendent of a department which draws up the *London Tables of Mortality*, the *Quarterly Returns of Births, Deaths, and Marriages*, and the *Annual Abstracts*. In 1851, 1861, and 1871, he was engaged on the census. In 1872 he was chosen a corresponding member of the French Institute. In 1880, on the appointment of a new Registrar-general, F. (who was a C.B.) withdrew from the public service. He wrote a *Statistical Nosology*, and valuable papers on Life Assurance, the Income Tax, the Public Health, &c. F. died 14th April 1883.

FARRAGUT, DAVID GLASCOE, an American naval officer, was born near Knoxville, Tennessee, in 1801. In 1862, he was appointed to the command of a naval expedition to act against the Confederates in the Gulf of Mexico, and received the surrender of New Orleans. He afterwards took Natchez; and in 1863 he aided General Grant in the combined attack on Vicksburg, which resulted in its capitulation. In 1864, after a furious engagement between his fleet and the Confederate forts and vessels at Mobile, he succeeded in capturing the forts, which led to the fall of the city. In 1866, he attained the rank of admiral, and a purse of 50,000 dollars was presented to him. F. died in 1870.

FA'RRIER (from *ferrum*, iron), a person who shoes horses and treats their diseases. The better class of farriers are often men of great shrewdness and observation, sometimes possessing considerable experience. Their management of sick horses is occasionally sensible, but generally altogether empirical. They have usually but crude ideas of the structure, functions, or diseases of animals, and pin their faith mainly on a few carefully cherished recipes. To their calling as horse-doctors and shoeing-smiths (see SHOING), they usually unite those of cow-leech and cutter of colts and pigs, and although still met with in many of the rural districts of England and Ireland, their practice is passing into the hands of regularly educated veterinarians. See VETERINARY MEDICINE.

FARRIERS, ARMY. Farriers-major and farriers are non-commissioned officers in the cavalry, artillery, engineers, and military train, whose duty it is to shoe the horses of their corps, and, generally, to assist the veterinary surgeon in exercising a proper care over the regimental animals. They receive the same pay as other sergeants (with whom they rank); and, in addition, certain allowances proportionate to the number of animals in charge. The sum necessary to defray this allowance for a year is about £10,000.

FARS, or FARSISTA'N (anciently *Persis*), a province of Persia, on the east shore of the Persian Gulf, lying between lat. 27° 30' and 31° 30' N., and between long. 49° 30' and 55° E. The coast region is flat, with a hot climate; inland, the ground rises to an elevation of from 2000 to 3000 feet, the climate is cooler, and valleys, alike remarkable for their beauty and fertility, ranging from 15 to 100 miles in length are numerous. East of this hilly district the province again becomes flat and sandy; and here occurs the large salt-lake Bahktegan. The chief rivers are the Bundemeer (anciently Araxes), the Nabon, and the Tab (anciently Arosis). The province produces tobacco, wine, rice, dates, opium, linen, cotton, silk, cochineal, and roses for the manufacture of attar. It has iron and lead mines, marble and alabaster quarries, and yields also borax and naphtha. It trades mainly with India. The principal towns are—Shiraz, Jehroom, Darab or Darabgerd, Behbahan or Babahan, and Bushire. North of Shiraz, at a distance of about 30 miles, lie the ruins of the ancient and splendid city of Persepolis. F. also contains the remains of Shalpur, a city older than the age of Alexander the Great, and the celebrated sculptured rock, called by the Persians *Naksh-i-*

Rustam. A cold winter and heavy floods prevailed in 1873—1874, which caused great damage to property; nearly one-third of the city of Shiraz was destroyed by the floods.

FARSA'N ARCHIE'LAGO, a group of islands in the south-east of the Red Sea, the chief of which are Farsan Kebeer, 31 miles long, and Farsan Seggeer, 18 miles, in lat. $16^{\circ} 30'$ — 17° N., and long. $41^{\circ} 45'$ — $42^{\circ} 10'$ E. They would be valuable as harbors, were it not for the reefs in the vicinity.

FARTHING (Sax. *feorthing* from *feorth*, fourth), the fourth part of a Penny (q. v.).

FA'RTHINGALE, old form of the word (as found in Bishop Latimer) *verdingale*, is probably a corruption of the French *vertugade*; from Spanish *verdugado*, hooped; *verdugo*, a rod or hoop; *verde*, green. For a description of the farthingale, see **CRINO-LINE**.

FA'RYNDON INN, the name formerly borne by Serjeants' Inn, Chancery Lane. This building belonged to the bishops of Ely, by whom, in 1411, it was let to the serjeants-at-law. In 1484, the name was changed to Serjeants' Inn (q. v.).

FASA'NO, a town of Italy, in the province of Bari, and 33 miles south-east of the town of Bari, is situated on the high road from that town to Brindisi. It is small, but wealthy. The whole of the district of F. abounds in olive plantations, and there are numerous oil-presses in the town and neighborhood. Pop. (1871) 12,809.

FA'SCES were bundles of rods usually made of birch, but sometimes of elm, with an axe projecting from the middle of them, which were carried before the chief magistrates of ancient Rome, as symbols of their power over life and limb. They were borne by the lictors, at first before the kings; in the time of the republic, before consuls and prætors; and afterwards before the emperors. Their number varied, a consul having twelve, and a prætor, six; but within the city only two. Valerius Publicola introduced a law that within the city the axe was withdrawn, except in the case of a dictator, who was preceded by twenty-four lictors, bearing as many fasces. Publicola also made the fasces be lowered at the assemblies of the people, as an acknowledgment of their supreme power.

FA'SCIA, in Architecture, a flat space or band, like a broad ribbon, usually between mouldings, as at *a*, *a*, *a* of the architrave (see fig.). Architraves are called single, double, or triple fasciæ architraves, according to the number of fasciæ into which they are divided.

FASCINATION BY SERPENTS. A power has long been popularly ascribed to serpents, or at least to some kinds of them, of fascinating by their eye the small animals on which they prey, so as to prevent the escape of the intended victim, when its escape would otherwise be easy, and to cause it rather to run or flutter into the mouth which is open to devour it. This popular notion has been ridiculed, but is supported by a large amount of evidence, and has been fully adopted by some of the most scientific observers. In the earlier part of last century, Kalm described the rattlesnake as frequently lying at the bottom of a tree, on which a squirrel is seated, and fixing its eyes on the little animal, which from that moment cannot escape, but begins a doleful outcry, comes towards the snake, runs a little bit away, comes nearer, and finally is swallowed. Le Vaillant describes a similar scene, as witnessed by him in Africa, a shrike incapable of moving away from a serpent which was gazing fixedly at it, and dying of fear, although the serpent was killed. Dr. Andrew Smith states that the presence of a non-venomous South African tree-snake, *Bucephalus viridis*, in a tree, causes the birds of the neighborhood to collect around it and fly to and fro, uttering piercing cries, 'until some one, more terror-struck than the rest, actually seizes its lips, and almost without resistance, becomes a meal for its enemy.' He adds, 'whatever may be said in ridicule of fascination, it is nevertheless true that birds, and even quadrupeds, are, under certain circumstances, unable to retire from the presence of certain of their enemies; and what is even more extraordinary, unable to resist the propensity to advance from a situation of actual safety, into one of most imminent danger.'

This I have often seen exemplified in the case of birds and snakes; and I have heard of instances equally curious, in which antelopes and other quadrupeds have been so bewildered by the sudden appearance of crocodiles, and by the grimaces and contortions they practised, as to be unable to fly, or even move from the spot towards which they were approaching to seize them.' Ellis, in his *Three Visits to Madagascar*, records anecdotes of the same kind, and one in particular, of a frog apparently unable to move, until an object was pushed between it and the eye of the snake, when the frog immediately darted away, as if relieved from some mesmeric influence exerted over it.

FASCI'NES (from Lat. *fascis*, a bundle) are fagots for military purposes made of young branches of trees or brushwood, and also

of osiers, bound together with yarn or withes. They are about a foot in diameter, and of various lengths, averaging 12 feet, according to the object for which they are intended. Fascines are used in the construction of temporary works; for filling a ditch, and sometimes, in a pile, for setting fire to an obstruction. Before a siege, the soldiers are employed in making fascines in great number; and when needed, each soldier bears one to the place, casts it on the heap, and the quantity required is thus accumulated in a remarkably short time.

FASCI'OLA, a generic name formerly employed to designate all the *Trematode Entozoa*, as Flukes, &c., which are now, however, divided into many genera.

FA'SHION, or, as the French term it, *La Mode*, admits as little of exact definition as of being referred to any intelligible principle. In every age and country, there has been a recognizable costume or general style of male and female attire, along with certain niceties in the shape, color, and texture of dress, which, fluctuating according to taste or whim, are known as the fashion—a word which etymologically signifies making in a particular form. The terms fashion and fashionable are, however, so comprehensive as to include much beyond the sphere of the toilet; as, for example, a style of speaking, living, and forming opinions; there being, to use a common phrase, 'a fashion in everything.' It is only in China and some other eastern countries that in consequence of dress being regulated by sumptuary laws or some equally strict traditions, the fashions of attire remain from generation to generation with little or no change.

The nature of clothing, and the necessity for its use, being treated in the articles **WEAVING** and **SANITARY SCIENCE**, what seems desirable here is to glance at the leading forms of dress and more conspicuous fashions that have prevailed in Western Europe, and more particularly in England, since the dawn of civilization. Our modern costume has seemingly had a double origin—that of the Romans and of the Teutonic people, who in different branches invaded France and Britain. The usual Roman dress, in the latter period of the Empire, consisted of a tunic, or loose upper garment, with a dress for the lower limbs, called *bracæ*; hence the modern term *breeches*. Over all was occasionally worn by the higher classes the *toga*, or mantle.

It is believed that these Roman costumes were generally copied by the greater number of British, at least among the more opulent classes. In the dress of the women, however, there was but little change. They appear in two tunics, the one reaching to the ankles, the other having short sleeves, and reaching about halfway down the thigh; in other words, they resemble a round gown, or bedgown and petticoat, though the latter, distinct from a body and sleeves, is not considered to be ancient. This tunic was called in British *gan*; hence our word *gown*, of which we still see specimens of short dimensions worn by women of the humbler classes in England, Scotland, and Wales.

The Anglo-Saxon and Danish periods of English history are marked by new peculiarities in costume. Soon after the departure of the Romans, and the arrival of the Saxons in the 5th c., fashions of apparel were introduced from Northern Germany, which continued with no material change for several centuries. The most important improvement in the ordinary dress of the people was the introduction of the *shirt*, a linen garment worn next the skin, for which we are indebted to the Saxon invaders. The common dress of the 8th c. consisted, as we find, of linen shirts; tunics, or a kind of surcoat; cloaks fastened on the breast or shoulders with brooches; short drawers met by hose, over which were worn bands of cloth, linen, or leather, in diagonal crossings. Leathern sandals were worn by the early Anglo-Saxons; but afterwards the shoe became common: it was very simple, and well contrived for comfort, being opened down the instep, and there, by a thong passed through holes on each side of the slit, drawn tight round the feet like a purse. A felt or woollen cap, called *hat* (hence our modern word *hat*), was worn by the higher class of Anglo-Saxons; but it is generally believed that the serfs or lower orders were without any other covering for the head than what nature had given them. The Anglo-Saxon tunic still exists in the *smock-frock*, a species of overall generally worn by the peasantry and some farmers in England. The *blouse*, worn by workmen in France and Switzerland, has an equally early origin.

The Norman Conquest introduced greater taste and splendor into British costume. Now, were introduced Gloves (q. v.), along with the fashions of chivalry. The engraving represents a gentleman of the reign of Henry V.: he is dressed in a short tunic, buttoned in front, with girdle, large loose sleeves, tight hose forming pantaloons, and stockings in a single piece, peaked shoes, and head cloth or cap. About this period, silks and velvets of divers colors came into use among the higher classes, by whom gold chains were generally worn. The dress of ladies was of the richest kind. Gowns were embroidered and bordered with furs or velvet; and the bodice, laced in front over a stomacher, now

first appeared. But the greatest eccentricity was the lofty steeple head-dress, shown in the annexed portrait; this consisted of a roll



Gentleman of Fifteenth Century.



Lady of Fifteenth Century.



Man and Woman of the Sixteenth Century.

of linen, covered with fine lawn, which hung to the ground, or was mostly tucked under the arm.

In the 16th c., the upper part of the long hose or nether garments began to be worn loose, or slashed with pieces of different colors let in, and the arms and shoulders of the doublet or jacket were fashioned in a similar style. Boots were also worn loose on the leg with the upper part falling down; hence the origin of the *buskin*. Ruffs or ruffles, collars, and velvet bonnets with feathers, came likewise into use, as may be seen from the paintings of Henry VIII. Hall, the chronicler, describes several of Henry's superb dresses, and among them a *frock*, or coat of velvet, embroidered all over with gold of damask, the sleeves and breast cut and lined with cloth of gold, and tied together with great buttons of diamonds, rubies, and orient pearls. The cloaks and mantles were of corresponding magnificence. The shirts were pinched or plaited, and embroidered with gold, silver, or silk. The term *hose* continued to be applied to the entire vestment, from the waist to the feet, throughout this century: the material is more distinctly stated, for Henry wore knit silk as well as cloth hose: the precise period of the separation of the hose into breeches and stockings, is not so clear as the derivation of the latter term from the '*stocking* of hose;' 'that is, adding the lower part that covered the legs and feet to that which was fastened by points to the doublet,' and was called the *stocks*. The shoes and buskins were of the German fashion, very broad at the toes, and of velvet and satin, slashed and puffed. The hats, caps, and bonnets were of almost endless forms and colors.

The dress of the middle ranks in the reign of Henry VIII. may be seen in prints of the time; plain russet coats, and a loose kind of kersey breeches, with stockings of the same piece, were the ordinary suit; and the London apprentices wore blue cloaks in summer, and gowns of the same color in winter, as badges of servitude; for this appears to have been the age of domestic distinctions—the relics of the feudalism of the middle ages. The women wore russet, or long woollen gowns, worsted kirtles (hereafter called *petticoats*), and white caps and aprons; and white underlinen came into general wear. The engraving shows a man and woman in the ordinary dress of this period.

The principal novelty of the reigns of Edward VI. and Mary was the flat round bonnet or cap, of plain velvet or cloth, worn on one side of the head, and decorated with a jewel and single ostrich feather. The bonnet itself is preserved in the caps worn at the present day by the boys of Christ's Hospital; and their blue coat and yellow stockings are such as were worn by the London apprentices at the date of the foundation of the hospital by the youthful Edward. See *HOSIERY*.

The male costume in Elizabeth's reign was the large trunk hose, long-waisted doublet, short cloak, hat, band, and feather, shoes with roses, and the large ruff; but the great breeches, 'stuffed with hair-like woolsacks,' after the separation of the hose into this garment and stockings, appear to have been worn throughout the reign: they were made of silk, velvet, satin, and damask. The doublets were still more costly and quilted and stuffed, 'slashed, jagged, pinched and laced;' and over these were worn coats and jerkins in as many varieties as there are days in the year. The cloaks were of the Spanish, French, and Dutch cuts, of cloth, silk, velvet, and taffeta of all colors, trimmed with gold, silver, and silk-lace and glass bugles, inside and outside equally superb. The stockings, shoes, slippers, and ruffs resembled those of the ladies.

Hats now began to supersede the bonnets of a former era. Those of beaver were exceedingly expensive, and they were for the most part made of felted wool, dyed. The most remarkable thing

about these hats was their numerous shapes: some were steeple-crowned; others were flat and broad, like the battlements of a house; and others with round crowns, and bands of all colors, and ornamented with huge feathers and brooches, clasps, and jewels of great value. See *HAT*.

As regards female attire, the more conspicuous features in the reign of Elizabeth were the farthingale (q. v.) and ruff. The farthingale, or fardingale, consisted in an extravagant expansion of the lower garments, by means of cane or whalebone, by which the lady seemed to walk in a kind of tub. The farthingale, which is referred to by Shakspeare, Butler, and other writers, mostly in a satiric vein, was the predecessor of the hoop, which in its turn, after an interval, was succeeded by the Crinoline (q. v.) and hoop-work of steel. The widely extended ruff of fine linen, like a huge frill, is seen in the pictures of Elizabeth and her envied rival, Mary Queen of Scots, both stars of fashion in their day.

Under James I., the male costume was somewhat more Spanish, as respects the slashing and ornamenting of the doublet and breeches. Late in the reign, however, the jackets or doublets were shortened, and the breeches reduced in size, and fastened in large bows at the knees; the well-stockinged leg was admired, and the hat worn low in the crown, and with broad rim, as seen in portraits of the date 1619. Beards and whiskers had become almost universal in the reign of Elizabeth; but in that of James, the former was sometimes worn trimmed to a point, hanging down at the division of the ruff.

In the female costume, there was little change. The farthingale continued to be worn by ladies of quality; a strong passion for foreign lace was introduced; pearls were the favorite jewels; and the ruff maintained its sway, so as to be anathematized from the pulpit; and the fancies of female costume were glanced at in a sermon preached before the king at Whitehall in 1607—1608, as 'her French, her Spanish, and her foolish fashions.'

The fashion of dress in the reign of Charles I. became still more decidedly Spanish and picturesque. There were now worn collars of rich point-lace, large and hanging down on the shoulders, held by a cord and tassel at the neck, and now called *Vandyke*, from its being the most striking part of the dress in which Vandyke at that time painted portraits.

The principal habits were vests and cloaks of velvet, or silk damask, short-trousered breeches terminating in stuffed rolls, and fringes and points, and very rich boots, with large projecting lace tops.

A dress of Charles is thus described: A falling band, green doublet (from the armpits to the shoulders wide and loose), zigzag turned-up ruffles, long green breeches (like a Dutchman's), tied below the knee with yellow ribbons, red stockings, green shoe-



Citizen in the time of Charles I.



Gentleman of 1750.

roses, and a short red cloak lined with blue, with a star on the shoulder; the king sometimes wore a large cravat, and at other times a long falling band with tassels. The dress of the gay courtiers or cavaliers consisted of a doublet of velvet, silk, or satin, with large loose sleeves, slashed, and embroidered; Vandyke collar and band, and short embroidered cloak, worn on one shoulder; the long breeches, fringed and pointed, met the ruffled tops of the boots; the embroidered sword-belt was worn over the right shoulder, and in it was hung a Spanish rapier, and in the flapping beaver-hat was worn a plume of feathers confined by a jewel. A buff coat or jerkin was often worn, as a better defence than the doublet, which is sometimes covered. The engraving represents a citizen of this period more plainly attired.

The female costume of this period was rather elegant than splendid. Gowns with close bodies and tight sleeves were worn, through the farthingale was retained, with a gorget ruff standing up about the neck like a fan. French hoods were still worn, though with little distinction as to rank. The hair was worn in small curls, and the hoods, of all colors, fastened under the chin

with curious effect. Earrings, necklaces, and bracelets were much worn; but the Puritans forbade the females to wear lace, jewels, or even braided hair; and they retained the close hood and high-crowned hat.

Towards the close of the reign of Charles I., the cumbersome farthingale disappeared, with the yellow starched ruff and band. These tasteless fashions being dismissed, the female dress became very elegant, with its rich full skirt and sleeves, and falling collar edged with rich lace, and the hair worn in graceful ringlets; but these vanities were condemned by the Puritan party.

With the restoration of Charles II. came certain tasteless innovations upon the elegant Vandyke costume of the time of Charles I., which were the first resemblance to the coats and waistcoats of the present day. Thus our most picturesque attire lasted little more than a quarter of a century. Its decline was gradual; its chivalric character soon degenerated into grotesqueness, which in its turn changed to stark meanness. Early in the reign of Charles II., the doublet was much shortened, and worn open in front, where, and at the waistband, the rich shirt was shown; and the loose sleeves and breeches were decked with ribbons and points, and from the knee-bands hung long lace ruffles. At the wrists, too, ruffles were worn; but the lace-collar was shorn of its points. The cloak was retained upon the left shoulder, and the high-crowned and plumed hat remained for a short time; but the crown of the hat was soon lowered.

The petticoat breeches were another absurdity; although ornamented with ribbons at the sides, the lining strangely appeared below the breeches, and was tied at the knees; to match which, the sleeves of the doublet only reached to the elbows, and from under them bulged the ruffled sleeves of the shirt, both being ornamented with ribbons. Meanwhile the skirt of the doublet had been lengthened from above the waist nearly to the knees, and had buttons and button-holes in its entire length, thus becoming a coat, and so named in an inventory of 1679; wherein also are the items of *waistcoat, breeches, pantaloons, drawers and trousers*, being the earliest mention of these articles. Stockings of various kinds were common; and 'the lower ends of stockings' are understood as socks. Instead of the lace-collar was worn the long square-ended cravat, of the same material, from Brussels and Flanders.

Passing to the reigns of James II. and William III., we find the male attire gradually fashioned according to the artificial costume of the court of Louis XIV. Every article of dress was now more prim and exact. The petticoat breeches were exchanged for the close-fitting garments tied below the knee, and therefore called *knee-breeches*; the broad-brimmed hats were turned up on two sides, and edged with feathers or ribbons; we began to see the rich long lace cravat and embroidered waistcoat; and the band was now narrowed, so as to resemble that worn at the present time by clergymen. Wigs, which had been some time in use, were worn still longer than hitherto, hanging down in front, or flowing upon the shoulders, though the color was altered from black to suit the complexion. From the 17th to the end of the 18th c. was the era of *Hair-powder* (q. v.), *Wigs* (q. v.), and cocked-hats; in these as in other matters there being an excessive artificiality in the tastes of the higher classes. In the annexed cut, we offer a representation of a gentleman of 1750, with his flowing coat and ample cuffs, frills at the wrist, deep waistcoat hanging over the legs, long white hose drawn over the knees, his cocked-hat folded under his arm, and in his hand the open Snuff-box (q. v.). Such was the appearance of what is traditionally known as the 'old English gentleman.' The coats of the 18th c. were of velvet, silk, or satin, as well as broad-cloth, and their colors very fanciful. Hogarth's favorite color was sky-blue; Reynolds's, deep crimson and violet; and Goldsmith rejoiced in plum-color. About 1790, cloth became the general wear; the waistcoat being of the costlier materials, and embroidered, and sometimes the breeches. Buckles were worn at the knees and in the shoes till the close of the century; and the large square plaited buckle was the *ton* until 1791, when shoe-strings became general. Among the artificialities of dress during the greater part of the 18th c., none was more odious than that of Hoops (q. v.), worn by ladies, who, by these means of expansion, were made to appear as if standing in an inverted tub. In the reigns of George I. and II., a loose kind of drapery at the back of the dress, called a *sacque*, and hooded silk-cloaks, were worn, also a very small mull, such as have been lately revived. In the 18th c., after the disuse of towering head-dresses, Veils (q. v.) of an elegant fabric were introduced, and the Fan (q. v.) was an important article for ornament and flirtation.

The formalities of the 18th c. received a severe blow at the French Revolution; and in the ten years from 1790 to 1800 a more complete change was effected in dress, by the spontaneous action of the people, than had taken place at any previous period in a century. The change began in France, partly to mark a contempt for old court usages, and partly in imitation of certain classes of persons in England, whose costume the French mistook for that

of the nation generally. This new French dress was introduced by the party who were styled the *Sans Culottes*. It consisted of a round hat, a short coat, a light waistcoat, and pantaloons; a handkerchief was tied loosely round the neck, with the ends long and hanging down, and showing the shirt-collar above; the hair was cut short, without powder, *à la Titus*, and the shoes were tied with strings.

The comparatively simple form of dress of the *Sans Culottes* found many admirers in England, and soon became common among young men; the change from antique fashions was also greatly helped by the imposition of a tax on the use of hair-powder, which was henceforth generally abandoned. Pantaloons, which fitted closely to the leg, remained in very common use by those persons who had adopted them till about the year 1814, when the wearing of trousers, already introduced into the army, became fashionable. It is proper, however, to mention that trousers had, for the previous fifteen or twenty years, been used by boys, and were perhaps from them adopted by the army. Previous to the French Revolution, the dress of boys was almost the same as that of men. Although trousers—called by the Americans *pants*—were generally worn after 1815, many elderly persons still held out in knee-breeches against all innovations, and to the present day an aged gentleman may occasionally be seen clinging to this 18th c. piece of dress. The general use of white neckcloths continued, notwithstanding the introduction of the standing collar, till the reign of George IV., when this monarch's taste for wearing a black silk kerchief or stock, and also the use of black stocks in the army, caused a remarkably quick abandonment of white neckcloths, and the adoption of black instead. The year 1825, or thereabouts, was the era of this signal improvement in costume.

While these leading changes were effecting, other alterations of a less conspicuous nature were from time to time taking place. The disbanding of the army after the peace of 1815 led to various transformations besides those we have mentioned. While pantaloons were the fashionable dress, it became customary to wear Hessian boots; these, which had originated among the Hessian troops, were without tops, and were worn with small silk tassels dangling from a cut in front; being drawn over the lower part of the pantaloons, they had a neat appearance; but the keeping of them clean formed a torment that prevented their universal use. See *Boots*. When trousers were introduced from the practice of the army, the use of Wellington boots to go beneath them also became common. Referring to the era of 1815 to 1825 as that in which trousers, Wellington boots, and black neckcloths or stocks came into vogue, we may place the introduction of the surtout in the same period of history. From the time when the collarless and broad-skirted coat had disappeared about the commencement of the century, the fashion of coats had changed in various ways till the above-named era, when the loose frock-coat or surtout was added to the list of garments.

Such is a general account of the progress of fashions in England until nearly the present day. In these fashions, the Welsh, Irish, and Scotch have participated, and there is now little to distinguish the inhabitants of one part of the United Kingdom from another. What differences exist in particular localities—as, for instance, the round hats of the women in Wales, the checked gray *plaid* of the Lowland Scottish peasantry, and the *tartan* of the Highlanders—will receive some notice under their appropriate heads.

The general simplifying of dress subsequent to 1815, was not unaccompanied by an expiring effort to sustain a high style of fashion. The *macaroni*, or highly dressed bean of the 18th c., was now succeeded by the *dandy*, who, with mincing, affected manners, prided himself on his starched collars, his trouser-straps, and the flashy bunch of seals which dangled from his watch-chain. The Regency was the era of this kind of supreme dandyism, but it continued till later times, and characterized a number of leading public personages, of whom notices occur in Raikes's *Reminiscences*, from 1831 to 1851. In the present day, may be noted a kind of breakdown of everything like formality in gentlemen's walking costume. Plain cloths, of diverse hues, called *Tweeds* (q. v.), have superseded materials of a superior quality; cloth caps, or soft felted hats, called *wide-awakes* (see *HAT*), cover the head; and the feet are provided with short ankle-boots instead of Wellingtons. In evening or dinner costume, however, the old etiquette of dress-coats and white neckcloths is still maintained. Among the changes that are taking place in the morning or walking dress, none is so remarkable as the growing fashion of wearing *knickerbockers*. These are wide loose trousers to below the knee, leaving the lower part of the leg only stockinged or covered with leggings. This fashion, which has been copied more immediately from the French *Zouaves* (q. v.), and partly perhaps from the common practice of stuffing the lower parts of the trousers roughly into boots in the western regions of the United States, is very much a resumption of the costumes seen in old Dutch prints. Should it become general, leg-gaiters or boots will come again into use, and the present generation may live to see the fashion

of male attire work once more round to the knee-breeches of the 18th century. In female as well as in male costume, fashion seems to have a tendency to work in a circle; of this, the late, but now obsolete, resumption of the farthingale, or hoop, under the name of crinoline, offers a sufficient example, besides affording a ludicrous instance of the unreasoning manner in which extravagances in dress are usually followed. It is to be observed, however, that Englishwomen, chargeable as they are with this absurdity, set a most creditable example to their sex all over the world, in allowing no fantastic change of fashion to prevent them from taking out-door exercise in all weathers, which the introduction of india-rubber Goloshes (q. v.) has materially aided.

As to the moral view that may be taken of the whimsicalities of female fashions, we might refer to the numerous papers of Steele in the *Tatler* and *Spectator*, and also the writings of other 18th c. essayists; passing these over, it is enough to quote the words of Hazlitt, a more recent essayist. 'Fashion,' he says, 'constantly begins and ends in two things it abhors most—singularity and vulgarity.'

'It is the perpetual setting up and then disowning a certain standard of taste, elegance and refinement, which has no other formation or authority than that it is the prevailing distraction of the moment; which was yesterday ridiculous from its being new, and to-morrow will be odious from its being common. It is one of the most slight and insignificant of all things. It cannot be lasting, for it depends on the constant change and shifting of its own harlequin disguises; it cannot be sterling, for, if it were, it could not depend on the breath of caprice; it must be superficial, to produce its immediate effect on the gaping crowd; and frivolous, to admit of its being assumed at pleasure by the number of those who affect to be in the fashion, to be distinguished from the rest of the world. It is not anything in itself, nor the sign of anything, but the folly and vanity of those who rely upon it as their greatest pride and ornament. It takes the firmest hold of weak, flimsy, and narrow minds, of those whose emptiness conceives of nothing excellent but what is thought so by others. That which is good for anything is the better for being widely diffused. But fashion is the abortive issue of vain ostentation and exclusive egotism: it is haughty, trifling, affected, servile, despotic, mean and ambitious, precise and fantastical, all in a breath—tied to no rule, and bound to conform to every rule of the minute.' For a large variety of amusing particulars concerning fashions, 'stars of fashion,' &c., during the past two centuries, we refer to Mrs. Stone's *Chronicles of Fashion* (Lond. 2 vols. 1845).

FAST (a word common to the Teutonic tongues, which Grimm derives from a root signifying primarily to hold, keep, observe, and hence to restrain one's self; Lat. *jejuniū*, Gr. *nestēia*, Heb. *tsom*) is the word used to express a certain self-imposed restraint with respect to the nourishment of the body. The abstinence enforced may be either partial, when the restriction is confined to certain articles of food; or total, when all sustenance is dispensed with for a specified time. The origin of the custom seems to be coeval with man's first experience of the salutary influence which abstinence exercises on the health, and with his more or less instinctive consciousness of the necessity of retaining the body in due subjection to the soul. By degrees, the self-mortification which it implied raised it into a sacrifice offered to the Deity; it became a religious observance, was surrounded with rites and ceremonies, and finally bore the stamp of a divine law. Climate, the habits of a people, and their creed, gave it at different periods different characteristics; but it may be pronounced to have been a recognized institution with all the more civilized nations, especially those of Asia, throughout all historic times. We find it in high estimation among the ancient Parsees of Irania. It formed a prominent feature in the ceremonies of the Mysteries of Mithras; and found its way, together with these, over Armenia, Cappadocia, Pontus, and Asia Minor, to Palestine, and northward to the wilds of Scythia. The ancient Chinese and Hindus, and principally the latter, in accordance with their primeval view—which they held in common with the Parsees—of heaven and hell, salvation and damnation, of the transmigration of the soul, and of the body as the temporary prison of a fallen spirit, carried fasting to an unnatural excess.

Although the Vedas attach little importance to the exorciation of the body, yet the Pavaka, by the due observance of which the Hindu believer is purified from all his sins, requires among other things an uninterrupted fast for the space of twelve days. Egypt seems to have had few or no compulsory general fasts; but it is established beyond doubt, that for the initiation into the mysteries of Isis and Osiris, temporary abstinence was rigorously enforced. In Siam, all solemn acts are preceded by a period of fasting, the seasons of the new and full moon being especially consecrated to this rite. In Java, where abstinence from the flesh of oxen is part of the religion of all, Buddhists and worshippers of Brahma alike, the manner and times of the observance vary according to the religion of the individual. Again, in Tibet, the Dalai-lamaites and

Bogdo-lamaites hold this law in common. That Greece observed and gave a high place to occasional fast-days—such as the third day of the festival of the Eleusinian mysteries, and that, for instance, those who came to consult the oracle of Trophonius, had to abstain from food for twenty-four hours—is well known. It need hardly be added, that the Romans did not omit so important an element of the festivals and ceremonies which they adopted from their neighbors, though with them the periods of fasting were of less frequent recurrence. See *THESMOPHORIA*.

As to the Semitic races, although we find the people of Nineveh undergoing occasional fasts, to which even animals were made to conform, yet the Mosaic law set apart one day only in the whole year for the purpose of fasting. The 10th day of the seventh month (Tishri), called 'the Day of Atonement' (Yom Kippur), or, as the holiest of the whole year, 'the Sabbath of Sabbaths,' was ordained for 'the chastening of the *Nephesh*,' which the traditional law explains as meaning the strictest and most rigorous abstinence from all food or drink, as also from washing, anointing, the putting on of sandals, &c., from the sunset of the ninth to the rising of three stars on the evening of the tenth day. In process of time, five days of compulsory fasting were added, in commemoration of certain days of humiliation and national misfortune—viz., the 17th of the fourth month (Tamuz), as the anniversary of the taking of Jerusalem both by Nebuchadnezzar and Titus; the 3d of the seventh month (Tishri), when Ishmael had killed Gedaliah, the Jewish governor appointed by the Babylonians (Jer. xli. 2); the 10th of the tenth month (Tebeth), in remembrance of the siege of Nebuchadnezzar; the 13th of the twelfth month (Adar), the fast of Esther, and the day most rigorously kept, next to the great Day of Atonement:—the 9th of the fifth month (Ab), the anniversary of the destruction of the first temple by Nebuchadnezzar, and of the second by Titus. That the people had at all times been prone to attach great importance to the use of this penance as a visible sign of outward contrition, is clear from that ordinance of the Mosaic law which puts into the hands of the head of a family the power of confining self-imposed vows of abstinence within due limits.

The community loved to express their penitence for sin, or their grief on the death of great men, by occasional fastings. They were also considered an efficient means of averting the divine wrath, of insuring victory over an enemy, or of bringing down rain from heaven. Besides, fasting was not unfrequently resorted to by those who wished to free their minds from all hindrances to meditation, as in the forty days of Moses (Exod. xxxiv. 28), or the fast of Daniel (Daniel, x. 2 and 3). This fast of Contemplation, as it might be called, seems also to have been the model imitated by the Cabbalists, some of whom are known to have fasted from Sabbath to Sabbath. In later times, when, after the destruction of the temple, sacrifices had ceased, fasting, as causing a decrease in the flesh and fat of the individual, was considered to be in some degree a substitute for the animal which had formerly been offered up by the priest. From a means to repentance and inward purification, which purpose alone it had been originally intended to serve, it became an end and a virtue in itself; an abuse, indeed, neither unknown nor undenounced even in the days of the prophets. If we add to this the endless chain of dire calamities and ever-renewed persecutions of which the Jews have been the victims for many a long century, the ever-increasing number of their fasts commemorative of deaths and tribulations will be far from surprising. Most of these, however, which were superadded from time to time, soon fell into oblivion. Over and above the six already mentioned, but few entire days are now observed by the orthodox, and these merely of a local character. Fasting, with the Jews, always implies entire abstinence, and lasts, except on the Day of Atonement and the 9th of Ab—when the sunset of the previous evening is the sign for its commencement—from the break of the day to the appearance of the first three stars. Sackcloth and ashes, the garb of the penitent in ancient times, are no longer worn; but as the special holiness of the Day of Atonement is celebrated by various solemnities (see *FESTIVALS*), so the deepest mourning over the loss of temple and country is visibly expressed by many ceremonies in the Jewish synagogues and homes on the 9th of Ab. On that day also, to add the individual to the national sorrow, the cemeteries are generally visited. Of several half-days of fasting that have survived, we will mention the first two Mondays and the first Thursday in the second month (Iyar) and in the eighth month (Cheshwan), (sheni vachamishi vesheni), in celebration of the two meeting-points of summer and winter; as also, several days before the New-year or Day of Judgment, and before the Day of Atonement. The individual is bound to celebrate by fasting the anniversary of the death of his parents, his own wedding-day until the performance of the marriage-ceremony, and the birth of his first-born male child (up to its thirteenth year—when the duty falls upon the latter himself), on the day preceding the Pesach (Pusha)—in commemoration of the sparing of the Israelite first-born in Egypt. For the several hours' fasts on the two New-years'

Days, and on the first six days of the Feast of Tabernacles, we refer likewise to FESTIVALS, and we will only add in conclusion, that the Sabbath causes the postponement of any fast—that of the Day of Atonement only excepted—which may happen to be coincident with it; and that children—girls up to their twelfth, boys to their thirteenth year—pregnant women, and the sick, are exempted from the observance.

In the time of Christ, fasting, as we have seen, was held in high estimation. The Mondays and Thursdays—the market-days, on which the judges sat, and the law was read in the synagogues—were especially set aside for this purpose by the Pharisees. The Essenes fasted even more frequently. The Sadducees alone took exception to this rite, and were therefore considered ungodly. Christ himself neither approved nor disapproved of the custom, but, as in all matters of ceremony, allowed disciples, Jews and Gentiles, to act according or contrary to their old habits. He is distinctly against such a *commandment*, and even excuses those who did not fast. His own abstinence from food for forty days was like that of Moses, entirely an individual act; and against a voluntary and limited imitation of such abstinence, to which the spirit might move a man, no objection whatever was to be taken.* During the first centuries of Christianity, these voluntary fasts were frequent enough; the new converts adhering in most cases to their old rite, and only taking care to change the days, which had been days of abstinence in their former religions for others. Besides, they were considered a befitting preparation for holy acts and feasts, for ordination and baptism. The time mostly celebrated annually in common by all were the forty hours from Friday afternoon to Sunday morning, during which time Christ laid in the sepulchre. But not before the end of the second century was anything like an ordinance promulgated with respect to fasting in the new religion. It was first Montanus who, as the Paraclete, introduced, among other laws of excessive severity and rigor, fasting, as an inhibition upon the faithful. The Wednesdays and Fridays, as the days when Christ was taken a prisoner and crucified, were made days of strictest abstinence from all food; while on the other days of the week, dried, uncooked victuals only were allowed. Asceticism and monachism had their share in the gradual development of the doctrine of the necessity of mortifying the flesh, and as a natural consequence, in the growth and diffusion of the custom of fasting. Yet, in the first six centuries, the difference in the various Christian communities was not greater in any other doctrine or ceremony than in this.

Bishops and councils, however, gradually fixed the times and seasons for the whole of Christendom. The 40 hours had gradually become 40 days, called the Quadragesima; and the council of Orleans, in 541, made it binding upon every Christian not to eat any meat during this time, save only on the Sundays.† The eighth council at Toledo, in the 7th c., declared those who ate meat during Lent, sinners unworthy to partake in the resurrection. From the 8th c. to the 11th, when a gradual reaction set in, the laws of fasting and the punishments awarded to the transgressors became stricter and stricter; interdict and excommunication were among the penalties. By degrees they had become so numerous and different in kind, that they were divided into—1. *Jejunium generale* (a fast binding for all); 2. *Consuetudinarium* (local fast, &c.); 3. *Penitentiale* (atonement for all transgressions); 4. *Votivum* (consequent upon a vow); 5. *Voluntare* (for the better carrying out of an undertaking). These again were kept either as 1. *Jejunium naturale* (an entire abstinence from food or drink, especially in preparation for the reception of the Eucharist); 2. *Abstinencia* (certain food only being allowed, but several times a day); 3. *Jejunium cum abstinencia* (the same food, but which must be taken once a day only); and 4. *Jejunium sine abstinencia* (all kinds of food, but only once a day). The food prohibited on partial fast-days included, during certain periods, not only the flesh of quadrupeds, fowl, and fish, but also the 'lactinia'—

i. e., all that comes from quadruped and bird, as butter, eggs, milk, &c. We cannot here enter into detail; the discrepancies and differences of opinion with respect to the times and modes of fasting, or to the food prohibited, being, even among successive popes and contemporary bishops and elders of the church, so numerous, and involved in such obscurities, that the church historians themselves shrink from enumerating them. Suffice it to say, that they gradually developed in the Roman Church into—1. Weekly fasts, of which Friday, as the day of the crucifixion, seems to have been early and generally observed. To this was added the Wednesday, as the day on which the death of Christ was resolved upon. These two days received the name of *Stationes*; a term borrowed from the *stationes* of the Roman soldiers, in accordance with the views held by the ascetics and monks, that they were the warriors of Christ. At a synod in Spain in the beginning of the 4th c., the Saturday was superadded, but this innovation met with great opposition, especially in the East, where Jewish notions regarding the Sabbath had obtained a more permanent recognition. 2. *Vigils*, originally night-services observed by the first Christians on the eve of Sundays and festivals, partly in imitation of the Jewish custom of celebrating the entrance of the Sabbath and of festivals on the evening of the previous day, and partly in fear of the danger to which a service in the daytime would have exposed the early converts.

Although these night-services became unnecessary in the course of time, they were still continued up to the 4th c., when, owing to the abuses to which they led, they were abolished, or rather transformed into fast-days, kept on the eve of great festivals in honor of Christ, Mary, Saints and Apostles. 3. The great or 40 days' fast (Quadragesimal fast), the most important and most rigorously enforced of all. The 40 hours of fast, in commemoration of the 40 hours during which Christ's body lay in the tomb, gradually expanded to 36, or rather 40 days, as mentioned before, in pious allusion to the 40 days of Moses, Elijah, Christ, the 40 years' sojourn in the desert, or the 40 camps—all considered typical, and the fasting became severer the nearer Passion-week itself approached, in which many other signs of mourning and contrition were generally exhibited. 4. The Quatember fasts on the Wednesdays, Fridays, and Saturdays in one week in each season, in imitation of the four Jewish fasts in the 4th 5th, 7th and 10th month.—There were still many other fasts, such as those of ordination, &c., but as they had only a temporary existence, we cannot treat of them here. Nor can we enter into the various dispensations granted by the church, or the special pastoral letters generally issued before Quadragesima, nor into the variations in the observance of fasts and fasting in our own days; we can only add, that they have in a great measure lost their former severity, and that only partial abstinence is the rule in all cases. The opinion held by the church in former days, that fasting is meritorious, and conducive to the salvation of the soul, has undergone no change.

With respect to the Greek Church, we have to observe that fasting was and is kept with much greater severity, the non-observance of it being the least venial of sins. The days here extend over almost three-quarters of the year. The principal ones are the Wednesday and Friday—with a few exceptions—throughout the whole year; the great Easter fast, lasting 48 days; that of Christmas, 39 days; that in honor of the Virgin, 14 days; and that of the Apostles, beginning on Monday after Trinity, and extending to the 29th June. Besides these smaller fasts of preparation, which correspond to the vigils of the Roman Church, they have many more occasional fasts, which we, however, must omit here.

The Church of England considers fasting a praiseworthy, but by no means obligatory custom. According to Hook's *Church Dictionary*, the distinction between the Protestant and the Roman Catholic view of fasting consists in this, that the Roman Catholic regards the use of fasting as an imperative means of grace, the Protestant only as a useful exercise preparatory for the means of grace. In proof how much the Church of England has left the question of fasting to the conscience and discretion of her members, it may be observed that she has neither defined the mode or degree of fasting, nor anywhere given a positive command to fast. It has been remarked that no bishop of the Church of England has in an episcopal charge laid down fasting as a positive requirement. The days named by the English Church as seasons of fasting or abstinence, are the forty days of Lent (q. v.), including Ash Wednesday and Good Friday; the Ember (q. v.) days; the three Rogation (q. v.) days, and all the Fridays in the year (except Christmas Day) and the eves or vigils of certain festivals.

The Scottish almanacs contain lists of the *fast-days* of all the principal places in Scotland. These are generally one in each year, appointed by the kirk-session of the Established Church of the parish, or by concurrence of kirk-sessions in towns, but generally by use and wont fixed as to their date. The fast-day is always some day of the week preceding the *Communion Sunday*, or Sunday set apart in the Presbyterian churches for the dispensation

* Roman Catholics, however, maintained that all the words of our Lord, which to Protestants appear to discountenance the obligation of fasting, are directed exclusively against the ostentations and self-reliant fasts of the Pharisees. They even understand the language which he used in condemning the practice of the Pharisee fasters, as containing a direct exhortation to his own disciples—not that they should abstain from fasting—that they should fast with suitable dispositions. They hold, moreover, that in exempting his disciples from fasting, he had regard only to the actual time of his own presence among them. It was incongruous, he said, t. at the children of the marriage should fast as long as the bridegroom was with them; but, he added, 'the days will come when the bridegroom shall be taken away from them; and then they shall fast in those days' (Mark iii. 20; Matt. ix. 15). Hence they infer, that from the time of our Lord's ascension the practice of fasting became obligatory on his disciples, the temporary cause of the exemption hitherto existing having ceased.

† It is only just to add, however, that here again Catholics dissent strongly from the Protestant view of this history. They admit that the followers of Montanus did introduce greater rigor and frequency into their fasts; but they deny that before the time of Montanus the practice of fasting was not fully recognized in the Christian Church, and regarded as strictly obligatory. The very earliest allusions to the forty days' fast of Lent (*tessarakosté*) regard it as an established and recognized institution. The very first fathers who allude to it, speak of it as 'handed down and observed by the church'; and so far is its origin from being ascribable to the influence of Montanism, that, on the contrary, the earliest relaxations which the church admitted were a reaction against the excessive and intolerable rigor of that fanatical sect.

of the Lord's Supper. It is usually appointed as a day for 'fasting, humiliation, and prayer.' Business is generally suspended, shops shut as on a Sunday, and churches opened for public worship. By an act of parliament passed not many years since, factories are prohibited from carrying on work on the parish fast-day, but in consequence of the ecclesiastical divisions in Scotland, it has become more common than it once was for agricultural and other kinds of work to be carried on. The fast-day of a large town is always a busy day on the railways, many taking advantage of it for excursions, and making it a day of amusement; too many, also, a day of dissipation and revelry. That it is right to keep up the fast-day in these circumstances is doubted by many who themselves conform to its religious observance, although of that observance *fasting* does not now generally form a part. Many, however, doubt if it ever was a good institution; alleging that it is inconsistent with the frequent celebration of the Lord's Supper, which they deem right and desirable, and to which there is a growing tendency. The Scottish Reformers, as appears from the *First Book of Discipline* contemplated the ordinary celebration of the Lord's Supper at least once a month; and the fast-day, as it now exists in Scotland, derives its origin from a later period.

A few words remain to be said of the Mohammedan fasts. Islam, as an offspring of Judaism and Christianity, adopted this custom with many other from both churches. During the whole month of Ramadan, in which the Prophet brought the Koran from heaven, eating, drinking, smoking, smelling perfumes, &c., are strictly forbidden from daybreak till sunset; for the intervening nights, however, all these restrictions are removed. There are, besides, many voluntary fasts, expiatory like the 10th of Moharram, corresponding to the Jewish Day of Atonement, or for the averting of the Divine wrath in sudden calamities, or as an indemnification for the omission of certain pious acts, as the pilgrimage, &c. See JEWS, MOHAMMEDANISM, MONKS.

Besides the Bible, *Schulchan Aruch*, *Koran*, and the Fathers generally, we refer to the following authorities on this subject: Bingham, *Orig.* vol. ix. 1, 21; Fabricius, *Bibliogr. Antiquaria*, c. 11; J. A. Muratori, *De Quatuor Temporibus*, &c.; J. Dailéus, *De Jejuniis et Quadragesima*, 1654; Schöne's *Geschichtsforschungen*, Th. 1; *Briefe über d. Gottesd. d. morgenl. Kirche*, von Dr. E. v. Muralt (Leip. 1898); Siegel, *Altchristl. Alterthümer*; Dassel, *De Jure Temporis Quadragesimæ*, 1617; Walch, *De Jejuniis Quadragesimali* (Jene, 1727); Homborg, *De Quadragesima Veterum Christianorum et ritibus in ea quondam usitatis diss. qua etiam de recentior. Papist., Græc., Russ., Syrian., Georgian., Maronit., Jacobit., &c. dissertatur* (Helmst. 1677).

Fasting, or deprivation of food, is, in a physiological sense, a state inconsistent with the continuance of life in most warm-blooded animals more than a few weeks. If water is not supplied, the period is much shorter, being in man commonly not more than a very few days, or at most a week. Persons have been found in coal pits and mines, and in other situations where access to food has been impossible, but where water could be had, as long as six weeks after their seclusion, still alive, though of course in a very feeble condition; and a very small daily allowance of food has supported life longer than this, as in some cases of shipwreck, and other accidents at sea. Cases of alleged fasting, longer than this, as in the notorious woman of Tutbury, are certainly in most instances due to imposture. The insane would appear, in some instances, to bear fasting better than the healthy. Hibernating animals (see HIBERNATION) are capable of sustaining the want of food for an apparently indefinite period of weeks during the winter sleep; but no warm-blooded animal can endure fasting in anything like the same degree as the reptiles, in many of which, indeed, the natural state of existence is one of long intervals between the times of taking food, and in which the vital change of texture is remarkably slow. Thus, the remarkable amphibious animal, the *Proteus anguinus*, has been known to live for years without food, and the same is true of salamanders, tortoises, and even goldfishes. In fasting, the body gradually emaciates, most of the secretions are arrested, or greatly diminished, and at last the animal heat falls rapidly in all parts of the body. In attempting the recovery of persons reduced by fasting, food must be given in very small quantities at a time, and of the most nourishing and digestible quality; stimulants should be either withheld, or very cautiously administered. The most important point, next to the regulation of the food, and sometimes even before food is given at all, is the removal of the torpor and chill of the body by gradually applied heat, with friction of the limbs. See Tiedemann's *Physiology*; Burdach's *Physiology*; Chossat, *Recherches sur l'Inanition*.

FAST AND LOOSE is the name of a cheating game, also called *Pricking at the Belt*, which appears to have been much practised by the gypsies in the time of Shakspeare. The following is a description: 'A leathern belt is made up into a number of intricate folds, and placed edgewise upon a table. One of the folds is made to resemble the middle of a girdle, so that whoever shall

thrust a skewer into it would think he held it fast to the table; whereas, when he has so done, the person with whom he plays may take hold of both ends, and draw it away.' The game is still practised at fairs, races, and similar meetings under the name of *Prick the Garter*; the original phrase, 'Fast and loose,' however, is now used to designate the conduct of those numerous slippery characters whose code of ethics does not forbid them to say one thing and do another.

FASTEN'S EVE. See SHROVETIDE.

FASTI. *Fas*, in Latin, signifies divine law, and *fastus*, anything in accordance with divine law. Hence the *dies fasti*, or lawful days, among the Romans, were the days on which it was lawful to transact business before the prætor. But the sacred books in which the lawful days of the year were marked, were themselves denominated *fasti*, and the term was employed, in an extended sense to signify various kinds of registers, which have been often confounded with each other. These registers fall into two principal divisions—the *Fasti Sacri* or *Kalendares*, and the *Fasti Annales* or *Historici*.

1. *Fasti Kalendares*, or calendars of the year, were kept exclusively by the priests for about four centuries and a half after the building of the city. The appearance of the new moon was proclaimed by a pontifex, who at the same time announced to the people the time which would intervene between the Kalends and Nones. See CALENDAS, also CALENDAR. On the Nones, the country-people assembled for the purpose of learning from the Rex Sacrorum the various festivals of the month, and the days on which they would fall. In the same way, those who intended to go to law, learned on what days it would be right (*fas*) to do so. The mystery with which this lore was surrounded, for purposes of power and profit, by the favored class, was dispelled by Cn. Flavius, the scribe of Appius Cæcus, who surreptitiously copied from the pontifical book the requisite information, and published it to the people in the forum. From this, time-tables (*fasti*) became common, very much resembling modern almanacs. They contained the days and months of the year, the Nones, Ides, lawful and unlawful days, &c.; astronomical observations on the rising and setting of the fixed stars, the commencement of the seasons, brief notices concerning the introduction and significance of certain rites, the dedication of temples, the dates of victories, disasters, and the like. In later times, the exploits and honors of the imperial family were duly entered in the calendar. The celebrated *Fasti* of Ovid is a sort of poetical companion to the calendar, as published by Julius Cæsar, who remodelled the Roman year.

Several very curious specimens of *fasti* on stone and marble have been discovered, of which one of the most remarkable is the *Kalendarium Prænestinum*, which stood in the lower part of the forum of Præneste, described by Suetonius. Of these ancient *fasti*, eleven are enumerated by Foggini, a learned Italian antiquary. One of the most interesting is a rural almanac, known as the *Kalendarium Rusticum Farnesianum*. It is cut on four sides of a cube, each side of which is divided into three columns, each column embracing a month. The various agricultural operations to be performed in each month are given on this curious relic, in addition to the ordinary information contained in these calendars. In the month of May, for example, the rustic is told that his corn must be weeded, his sheep shorn, his wool washed, &c.

2. *Fasti Annales* or *Historici*, were chronicles, containing the names of the consuls and other magistrates of the year, and an enumeration of the most remarkable events in the history of Rome, noted down opposite the days on which they occurred. From its application to these chronicles, the word *fasti* came to be used by the poets as synonymous with historical records. A very interesting specimen of *fasti* of this class was discovered in the forum at Rome in 1547. The fragments into which it had been broken were collected and arranged by the Cardinal Alexander Farnese, and placed in the Capitol, where they may still be seen, together with some additional portions which were discovered in 1817 and 1818. See Smith's *Dictionary of Greek and Roman Antiquities*, voce 'Fasti,' and also the article on 'Calendar' (Roman) in the same work.

FAT LUTE is the term applied to a composition of linseed oil and pipeclay. See LUTE.

FA'TA MORGA'NA is a striking kind of mirage observed in the Strait of Messina. A spectator on the shore sees images of men, houses, ships, &c., sometimes in the water, sometimes in the air, the same object having frequently two images, one inverted. See MIRAGE.

FATE, FATALISM, express a conception which has more or less prevailed in all religions. The words are derived from the Latin *Fatum*, which has primarily a passive signification, denoting something uttered—a decree or ordinance. The Greeks expressed the same thought by *Eimarmene*. *Moiræ*, again, was the active personification of the idea—the goddess Fate or Destiny.

It represented, in the Greek mythology, the final monotheistic element—the vague Unity binding together and dominating over the crowd of Olympian deities. In Homer, *Moirā* has a double meaning, appearing sometimes as superior to the will of Zeus, and sometimes as inferior to this will. With the course of Grecian thought, the conception of Fate became more spiritualized. In Æschylus it is an inexorable Destiny; in Sophocles and Plato, it is more of a free and ordering Will. In the latter forms of Greco-Roman speculation, again it undergoes various modifications. With the Epicureans, it seems identical with Chance (*Tuche*); with the Stoics, it is the very opposite of this. In the one case, the Absolute is a mere blind fatality; in the other case, it is an imminent necessity of reason, governing with iron sway the apparently accidental phenomena of life.

In the two great religions of modern times, Christianity and Mohammedanism, the same conception is found in various forms. In the latter, the Highest is conceived as an arbitrary and inexorable law, swallowing up every lower law of activity, and permitting no scope to freedom of development in human nature. In Christianity and the modern speculation which it has colored, it shows itself less broadly in the well-worn doctrines of Predestination and of Philosophical Necessity.

In the Predestination theory of Augustine, Calvin, and many others, the old fatalistic doctrine is repudiated; the recognition of a free determining element in the Divine Will, separates their idea of it altogether from that of a mere blind Destiny; but the influence of the mode of thought out of which the old idea sprung, appears in the manner in which the divine decrees are sometimes spoken of as inexorably overbearing human freedom. In the doctrine of philosophical necessity promulgated by Leibnitz, Edwards, and in a somewhat different form by Modern Positivism, the same idea emerges under the name of inevitable sequence—of an invariable connection linking together all phenomena material and mental. An immutable law is declared to pervade and harmonize all existence. This is a much higher conception, but it is not difficult to see how easily it may pass into the old pagan doctrine of Fate.

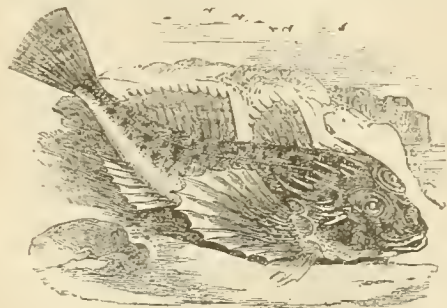
The doctrines of Predestination and of Philosophical Necessity have been supposed mutually to support each other; in reality, however, they are very different doctrines. The one starts from the dominating conception of the divine Will as overruling all things, and approaches fatalism by ascribing in certain cases such an absorbing energy to this Will as to leave no power of free action to any other will. It conceives of everything as swallowed up in the single omnipotence of the Divine. It is *Pantheistic*. The other starts from the dominating conception of law in nature, and approaches fatalism by investing this law with an immutable and self-subsistent character. It looks at all existence as a mere undeviating routine of development, and tends in exact opposition to the other doctrine, to shut out the Divine behind the screen of the Natural. It is *Atheistic*. It is, of course, merely the tendency of the respective speculations that is thus characterized.

The conception of Fate springs irresistibly from man's consciousness of the transcending greatness of what is outside and above his own feeble existence—of the objective power that encloses and moulds his own subjective activity. As such, it will never wholly disappear from human speculation, however endlessly modified it may be.

FATES. See PARCÆ.

FATHER. See PARENT AND CHILD, FAMILY, PATRIA POTESTAS.

FATHER-LASHER (*Cottus bubalis*), a very common fish on the British coasts, the most spiny of the British species of *Cottus*



Father-Lasher (*Cottus bubalis*).

(q. v.), and particularly armed with strong spines on the back of the head—which is large—and on the gill-covers. When touched, it distends its gill-covers, sets out its spines, and assumes a very threatening appearance. Its general aspect is indeed forbidding,

and even the little boys who angle from the rocks and pier-heads are usually averse to touch it, although it is said to be wholesome and agreeable food. It is of a brown color above, whitish beneath, curiously marbled and spotted, the fins marbled black and white. In Scotland, it bears the name of *Lucky Proach*.

FATHERS OF THE CHURCH (*Patres Ecclesiastici*), certain early writers of the Christian Church. The term *Abba*, Græcised *ἀββας* (Father), in use among the Talmudists as a synonym of Rabbi (my master), and constituting, according to Maimonides, the third or lowest honorary title of a Doctor of the Divine Law, was in the first centuries of Christianity applied indiscriminately to all theological writers who were distinguished by their learning, genius, or piety. Gradually, however, the word Father, or, more fully, Father of the Church, was confined to those teachers whose writings were considered pre-eminently orthodox, and who might be looked upon as the *progenitors*, as it were, of certain dogmas, upon the development of which they had exercised a more or less direct influence; while those writers who diverged into the fields of heretical opinion were called simply *Scriptores Ecclesiastici* (Church-writers). Out of the number of the former, some few master-minds, to whom the church owed still greater tribute, were again singled out as *Doctores Ecclesie* (Doctors of the Church), which title of pre-eminence, however, is bestowed on many writers who lived subsequently to the time of the Fathers, in consideration of their 'purer and more excellent doctrine' (Benedict, xiv., *Bulla. Milit. Eccles.*).

The temporal limits within which the Fathers are to be confined, as well as their proper share of authority in matters of faith, have long been points of grave discussion. While some include the Fathers of the 1st c., generally called the Apostolical Fathers, on account of their being the contemporaries or disciples of Christ and the apostles, they are excluded by others; again, by some, the 7th c. is made the closing period, while others carry the list down to the 12th, or even the 13th century.

With respect to the authority of the Fathers, some, like Fredregis, held their words to be as sacred as those of the prophets and sacred writers; while others, like Alphonso di Castro, Melellus Cano, and Cardinal Cajetan, ridiculed the notion that Symmachus should be made equal to St. Paul, or Didymus to St. John the Evangelist. Others, again, like Pope Gregory and the majority of writers, took the middle course of regarding them not as infallible, much less as prophets and apostles, but held, that when in matters of faith the most perfect and unswerving unanimity reigns among them, then only the Holy Ghost is to be considered to speak through them. See RULE OF FAITH INFALLIBILITY.

Immense as is the range and variety of their writings, ascetic, apologetic, polemical, exegetical, moral, historical, or dogmatical, so also is the diversity of their individual value. Nothing can be further from historical justice than either the wholesale laudation or condemnation of these writers as a body; but whatever stand we may take, we cannot but see that they are of the utmost moment. Stretching as they do over the entire extent of that period which forms the turning-point between the antique and modern world, they faithfully and often unconsciously portray that awful change, of which they were in no small degree the instruments—the gradual wane of old faiths, and of an old civilization, and the slow and struggling rise of that which was to replace them; while they preserve the most minute and trifling details with the same accuracy as the most momentous event, as each happened to bear upon their subject.

The philosopher, the historian, the antiquary, each and all will find their writings, as a whole, to contain an inexhaustible fund of instruction. Of no less interest, perhaps, are their works in relation to the writers individually. These, issuing from all parts of the then known world, from all ranks, all creeds, could not but impress the stamp of their nationality and callings, besides that of their youth or age, vigor or feebleness, upon their writing—Jew, Greek, Roman, African, Spaniard—orator, poet, lawyer, statesman, priest, they all bring with them that which was their own before they embraced the new faith: their dialectic power, their fantastic poetry, their graceful speech, their stern austerity. What Greek subtlety did theoretically for the development of dogma in Origen and Athanasius, that Roman thoroughness did practically for the erection of the hierarchy in Leo the Great and Gregory III.; while from Egypt came asceticism and monachism, the ascendancy of spiritualism over sensualism is owing to those who came from the northern coast of Africa. How far Platonism, and especially neo-Platonism, Aristotle and Greek philosophy generally, are found developed in these works, and infused into the new faith by the former teachers of the academies themselves, who mostly retained their old philosophical garb, upon this, as well as upon many other points, we must forbear to enlarge.

We will now proceed to take a brief survey of these writers—referring for further information to the special articles on the more eminent among them. According to the now generally

adopted method of dating them from the 1st to the 7th c., they are divided into two distinct periods, the first of which goes down to the Council of Nicaea, 325 A.D. Of those who head the list, the Apostolic Fathers—so called from their supposed connection with Christ and the apostles—very little need be said, as their writings, which are mostly of an ascetical character, have come down to us in a corrupt and mutilated state, and as the writers themselves owe their chief celebrity to the times in which they happened to live. We have here Barnabas, the son of Teostes, and the companion of St. Paul (Acts ix. 27; xii. 25); Clement, supposed to have been the third Bishop of Rome; and the Clement mentioned by St. Paul (Philipp, iv. 3); Hermas, identical perhaps with the Hermas of St. Paul's Epistle to the Romans (xvi. 14); Ignatius, Bishop of Antioch; Polycarp, Bishop of Smyrna; Papias; Dionysius the Areopagite, &c. Next follow the Apologists, or those Fathers whose chief aim was the defence of the new faith against the Roman state, and non-Christian authors, and who were the first to make their scientific culture, and more especially the Platonic philosophy, subservient to Christianity, for this purpose: Quadratus the 'Evangelist,' a traveling missionary; Aristides, an Athenian philosopher; Justin Martyr, the well-known author of the two Apologies and the Dialogue with Trypho (or rather Tarphon); Tatian of Assyria, who, having examined the different forms of worship, as well as the systems of philosophy prevalent in his time, felt satisfied with none but Christianity, and became a disciple of Justin, and a vindicator of the philosophy of the barbarians; Athenagoras, who addressed his Apology to the Emperor Marcus Aurelius, and his son Commodus, and wrote a Defence of the Doctrine of the Resurrection; Theophilus, Bishop of Antioch; Miltiades, &c.

Next come the Church Fathers of Asia Minor, men of more practical and more peaceful tendencies: Hegesippus, perhaps an Ebionite; Irenæus, Bishop of Lyon and Vienne, who wrote a refutation of the Gnostic system; Hippolytus, his disciple, of unknown birthplace and renowned name. In the North African Church, the development, inasmuch as its language, dogmas, and laws were adapted by the greater part of the Christian world in the West, we find Tertullian of Carthage, the rhetorician and advocate, a man of profound mind and vast influence; Cyprian, the author of the *Testimonies* in favor of Christ; Commodian, the writer of the *Rules of Living*; and Arnobius, a rhetorician of Sica, in Numidia. The first comparatively barren, though otherwise highly important church, is the Roman. The pre-eminently practical Roman mind looked more to the outward growth and well-being of the church than to literary excellence, and thus we have only two distinguished authors to be noticed here—the Presbyter Caius, known as the opponent of the Montanists; and the Presbyter Novatian, who wrote a treatise on the Jewish laws respecting food. The church which, more than any other, endeavored to combine speculation with faith, and which gradually became, through its high degree of culture and erudition, and very center of Christianity, is the Alexandrian. And here we have Pantænus; Clement the Alexandrine, chiefly known by his *Stromata* or *Elements of the Gnosis*; Origen, called Adamantinus, the eminent Neo-Platonist, born 185 A.D., in Alexandria, one of the most influential writers of the whole Christian Church; Heracles, with his disciple Dionysius, a liberal and moderate man; Gregory, the worker of miracles; Pamphilus and Julius Africanus, the first Christian chorographer.

In the second period, which dates from the Nicæan Council, and comes down to Gregory II., 604 A.D., a period altogether superior, on account of the great number of intellectual and erudite men who devoted their lives and labors to the church, we have to distinguish the Greek from the Latin Fathers. Among the former, we have again to draw a line between those of the Alexandrine school—like Eusebius Pamphili, the Herodotus of the church; Athanasius, the father of orthodoxy; Basil the Great, Doctor Ecclesiæ, and his brother Gregory of Nyssa; Gregory of Nazianzen, called the Theologian, by way of eminence; Didymus; and Cyrillus, some time Patriarch of Alexandria, the chief prosecutor of Nestorius—and those of the Antiochian school, where we find Ephraem Syrus, 'the prophet of the Syrians,' Cyril of Jerusalem, the converted Arian; John Chrysostom, of brilliant eloquence; Diodorus, Bishop of Tarsus, one of the chief founders of the Antiochian school; and Theodoretus, Bishop of Cyrus. Besides these, we find, of Greek Fathers who belonged to neither school—Epiphanius, the violent adversary of Origen; Socrates Scholasticus, the continuator of Eusebius's *Ecclesiastical History*; Philostorgius, an Arian Church historian; Logomenus; Evagrius; Macarius the Elder, chiefly known through his miracles and combats with the devil; Procopius of Gaza, the rhetorician; and Joannes Scholasticus, famous through his collections of canonical law.

Among the Latins, we have to enumerate first the African Fathers: Fabius Victorinus; Augustine of Tagaste in Numidia, the greatest dogmatist of the Western Church; Pope Gelasius I. (492—496), who finally fixed the canon of the Bible for the Roman Church; and the Bishops Fulgentius, Junilius, and Faundus. Of

Spaniards, we have Prudentius the poet; Paulus Orosius, whom Augustine used as his messenger to the East in his controversies with Pelagius. Of Gauls there are Hilarius Pietaviensis, Bishop of Poitiers about 350, the Athanasius of the West; Paulinus of Nola; Sulpitius Severus, friend of Martin of Tours; Vincent of Lerius, once a soldier, who wrote under the name of Peregrinus; Sidonius Apollinaris, Bishop of Clermont; Gennadius, the author of an ecclesiastical literary history; Emodius from Arles, who exerted himself to unite the Eastern and the Western Church; and Gregorius Turonensis, who wrote *Historia Ecclesiastica Francorum*, the basis of Frankish history. From other countries we have Sedulius, an Irishman; Joannes Cassianus, a Scythian; and Mercator, of unknown birthplace. We conclude with the Italians themselves: Lactantius Firmianus, the Christian Cicero; Julius Firmianus Maternus of Sicily; Ambrose, Metropolit of Milan, who raised his see to such a power that it dared to resist Rome herself up to the 12th century; Rufinus of Aquileia, defender of Origen against the charge of heresy brought against him in the West; Eusebius Hieronymus, undoubtedly the most learned of all the Latin Fathers, and who mastered also the Greek and Hebrew languages, collected in Palastine the most valuable notes for the elucidation of the Scriptures, and also corrected the Latin edition of the Vulgate; Pope Leo I.; Boëthius; Aurelius Cassiodorus, whose *Historia Tripartita*, in twelve books, served for a thousand years as a compendium of ecclesiastical history; the two poets, Arator and Venantius Fortunatus; and Pope Gregory I. (590—604), is regarded by Protestants as having first given the Western Church its peculiarly Roman Catholic stamp by developing the idea of the Eucharist into a Theophany, and making it the center of the worship. His works, especially his letters, are invaluable for the study of his own times, especially for the history of the conversion of the West.

On the MSS. of the Fathers, we refer to *Petri Lambecii Commentarii de Bibliotheca Casarea Vindobonensi*. The editions of the works of the Fathers are of two classes—those of the individual Fathers, whose writings are the most voluminous and of highest dogmatical importance, and the general Patristic collections, which comprise the writings of the less voluminous or minor Fathers. In the former class, the first place, beyond all dispute, belongs to the celebrated Benedictine editions, by the members of the great Maurist congregation of the French Benedictine order (see BENE-DICTINES), of which community the task of editing the Fathers came to be considered as the recognized work. The Benedictine editions of the greater Fathers, with the exception of two or three, still maintain the very highest place in the estimation of the learned. Of the collections of the works of the Fathers, the most important are those of La Bigne, Galland, Rössler, Walch, Zimmermann, and Migne. Reference may also be made to Cardinal Mai's *Bibliotheca Patrum*, *Spicilegium Romanum*, and *Classici Auctores*, and to the *Spicilegium Solesmense* of the Benedictines of Solesme. Translations of the principal Fathers are numerous. The chief works upon the more important Fathers are noted under their several names.

FATHOM, a measure of six feet, principally used in reference to marine soundings, and in mines. Originally a fathom was taken as the width to which the two outstretched arms extended.

FATIMIDES, or FATIMITES, the name of an Arabian dynasty which reigned for nearly two centuries over Egypt. Its founder was Mahadi-Obaidallah, who flourished from 910 to 934 A.D. He asserted that he was descended from Fatima, the daughter of the Prophet, and Ismael, a grandson of Ali. He thus won over to his side all the adherents of the widely diffused Ismaelites, an extravagantly schismatic sect of Mohammedans in Africa, and overthrew the race of the Aghlabides, who ruled at Tunis. His successor extended his dominion as far as Fez, and his descendant, Moëzz, in the year 970, conquered Egypt, expelled the reigning family, removed his court thither, founded Cairo, assumed the title of Calif, thus proclaiming himself the lawful successor of the Prophet, and subdued Syria and Palestine. After the death of Moëzz, the F. maintained their high position for some time; but gradually degenerated, and resigned all the cares of government into the hands of their viziers. Their power now rapidly declined, and their vast territories melted away. In religious matters, the F., because they were raised to power by the followers of Ali, took upon themselves the protection of the Shiïte sect and the establishment of the Ismaelitic doctrines. Between the years 1002—1021, the Calif Hakem-Biamr-Allah persecuted the orthodox Mohammedans or Sunnites, as well as Jews and Christians. He founded an academy at Cairo, and endowed it largely, but connected with it a secret society for the diffusion of Ismaelitic opinions. In the first stages, the novice was shown the untenable nature of the precepts of the Koran; in the sixth, the advanced student found that religious legislation must give way to the claims of philosophy; in the seventh, a mystic pantheism was proved to be the true philosophy; and finally, in the ninth, the initiated dis-

covered that he was not required to believe anything, and might do whatever he pleased. His system, with considerable modifications, found a home among that peculiar people the Druses (q. v.). After the death of Adhid, the last of the F., in 1171, the founder of the dynasty of the Ayubides, Salâh-ed-din (Saladin), took possession of Egypt.

FATS are those oily substances which are solid at ordinary temperature. They do not differ essentially from the liquid oils. See **OILS**.

FATS, ANIMAL. There is considerable difference of opinion amongst chemists regarding the exact nature of the fats occurring in the animal body. According to most chemists, they are composed of an admixture of three separate fats—margarine, stearine, and oleine, of which the two former are solid, and the latter fluid, at ordinary temperatures. Heintz, who has carefully studied these bodies, declares, however, that margarine is not a simple fat, but a mixture of stearine and palmitine (a solid fat occurring in palm-oil); and he considers human fat to be a mixture of stearine, palmitine, and oleine. For the chemical characters of these substances, we refer to the articles **MARGARINE**, **OLEINE**, **PALMITINE**, and **STEARIC ACID**, and we proceed to the consideration of the physiological relations of the fat.

Fat, usually enclosed in vesicles, is found very extensively in the animal kingdom. It is abundant in many larvae, and occurs more scantily in most insects. It is met with in the mollusca, and is comparatively abundant in all the divisions of the vertebrata. In most fish, it occurs throughout the body, but is especially abundant in the liver, where it is found in the hepatic cells, and not in its own characteristic vesicles. In reptiles, it exists chiefly in the abdomen. In birds, we especially find it about the peritoneum, and under the skin. In mammals, it is very generally diffused, but the greatest quantity is under the skin, in the omentum, and round the kidneys.

The quantity of fat in the human body varies considerably at different periods of life. In the earlier stages of foetal existence, we find scarcely any fat; in new-born children, there is usually a considerable quantity of this substance deposited under the skin, and the organism continues rich in fat till the age of puberty, when a marked diminution of the substance occurs. It again increases about middle life, and then occasionally occurs in great excess; for example, three or four inches of fat are not unfrequently found under the skin of the abdomen in corpulent persons.

Extraordinary deposits of fat in some particular part of the body are observed in certain races of men and animals. One of the most remarkable examples of this peculiarity is afforded by the Hottentot women, in whom the fat accumulates in the gluteal region to such an extent as to give a most remarkable prominence to that part of the body; and a somewhat analogous deposit exists in a variety of sheep (*Ovis steatopyga*, the fat-buttocked sheep), in which a large mass of fat, sometimes attaining a weight of forty pounds, is developed on the buttocks, and takes the place of a tail.

The origin of the fat in the animal body must undoubtedly be chiefly referred to the fat taken with the food. It has, however, been proved by the most careful investigations on various animals submitted to the process of fattening, on bees fed with cane-sugar, or with honey containing scarcely any wax, and on the larvae of the insects inhabiting galls, that the animal, like the vegetable organism, has the power of forming or producing fat, far more fat being found, in these experiments, in the body of the animal, than could be referred to the fat taken in the food. The excess must therefore have been formed either from the non-nitrogenous portion of the food, such as starch and sugar; or from the nitrogenous matters, such as fibrin, albumen, &c. In the case of the bees, it was distinctly proved that the fat was formed from sugar; while in the case of the larvae of the gall-insect, it was similarly shown that it was produced from the starch which forms the interior of the gall in which the animal lives; and as we have no corresponding evidence of the convertibility of fibrin, albumen, &c., into fat (although such a conversion is by no means improbable), we must for the present regard the non-nitrogenous foods as the chief fat-formers next to fat itself.

The physiological value of the fats is due partly to their physical, and partly to their chemical characters.

The uses of the fat deposited beneath the skin are, first, to protect the body from external shocks by a uniform diffusion of pressure through the whole adipose tissue; and, second, to keep up the heat of the body, by materially checking, through its very slight conducting power, the loss of free heat by radiation. This use of the fat is most clearly seen in some of the lower animals (the seal, whale, &c.), which are exposed to very low temperatures.

Another physical use of fat is to promote the mobility of various organs. Hence, in cases of extreme emaciation, it always remains

in the parts where motion is most essential, as the heart, and the orbit of the eye.

Another of its important physical properties is that of rendering other bodies supple, and diminishing their brittleness. In this point of view, the use of fat is very conspicuous in the bones.

The chief chemical use of the fat is its power of exciting and supporting the animal heat. In the oxidation of the fats in the animal organism, whether the process be gradual or rapid, a large amount of heat must necessarily be liberated; and that they are oxidized, and for the most part reduced to carbonic acid and water, is evident, because they neither appear in any quantity in the excretions, nor, as a general rule, accumulate beyond a certain point in the organism. An accumulation of fat thus serves as a reservoir of combustible matter in time of need. This is especially evident in the case of hibernating mammals, as, for example, hedgehogs, in which an enormous quantity is deposited just before the hibernating period: during this period it gradually disappears, its carbon being slowly consumed in the respiratory process, and keeping up the animal heat.

Fat is, moreover, one of the most active agents in the metamorphosis of animal matter. Lehmann ascertained that a certain, although a small quantity of fat was indispensable to the complete gastric digestion of nitrogenous food, a fact which is confirmed by the observation that in experiments on artificial digestion, the solution of substances used as food is considerably accelerated by the presence of a little fat. The occurrence of fat in the milk and in the egg, as also in all highly cellular organs (as, for example, the liver), is a clear indication that this substance plays an important part in the process of cell-formation; and no animal cell or cell-yielding plasma has ever been observed in which fat is not a constituent.

An undue accumulation or increased growth of the fatty tissue gives rise to the condition known as Obesity (q. v.).

FATTY ACIDS. See **OILS**.

FATUITY, or **DEMENTIA**, consists in the impairment or extinction of certain mental powers, or of all. Esquirol has quaintly but descriptively said that the idiot and imbecile are poor who have never been rich, but that the fatuous or demented are rich who have been made poor. This impoverishment is sometimes so extreme, and the sufferer is so little influenced by consciousness as to lose a knowledge of his own existence; and so little by impressions through the external senses, and by the instincts of the sensory ganglia, as to be equally ignorant of the existence of others. Life is vegetative merely. This deprivation may be partial or complete. It may appear as a weakening of sensibility. This is not the tolerance of powerful or painful impressions, or indifference to such, springing from abstraction or engrossment of the attention, but positive extinction of perception; or it may present the more common form of enfeeblement of intelligence, of memory; of the will, where the patient is apathetic, passive, plastic. The disease may involve the affections and the moral sense, and abrogate the power of decision, and all spontaneity of action and thought. Incoherence in ideas and words may be made to constitute another form, although generally regarded as a characteristic; whether it amounts merely to forgetfulness, or to confusion or irrationality, to inconsequence and inability to express instincts and wishes. Delusions and hallucinations may co-exist with these conditions, but, like the real impressions received by this class of the insane, they are feeble, fugacious, and unimportant. Under all these aspects, the essential element is privation of power; and this is met with as a specific mental disease, arising from obvious causes, unassociated with general alienation, acute in its nature, and rapid in its progress. It is most frequently the disease of youth, of the period of puberty, contemporaneous with growth, with debilitating and exhaustive processes, and depending, in all probability, as in the other forms, upon insufficient nutrition of the brain. At this age, the injury is reparable, and what may be designated juvenile dementia, has the rare distinction of being curable. More frequently, it is the sequel of mania, melancholia, and severe affections of the nervous system. The deterioration here arises from actual changes in the nervous structure, which render healthy nutrition impossible; so that, although mitigation, and sometimes to a marvelous extent, is within reach of treatment, recovery is believed to be impracticable. Again, it is an affection of old age; and although senile dementia may seem but an exaggerated state of dotage, it is accompanied by such marked physical changes, as to leave no doubt that it originates in circumstances differing widely from that gradual degeneration of the tissues which is evidenced by the 'second childishness and mere oblivion.' Lastly, this state may follow fever, when it is transitory, and generally of brief duration.

Fatuity is one of the few morbid mental conditions recognized in our legal code, even by name, as relieving from the consequences of criminal acts, and as disqualifying for administration

and disposal of property. Esquirol, *Des Malad. Ment.*, tom. ii. p. 219.

FAUCHER, LEON, a French publicist and statesman, was born at Limoges, 8th September 1803; studied at first philology and archaeology, in which branches of knowledge he acquired some reputation; but about the period of the July revolution (1830), betook himself, with genuine enthusiasm, to journalism and political economy. He became successively editor of the *Temps*, the *Constitutionnel*, and the *Courrier Français*. These functions occupied him from 1830 to 1842, during which period he published many articles on questions of political economy. In 1843, he began to write for the *Revue des Deux Mondes* a series of articles on the industrial condition of England. The whole were collected into two volumes, which appeared in 1845, under the title of *Etudes sur l'Angleterre*, and constitute the most weighty and substantial of all his productions, though Englishmen reckon the author greatly in error in many points. At the general elections of 1846, he was elected for the manufacturing city of Rheims, where his opinions on tariffs were highly appreciated. In the Chamber of Deputies, he voted with the dynastic opposition. A ready but by no means brilliant speaker, he came forward as one of the leading advocates of free-trade, and published in the *Siccle*, and in the *Revue des Deux Mondes*, a number of essays on national economy, characterized by their vigorous and spirited argumentation. After the revolution of 1848, he sat both in the Constituent and Legislative Assemblies for the department of Maine. When Louis Napoleon was chosen president, F. became first Minister of Public Works, and subsequently Minister of the Interior; but when the President proposed to appeal to universal suffrage, F. gave in his resignation, and, after the *coup d'état*, he withdrew from political life. F. died 14th December 1851. A large number of his most valuable contributions to the science or politics will be found in the collection of the *Economistes et Publicistes Contemporains*, and in the *Bibliothèque des Sciences Morales et Politiques*.

FAULT, the term in Mining and Geology for any interruption in the continuity of the strata coupled with the displacement of the beds on either side of the line of fracture. See **DISLOCATION**.

FAUN. Faunus was a mythical personage, an ancient king of Italy, who instructed his subjects in agriculture and the management of flocks, and was afterwards worshiped as the god of fields and of shepherds. The festival of the *Faunalia*, held on the 5th December, referred to the protection he exercised over agriculture and cattle. Fauna was his female complement. He was also worshiped as a prophetic divinity. As deity of the woods and of flocks and herds, he corresponds to the Greek Pan; the idea also arose of a plurality of Fauni or Fauns, like the Greek Satyrs, who were represented as monstrous deities with short horns, pointed ears, tails, and goats' feet, and to whom all terrifying sounds and appearances were ascribed.

FAUNA, a term employed to designate animals collectively, or those of a particular country, or of a particular geological period. Thus, we speak of the fauna of Great Britain, the recent fauna, the fossil fauna, the fauna of the Eocene period or formation, &c. The term bears the same relation to the animal kingdom that *Flora* does to the vegetable. Its derivation is from the mythological fauns, regarded as the patrons of wild animals. In the fauna of any country are included only those animals which are indigenous to it, and not those which have been introduced.

FAURIEL, CLAUDE CHARLES, a French philologist, historian, and critic, was born at St. Etienne, in the department of Loire, 21st October 1772, studied at the College des Oratoriens at Tournon, and afterwards at Lyon, and in 1799 was appointed to a situation under Fouché; but, destitute of all political ambition or predilections, and passionately fond of learned studies, F. resigned his office in 1802, and devoted himself to the calmer pursuits of literature. He made himself familiar with Sanscrit, Arabic, and the treasures of classical antiquity and of the middle ages; and although he did not write much, comparatively speaking, yet the value of what he did write cannot easily be over-estimated. M. Renan may exaggerate when he affirms that F. 'put in circulation the greatest number of ideas' of any contemporary writer; but even the Germans allow that in many points of literary history, criticism, and philology, F. was twenty years in advance of his age. After the July Revolution, he was appointed a professor at the Sorbonne; in 1836, he published his chief work, *Histoire de la Gaule Méridionale sous la Domination des Conquêteurs Germains* (4 vols., Paris), which is reckoned one of the best specimens of historical investigation and art produced in modern times. Worthy of notice, also, particularly on account of its remarkable historical introduction, is his edition of the Provençal rhymed chronicle, entitled *Histoire de la Croisade contre les Hérétiques Albigeois* (Paris, 1837). F. also contributed several important essays to the literary journals of France, of which, perhaps, the best known was that on the origin of the Epic of Chivalry in the middle ages. He died at Paris, 15th July 1844. Two years after his death appeared

a collection of his professorial lectures, under the title of *Histoire de la Poésie Provençale* (3 vols., Paris, 1846), in which F. endeavors, with great erudition and originality of criticism, to show that to the Provençals must be attributed the composition and primitive development of the greater portion of the romances of chivalry, including those which describe the contests of the Christians and Moors in Spain, and those which form the Charlemagne cycle, thus finding the origin of the old Spanish and German poetry on the soil of France. F.'s views have, however, met with considerable opposition.

FAUSSE-BRAYE, in Fortification, a low rampart encircling the body of a place, and raised about three feet above the level ground. This work has mostly been discarded by modern engineers, except when used in front of curtains, under the name of *Tenaïles* (q. v.). The French engineers gave this title to the work, as an adaptation from the Italian term *Fossa Brea*, which had its origin from the *fausse-braye* being commonly in the ditch, in front of the main wall. The *fausse-braye* had the advantage of giving an additional tier of guns for defensive purposes; but the still greater disadvantage of affording facilities for the scaling of the parapet.

FAUSSE RIVIÈRE (in English, *False River*) is a lake of Louisiana, United States, which deserves notice chiefly as an index of the physical character of the country. Till about a century and a half ago, it was a channel of the Mississippi—a fact which probably is still expressed in its name. Here, as in other alluvial formations, the beds of the running waters are undergoing incessant changes.

FAUST, or FUST, JOHANN, the chief promoter of the invention of printing, a rich citizen of Mayence, died in the year 1450. See **GUTENBERG**.

FAUST, DR., according to tradition, a celebrated dealer in the black art, frequently confounded with the preceding, was born at Knittlingen, in Würtemberg, or, as some say, at Roda near Weimar. He flourished during the latter half of the 15th and the beginning of the 16th centuries, and is said to have studied magic at Cracow. After having spent a rich inheritance left him by his uncle, F. is alleged to have made use of his 'power' to raise or conjure up the devil, with whom he entered into a contract for twenty-four years, obtaining during that time his fill of earthly pleasure, but at its termination surrendering body and soul into the hands of the Great Enemy. The devil gave him an attendant spirit or demon, called Mephistopheles, though other names are given him by the later traditionists, with whom he traveled about, enjoying life in all its forms, and astonishing people by working wonders, till he was finally carried off by the Evil One, who appeared in terrible guise, between twelve and one o'clock at night, at the village of Rimlich, near Wittenberg, though several other places lay claim to that very questionable honor. Some have doubted, considering the monstrously mythical from in which his career has come down to us, whether such an individual as F. ever existed, but it is now generally believed that there was a basis of fact, on which tradition has built its grotesque superstructure. Gorres, indeed, asserts that one George Sabellicus, who disappeared about the year 1517, is the real F.; but Philip Melancthon—the man of all the reformers whose word in regard to a matter of fact would most readily be trusted—says that he had himself conversed with Dr. Faustus. Conrad Gesner (1561) is equally positive; and Luther, in his *Table Talk*, speaks of Dr. F. as a man lost beyond all hope. The opinion that prevails, and which is reckoned to be intrinsically the more probable, is that some man of this name, possessed of varied knowledge, may possibly have practised jugglery (for the wandering savans of the middle ages had all a touch of the quack about them), and thus have been taken by the ignorant people for a dealer in the black art, and one who maintained a secret and intimate relation with evil spirits. His widely diffused celebrity not only occasioned the wonders worked by other so-called necromancers of an earlier age—Alberus Magnus, Simon Magus, and Paracelsus—to be attributed to him, but likewise many ancient tales and legends of a marvelous character were gradually transferred to him, till he finally appears as the very hero of magicians. But while, on the one hand, the narrative of F.'s marvels afforded amusement to the people, on the other, they were made use of for instruction by the clergy, who pointed out, in the frightful fate of F., the danger of tampering with the 'black art,' and the abominableness of a life sunk in sensuality and vice. The myth of F. has received a manifold literary treatment. First come the *Volksbücher* (or people's books), which record F.'s enterprises and feats. The oldest of these now known appeared at Frankfort in 1588. Then came an 'improved' edition of the same, by Widmann, entitled *Wahrhaftige Historien von denen gräulichen Sünden Dr. Joh. F.'s* (True History of the Horrible Crimes of Dr. John F., Hamb. 3 vols., 1599); and in 1695, a work was published at Nürnberg by Pfizer, based upon that of Widmann. The oldest of these books was translated into all the civilized languages of Europe.

Impostors also published books of magic under the name of F., such as *Faust's grosser und gewaltiger Höllenzwang* (Faust's Great and Potent Book of Spells), *Fausten's Mirakulkunst* (Faust's Art of Performing Miracles), and *Dreifache Höllenzwang* (The Threefold Book of Spells). These wretched productions are filled throughout with meaningless scrawls and figures, interspersed with texts from the Bible scandalously misapplied; but in the belief of the vulgar, they were supposed capable, when properly understood, of accomplishing prodigies. That the poetical art should in due time have seized on a subject affording so much material for the fancy to work upon, was inevitable; and consequently, German literature abounds in elegies, pantomimes, tragedies, and comedies on Faust. Since the end of the 17th c., the *Puppenspiel* (Puppet-show) of Dr. F. (first published at Leipzig in 1850) has been one of the most popular pieces in Germany. It forms the transition from the rude magic tales concerning F., to the later philosophic conception of the Faust-myth, which has become the most perfect poetical expression of the eternal strife between Good and Evil in the soul of man. The first writer who treated the story of F. dramatically was the English writer Christopher Marlowe, about the year 1600 (German translation by W. Müller, Berlin, 1818); but the grandest work on the subject is Goethe's *Faust*, the first part of which appeared under the title of *Dr. F. ein Trauerspiel* (Leip. 1790), and afterwards in a remodelled form, under the title of *F., eine Tragödie* (Tübingen 1803). The second part was published after the author's death, at Stuttgart in 1833. Besides Goethe's drama, may be mentioned Lessing's masterly fragment, *F. und die Sieben Geister* (F. and the Seven Spirits), G. F. L. Müller's *Dr. F.'s Leben* (Dr. F.'s Life, Manh. 1778), and Klüger's *F.'s Leben, Thaten, und Höllenfahrt* (F.'s Life, Doings, and Descent into Hell; Petersb. and Leip. 1791). The plastic art has also found a fit subject in Faust. In Auerbach's cellar at Leipzig, where F. is said to have performed many of his feats, are two rude daubs of the year 1525, representing F. and Mephistopheles riding out of the cellar on a wine-barrel. Rembrandt and Christoph von Sichem have also illustrated the story of F., and in modern times, Cornelius and Retzsch have done the same. See Peter's *Die Literatur der Faustsage* (3d ed. 1857); Engel's *Das Volksschauspiel Dr. F.* (1873).

FAUSTINA, mother and daughter. The former, *Annia Galeria*, usually spoken of as *Faustina Senior*, was the wife of the Roman emperor, Antoninus Pius, and died 141 A.D.; the latter, known as *Faustina Junior*, was married to his successor, Marcus Aurelius Antoninus, and died at a village near Mount Taurus in 175 A.D. Both, but particularly the younger, were notorious for the profligacy of the lives, which their exemplary husbands in vain endeavored to check. After their deaths, institutions for the relief of poor girls were founded both by Antoninus and Marcus Aurelius in honor of them, and were called '*puellæ alimentariæ Faustinae*.' Marcus Aurelius, in his meditations, speaks highly of his wife, and an attempt has been made by Wieland to defend her against the imputations of the historians of the emperors.

FAUSTINUS I., emperor of Haiti, known before his elevation to the throne, as Faustinus Soulouque, a negro originally of very humble circumstances, was born in St. Domingo in 1789. In his earlier years, he acted as servant, and afterwards as adjutant, to General Lamarre. He subsequently served under Presidents Petion and Boyer, and by the latter was raised to the rank of captain. After the year 1844, when the Haitian Republic—of which General Boyer was then president—was dissolved, a struggle for the supreme power ensued, in which F. played an important part. In 1847 he was appointed by the senate President of the Republic. On the 16th April 1848, a dreadful massacre of the mulattoes in Port-au-Prince took place at his instigation. This, and similar measures, struck terror into the hearts of his opponents. In August 1849, he had himself proclaimed Emperor of Haiti, a title which he enjoyed for about ten years; but a revolution having broken out in 1858, and a republic having been declared, F. was forced to abdicate, 15th Jan. 1859. He died 6th Aug. 1867.

FAVETTE, a French name, partially adopted in the English language, for some of the little song-birds of the family *Sylviada* or Warblers, having straight slender bills slightly compressed in front, the ridge of the upper mandible curving a little towards the tip, and the legs not long. They mostly belong to the genus *Curruca*, as the Blackcap, the Pettychaps or Garden Warbler, the Whitethroat, &c.; and to the genus *Salicaria*, as the Sedge Warbler, the Reed Warbler, &c. The Dartford Warbler (*Melospiza Provincialis*) is also called Fauvette. They are all very lively little birds, continually flitting about in pursuit of insects, mostly frequenting bushy places; and some of them, particularly those of the genus *Salicaria*, preferring watery situations where reeds abound.

FAVARA, a town of Sicily, in the south of the island, in the province of Girgenti, and four miles south-east of the

town of that name. It has rich sulphur-mines. Population in 1871, 15,233.

FAVART, CHARLES SIMON, a French dramatist, was born at Paris 13th November 1710, and first became known by his *La Chércheuse d'Esprit*, performed in 1741. In 1745, he married Madeemoiselle Duronceray, herself a dramatic writer of some note, and a singer of remarkable talent, and in the same year became director of the *Opéra Comique*. The fine taste and judgment of F. and his wife soon obtained for their theater a great reputation. It was they who made the first attempt to harmonize the costume of the actors and actresses with their impersonations, and to put a stop to the ridiculous practice of decking out soubrettes and country-girls in the attire of court-ladies. So powerful, however, was the opposition excited against them by the jealousy of the other theaters, that the *Opéra Comique* was closed in the first year of its existence. After some time spent with Maréchal de Saxe during his campaign in Flanders, F. and his wife returned to Paris, where the former continued to write operas. His wife died in 1772, and he 12th May 1793.

F.'s success as a writer was very great: he may be reckoned the father of the comic opera, and the happy successor of Le Sage, Piron, &c. The number of his pieces amounts to about 60, of which the most celebrated are *Comment l'Esprit vient aux Filles*, *Le Coq du Village*, *Bastien et Bastienne*, *Ninnette à la Cour*, *Les Trois Sultanes*, and *L'Anglais à Bordeaux*. His works have been published several times. An edition in ten volumes was published at Paris in 1810, under the title of *Théâtre de Monsieur et Madame Favart*. A very interesting book, entitled *Les Mémoires et la Correspondance de Favart*, giving delightful glimpses of the literary and theatrical world of the 18th c., was published at Paris in 1809 by his grandson.

FA'VERSHAM, a municipal borough and seaport in the north of Kent, on a navigable creek, opposite Sheppey Isle, 8 miles west-north-west of Canterbury. It chiefly consists of four streets in an irregular cross. It has a valuable oyster fishery, employing 200 to 300 persons. It sends much agricultural produce to London by hoys. The creek admits vessels of 150 tons. In the vicinity are some of the most important gunpowder factories in the kingdom. Pop. (1881) 8756. Under the name of Faversfield, it was a seat of the Saxon kings, where Athelstan, in 930, held a Witenagemôte. It has the remains of an abbey founded by King Stephen, where he and his queen, Matilda, are buried. St. Crispin is said to have been apprenticed to a shoemaker here. Near F. are some chalk caverns, with columns. In 1880, 13,047 vessels, of 637,447 tons entered and cleared the port.

FAVIGNA'NA, the chief of the *Ægades*, a group of islands in the Mediterranean, off the west coast of Sicily, lies at a distance of six miles from the Sicilian shore, and is about six miles long, with an average breadth of two miles. It has a town of the same name, with two castles, and a population of (1871) 4642. F. is fruitful, has good pasturage, and produces excellent wine.

FA'VOSITES, a genus of lamelliferous corals, found in Silurian, Devonian, and Carboniferous strata. They were social corals, closely packed together, no space being left between the walls of the different corallites. As in the other palæozoic corals, the lamellæ are developed in multiples of four, and the older portion of the stony base is partitioned off by horizontal tabulæ.

FAVORS, or MARRIAGE FAVORS, bows of white satin ribbons distributed at marriages in Great Britain, and usually pinned on the breast of all concerned, attendants and postilions included. The favors of those more immediately interested are sometimes enriched with orange blossoms. This is an old usage, connected with the love-knot of ancient northern nations; it forms almost the only remaining token of merriment in the nuptial ceremonial, and is, indeed, itself beginning to disappear.—See Brand's *Popular Antiquities*, edited by Ellis, article 'Bride Favors.'

FAVRE, JULES CLAUDE GABRIEL, a French advocate and minister, was born at Lyon, 21st March 1809. He was the son of a merchant, studied for the bar, and passed at Lyon in 1830. His political opinions were always intensely republican, and when pleading in the course of numerous political lawsuits, F. not unfrequently placed the state solicitors, and even the judges, in a very embarrassing position, by the boldness of his sentiments.

As the defender of the *Mutuellists* at Lyon in 1831, he was in danger of losing his life; this, however, did not prevent him from defending those who had been impeached in April, and commencing his speech with *Je suis Républicain*. From 1834, F. was a member of the Paris bar. In the February revolution of 1848, he was Home Secretary, in which capacity he wrote the notorious circular for which Ledru-Rollin's administration was so severely reproached, investing the commissioners of the republic with dictatorial authority in the provinces. He was active as a member of the Committee of Foreign Affairs. After the election of the

10th December, F. showed himself a persistent antagonist of Louis Napoleon, and after the flight of Ledru-Rollin, became the orator of the Mountain. The *coup d'état* closed his political career at this time. He refused to take the oath of fidelity to the imperial government, and betook himself again to his profession. In 1858, he defended Orsini, on his trial for a conspiracy to murder. In the same year, however, he became a member of the Legislature. In September 1870, after the downfall of the empire, he was appointed Minister of War, and carried on negotiations with Count Bismarck. He resigned office in July 1871, and resumed practice at the bar. F. was greatest in political repartee, and though long accustomed to public strife, his language was noted for its Attic elegance. He died 19th January 1880.

FAVUS (Lat. a honeycomb), a disease of the skin, chiefly of the hairy scalp, characterized by yellowish dry incrustations of more or less roundish form, and often cup-shaped, composed of the *Sporules* and *Mycelia* (q. v.) of a vegetable growth belonging to the order of *Fungi* (q. v.). The discs of favus are produced with great rapidity, and spread rapidly, if not attended to at the first, over the whole scalp, destroying the bulbs of the hair, which becomes very short and thin, and then falls out altogether. Favus is a disgusting and unsightly, but hardly a dangerous disorder; it is, beyond doubt, contagious, but only spreads where cleanliness is greatly neglected, and is therefore almost unknown among the better classes. It is far more common among children than among adults, and seems to be more frequent in Scotland than in England, and more frequent also on the continent than in either England or Scotland. The cure is sometimes attempted by a variety of medicated and simple ointments, and by pulling out the hair by the roots, or *epilation*, as it is called; but it seems hardly possible in inveterate cases to get rid of the disease without a very long persistence in habits of the most scrupulous cleanliness, and therefore the cure is seldom permanent, though easily attained for the time. Favus is almost always followed by permanent baldness of the parts affected; unlike Ringworm (q. v.), which is a minor disease of the same order.

The Favus fungus, *Achorion Schcenleinii*, is nearly allied to the fungus which has recently proved so destructive to vines, and has by some botanists been placed in the same genus, *Oidium*.

FAWKES, GUY (properly GUIDO), the head of the conspiracy known by the name of the Gunpowder Plot, was born of a Protestant family in Yorkshire, in the year 1570. He became a Roman Catholic at an early age, and served in the Spanish army in the Netherlands. Inspired with fanatical zeal for his new religion, on his return to England, he entered into a plot with sev-

Guido fawkes

Guido

Guy Fawkes's Signature before and after torture.

eral Catholic gentlemen for blowing up the king, his ministers, and the members of both houses at the opening of parliament, 5th November 1605. Guy F. was taken with the burning match in his hand, tried, and after having been put to the torture, was publicly executed January 31, 1606. In remembrance of this event, in most English towns, but particularly in London, a grotesque figure, stuffed with straw, is carried about the streets on the 5th of November, and finally committed to the flames. A political and religious signification was again imparted to this custom by what was called 'the papal aggression' in the year 1850, when the figure of Cardinal Wiseman (q. v.) was substituted for that of Guy Fawkes.

FA'Y, ANDRAS, a Hungarian author, was born in 1786, at Kóhany, in the county of Zemplén. After having studied philosophy and law at the Protestant college of Sárospatak, F. was called to the bar. He held a situation for some time in the county of Pesth, which, however, he afterwards relinquished, in order to be able to devote himself altogether to literary pursuits. After two volumes of poetry, appeared the collection of Fables (*Mesék*, Vien. 1820), and with the issue of that work F. obtained a decided reputation. The fables are like those of Phædrus and La Fontaine, but in prose. Richness of invention, simplicity of design, and truth of character, are the chief qualities for which the *Mesék* have become a household word among Hungarians. Among F.'s dramatic works may be mentioned the tragedy, *The Two Bathorys* (*A Két Báthory*, Pesth, 1827); the comedies, *Ancient Coins* (*Régi Pénzek*), and *Hunters in the Matra* (*Mátrai Vadászok*). The novel, *The House of the Bétekys* (*A Béteký-ház*,

Pesth, 1832), is rather of a didactic kind, but exhibits many features of Hungarian domestic life. Besides these, F. was a constant contributor to literary and scientific periodicals, and had also his share in some of those pamphlets by which great social questions, as, for instance, female education, savings-banks, &c., were brought to a successful issue in Hungary. In reading F.'s works, we are frequently reminded of Dean Swift. From 1825, which year may be said to have been the beginning of a new political life for Hungary, up to the year 1840, F. was foremost among the leaders of the liberal opposition in the county sittings of Pesth; but on the appearance of Kossuth, the strides of public life growing more and more rapid, F. gradually retired from the region of political controversy, turning his inventive mind to social improvements. The first savings-bank of Hungary (at Pesth) was entirely F.'s work. His literary works were published in eight volumes at Pesth, 1843—1844. He was a directing member of the Hungarian Academy of Sciences. He died in 1864.

FAYA'L, one of the most important of the Azores (q. v.), contains about 37 square miles, and about 27,000 inhabitants. As one must infer from such density of population, the island is fertile. In its center is a mountain 3000 feet in height; and on its south-east coast a conveniently bay with good anchorage. Its principal town, Horta, stands on this bay in lat. 38° 30' N. and long. 28° 41' W.

FAYETTEVILLE is the name of a flourishing city of North Carolina, United States of America. Standing on the left bank of the Cape Fear River, about 140 miles from its mouth, F. marks the head of its natural navigation; while, by means of locks and dams, it communicates likewise with the upper basin of the river. While the interior sends down coal, the neighborhood is covered with forests of pine, which are traversed by 350 mile of plank-road, and yield tar and turpentine, of which latter there are several distilleries. Cotton and flour manufacture are largely carried on by water-power. The extensive arsenal of F. was seized by the confederates in 1861, and destroyed by Sherman in 1865. Pop. (1870) 4660, half of whom were colored.

FAYUM, the name of an Egyptian province, surrounded, in the form of a basin, by the Libyan Desert, and connected merely by a narrow valley with that of the Nile, between lat. 29°—30° N., and 30°—31° E. This peculiar depression of the desert extends about 30 miles from north to south, and about 40 miles from east to west, its lowest point lying 100 feet below the banks of the Nile at Benisnef. F. is one of the most fertile provinces in Egypt; producing, in addition to the ordinary useful plants of the country, roses, apricots, figs, vines, olives, &c. in great quantities. The fertility, in a province the soil of which is naturally arid and sandy, is the result of irrigation. A canal from the Nile was, at an early period, carried westward through a gorge in the Libyan hills, which here skirt the western bank of the Nile, and after dividing into numerous branches lodged its waters in a depression in the north-west thus forming, it is said, the Lake Mæris (q. v.). The ancient capital of the province, called Krokodilopolis, and at a later period Arsinoë, stood on the eastern shore of Lake Mæris, and upon its ruins stands Medinet-el-Fayûm, the chief town of the province, with a population of about 10,000 inhabitants.

FEAL AND DIVOT is a predial Servitude (q. v.) peculiar to the law of Scotland, in virtue of which the proprietor of the dominant tenement possesses the right of turning up and carrying off turf from the servient tenement for the purpose of building fences, roofing houses, and the like. This, as well as the servitude of fuel, implies the right of using the nearest grounds of the servient tenement on which to lay and dry the turf Peats (q. v.) or feal. These servitudes do not extend beyond the ordinary uses of the actual occupants of the dominant tenement, and cannot be taken advantage of for such a purpose as to burn limestone for sale. They are not included in the servitude of pasturage, but must be constituted either by express grant, or by possession following on the usual clause of parts and pertinents. Ersk. ii. tit. ix. s. 17. The etymology of these words has been much disputed. *Feal* or *fail* is said to come from the Suio-Gothic *weall*, any grassy part of the surface of the ground; and Jamieson derives *divot* from *delve* (Sax. *delfan* or *deleben*), or, as another alternative, says that it may have been formed by the monkish writers of old charters from *defodere*, to dig the earth. The former is the more probable conjecture.

FEALTY (Lat. *fidelitas*) is the fidelity which a man who holds lands of another owes to him, and contains an engagement to perform the services, or to pay the dues, for which the land is granted. It was embodied in an oath, by which the tenant bound himself on entering to the lands. In taking the oath of fidelity, Littleton says, s. 91, that the tenant shall not kneel, nor shall make such humble reverence as in homage. The only object of fealty in modern times is to keep up the evidence of tenure where no other services are due; but even to this effect it has gone into desuetude.

FEAR, MANIA OF, or PANPHOBIA. There are many morbid manifestations of the instinct of cautiousness. Sudden fear in sleep, horrible dreams, nightmare, sleep-walking, have been regarded as symptoms of a special disease. Actual terror from irregular circulation in the sensory ganglia; the sense of falling or drowning in cardiac affections; incubus from disturbance of the circulation in the larger vessels by repletion, plethora, or position, where there is the super-addition of a delusion to the feeling of apprehension—are all allied and distinguished by involuntary and excited cautiousness. It is not only, however, when the intelligence may be supposed to be dormant, and the instincts awake, that such exaggerated fears paralyze minds otherwise sane and sound. Murat, 'the bravest of the brave,' and James I. of England, learned if not wise, were subject to vague, uncontrollable panics, which for a time unmanned them. The condition is often found associated with disease of the heart, as a consequence and concomitant rather than a cause. The presence of the *habitual* dread of evil, the fear of death, the sleepless and breathless anxiety during darkness, or solitude, or silence, as well as the sudden, wild, ungovernable panic, point to the existence of organic or functional diseases of the heart; and conversely, excited or irregular action of the organ, murmurs, angina, lead the astute psychologist to predicate fear as a characteristic of the mental condition. It precedes, and is believed to produce chorea, cancer, and scirrhus. Proximally, however, it depends upon alterations in the capillary circulation, or nervous structure of the brain. Its characteristic is involuntary, irresistible, blind terror, which arises and continues without an adequate cause, and which is not influenced by reason or religion, not even by the removal of the supposed object of alarm. The disease has appeared epidemically during commercial panics, during the horrors of cholera and plague, and in that singular affection called Timoria, which is marked by debility, tremor, and terror, and has been traced to the effects of the damp, unhealthy regions in Sardinia and Sicily, where it exclusively occurs. Panphobia is hereditary, and has been traced through three successive generations. In reviewing the unobtrusive members of an asylum family, the pallid, startled, staring, flickering countenances may be detected as those of patients laboring under fear. They resemble melancholics in pallidity of skin, but in place of courting they shrink from sympathy; though horror-stricken by gloom, they hide in corners, they escape, they shriek in desperation, they climb trees, and apparently inaccessible places; and encounter real in order to elude fancied dangers; or they are motionless, paralyzed. They fear and flee from enemies, police, demons, death, punishment; indescribable agonies themselves.—Fenchtersleben, *Principles of Medical Psychology*, p. 281; Arnold, *Observations on Nature, Kinds, Causes, and Prevention of Insanity*, &c., vol. i. p. 257.

FEASTS. See **FESTIVALS.**

FEATHER, a river of California, and a feeder of the Sacramento, runs through one of the richest gold-fields in the state. It receives the Yuba near Marysville, which appears to mark the head of navigation—the distance down the F. and the Sacramento to the harbor of San Francisco being about 100 miles.

FEATHER GRASS (*Stipa*), a genus of grasses remarkable for the long awns which give a peculiar and very graceful appearance to the species, mostly natives of warm temperate climates. In some of them, the awn is beautifully feathered. This is the case in the best known species, the **COMMON F. G.** (*S. pennata*) a very doubtful native of Britain, but found on dry hills in the middle and south of Europe. It is a perennial, easy of cultivation, and a favorite ornament of our gardens. When gathered before the seeds are ripe, its feathery awns—sometimes a foot in length—remain attached, so that tufts of F. G. retain their beauty throughout winter, and form one of the most pleasing and familiar decorations of rooms. They are often dyed, to give variety to the decoration, but are never more beautiful than in their natural yellowish-white color. The feathery awns not only assist in the diffusion of the seed, which is carried by the wind to great distances, but in a very interesting manner help to fix it in the soil. The seed alights vertically, the furrowed base of the awn becomes twisted, so that its furrows

form the threads of a screw, the feathery portion becomes horizontal, the wind acts on it, and the seed is screwed into the ground—a reverse action being prevented by stiff hairs which act as barbs.—The Esparto (q. v.) of Spain is nearly allied to the Common Feather Grass.

FEATHERS, a complicated modification of the tegumentary system forming the external covering or plumage of birds, and peculiar to this class of animals. Notwithstanding the varieties of size, strength, and color, all feathers are composed of a quill or barrel, *a*; a shaft, *bb*; and a vane, beard, or web, *cc*, on either side of the shaft, the vane consisting of barbs and barbules.

The quill by which the feather is attached to the skin is wider but shorter than the shaft, and forms a semi-transparent, horny, cylindrical tube, which terminates below in an obtuse extremity, presenting an orifice termed the lower umbilicus, *e*. A second orifice, leading into the interior of the quill, and termed the upper umbilicus, *f*, is situated at the opposite end, where the two vanes meet and unite. The cavity of the quill contains a series of conical capsules fitted one upon another, and united by a central pedicle; and the whole structure presents a remarkable combination of strength and lightness.

The shaft is always of greater length than the quill, and tapers gradually to its free extremity; it is flattened at the sides, is more or less convex on the back, and presents a longitudinal groove inferiorly. It is composed of white, elastic, spongy structure, which is covered by a thin horny sheath.

At the point of junction of the shaft and quill, we usually observe—except on the feathers of the wings and tail—a small supplementary shaft given off, which is furnished with barbs or fibres, and is termed the plumule or accessory plume. In the ostrich it is altogether absent; in the rhea, it is represented by a tuft of down; in the emu, on the other hand, it equals the original feathers in size, so that the quill supports two shafts; and in the cassowary there is a second plumule of considerable size, so that the quill presents three distinct shafts.

The vanes or webs are composed of numerous barbs or small fibres arranged in a single series along each side of the shaft. They are fine prolongations of the outer coat of the shaft, are of a flattened form, and lie inclined towards the apex of the feather, with their flat sides towards each other, and their margins in the direction of the external and internal sides of the feather. The barbs are broader near the shaft than at the free apex, and in the large wing-feathers the convexity of one is received into the concavity of another. They are, however, generally kept in position by the barbules, which are minute curved filaments arising from the upper edge of the barb, much as the latter arises from the shaft. There are two sets of these barbules, one curved upwards, and the other downwards, and those of one barb hook so firmly into those of the next, as to form a close and compact surface. In the ostrich, the barbules are well developed, but are loose and separate, and it is this arrangement which gives to the feathers of this bird their soft, plumous appearance.

Feathers present numerous gradations of structure. In the cassowary, the wings, instead of being provided with ordinary feathers, are furnished with five cylindrical stalks destitute of barbs, so that here we have merely the quill and shaft. On the breast of the wild turkey there is a tuft of feathers resembling long black hair. In the *Dasylophus Cumingii*, the feathers of the crest, breast, and throat are changed, at their extremities, into round, horny, lamellæ, looking like shining black spangles; and in the common waxwing or Bohemian chatterer, some of the wing-feathers present at their extremities small horny expansions, resembling red sealing-wax, both in color and consistence.

Besides the common feathers, the skin of many birds, especially of aquatic species—in which plumules rarely exist—is covered with a thick coating of down, which may be described as consisting of very minute feathers, each of which is composed of a very small soft tube lying in the skin, from the interior of which arises a minute tuft of soft filaments, without any central shaft. This downy covering secures warmth without weight, like the soft fur at the base of the hair of arctic mammals. In most birds, the skin also bears a good many scattered hair-like appendages, which indicate their relations to the ordinary feathers by the presence of a few minute barbs towards the apex.

Feathers are developed in depressions of the skin, lined by an inversion of the epidermis which surrounds the bulb from which each feather springs; they grow, much in the same manner as hairs, by the addition of new cells from the bulb, which becomes modified into the horny and fibrous stem, and by the elongation of previously existing cells. They are, when first formed, living vascular parts, growing by nutrient vessels; but when they are



Feather.



Feather Grass (*Stipa pennata*).

The seed alights vertically, the furrowed base of the awn becomes twisted, so that its furrows

fully formed, the vessels become atrophied, and the feathers become dried up, and gradually die from the summit to the base. For a full account of the development of the different parts, we must refer to Professor Owen's article, 'Aves,' and to Professor Huxley's article, 'Tegumentary Appendages,' in the *Cyclopædia of Anatomy and Physiology*.

Feathers grow with great rapidity, and in some birds attain a length of more than two feet. They are almost always renewed annually, and in many species oftener; hence it may readily be conceived how much vital energy must be exhibited in their development, and how critical the period of moulting must be. The plumage is generally changed several times before it attains the state which is regarded as characteristic of the adult bird; these changes may occupy a period usually ranging from one to five years.

Notwithstanding their extravascular nature, feathers, as is well known, undergo a change of color after they are completely formed. In yearling birds, the winter plumage, which succeeds the autumnal moult, gradually assumes brighter tints, the new color commencing at the part of the vane nearest the body, and gradually extending outwards till it pervades the whole feather. Dr. Weinland, an American naturalist, is of opinion, from a comparison of bleached specimens in museums, with recent ones taken from the bird, that the brightness and fading of the colors are due to the increase or diminution of an oily matter. Thus, the microscopic examination of the vane of feathers from the breast of a fresh merganser showed numerous *lacunæ* containing a reddish oil-like fluid; some weeks after, the same feathers having become nearly white from exposure to light, disclosed air-bubbles instead of the reddish fluid. If this fluid is an actual oil, as is most probably the case, it could make its way into the non-vascular tissue by mere physical imbibition; and on the varying quantities of this oil the variations of plumage would depend.

The property possessed by the plumage of most birds, of keeping the surface protected from moisture, is well known. This is due to two causes. Most birds are provided with an oil-gland at the base of the tail, whose secretion is distributed over the feathers by means of the bill; and, additionally, the shedding of water is partly due to a thin plate of air entangled by the feathers.

The feathers vary in form in different parts of the body, and afford zoological characters for the distinction of species. Hence, they have received distinct names, such as primaries, secondaries, tertiaries, &c., in ornithology. These terms are explained in the article **BIRDS**.

The chief uses to which feathers are applied in the arts are three—*pens*, due to the peculiar elasticity of the barrels; *bed-feathers*, due to the combined softness and elasticity of the barbs; and *ornament*, due to the graceful forms and delicate tints of the whole feather. The mode of preparing the barrels for pens is described under **QUILLS**.

Bed-feathers were used in England in the time of Henry VII.; but it is not known how much earlier. At the present day, goose-feathers are preferred, the white rather than the gray. What are called *poultry* feathers, such as those of the turkey, duck, and fowl, are less esteemed, on account of their deficient elasticity. Wild-duck feathers are soft and elastic, but contain an oil difficult to remove. The following is one among several modes of preparing feathers for beds. Clean water is saturated with quicklime; the feathers are put into a tub; the lime-water is added to the depth of a few inches; the feathers are well steeped and stirred for three or four days; they are taken out, drained, washed in clear water, dried upon nets, shaken occasionally while drying, and finally beaten to expel any dust. The larger establishments, however, now prepare bed-feathers by steaming, which is found to be a more profitable and efficient process. The *down*, which is of so light and exquisite a texture as to have become the symbol of softness, is mostly taken from the breasts of birds, and forms a warm and delicate stuffing for beds, pillows, and coverlets. The most valuable is that obtained from the eider-duck, described under **EIDER**.

Feathers used for head-dresses, or other purposes of ornament, are selected according to the forms and colors which they display. The *ostrich*, a very valuable kind of feather, may be taken as an example of the way in which ornamental feathers generally are prepared by the *plumassier*. The mode of catching the bird itself is noticed under **OSTRICH**; it suffices here to state that the hunters endeavor to avoid injuring the feathers by blood or blows. When brought to England, the feathers are assorted according to quality; those from the back and above the wings are the best, the wing-feathers next best, and the tail-feathers least valued. The feathers of the male are rather more prized than those of the female. They are cleaned for use by repeated soakings and washings in water, sometimes with and sometimes without soap. There is also a process of bleaching by means of burning sulphur. When dried by being hung upon cords, the feathers pass into the hands of the dresser, who opens the fibres by shaking, gives pli-

ancy to the ribs by scraping them with bits of glass, and curls the filaments by passing the edge of a blunt knife over them. If the feathers, whether of the ostrich or any other bird, remain in the natural color, little more has to be done; but if a change of tint be required, the feathers easily take dye-materials—such as safflower and lemon-juice for rose-color or pink, Brazil-wood for deep red, Brazil-wood and cudbear for crimson, indigo for blue, tumeric or weld for yellow, &c. A process of bleaching is adopted before the dyeing, except for black.

The kinds of feathers chiefly used for ornament are those of the ostrich, adjutant, rhea or American ostrich, emu, osprey, egret, heron, antrenga, bird of paradise, swan, turkey, peacock, argus, pheasant, ibis, eagle, and grebe. White ostrich feathers are prepared chiefly for ladies' head-dresses; and black for the Highland regiments and for funeral trappings.

The white and gray marabout-stork feathers, imported from Calcutta, are beautifully soft and light, and are in request for head-dresses, muffs, and boas; the white kinds will sometimes sell for their weight in gold. The flossy kinds of rhea feather are used for military plumes, and the long brown wing feathers for brooms and brushes. Osprey and egret feathers are mostly used for military plumes by Hussar troopers. Bird of Paradise feathers are much sought after by Oriental princes for turban-plumes. Cock's feathers are used for ladies' riding-hats and for military plumes. Dr. Macgowan, who was United States consul at Ningpo a few years ago, has described in the *American Journal of Science and Art*, an ingenious process which the Chinese adopt for combining brilliant-colored feathers with bits of colored metal into garlands, chaplets, frontals, tiaras, and other ornamental articles.

FEBRICULA (Lat. a little fever), sometimes called also *Ephemera* (Gr. a fever of a day), a fever of short duration and mild character, having no distinct type or specific symptoms, by which it can be distinguished and described. See **FEVER**.

FEBRIFUGE (Lat. *febris*, a fever, and *fugo*, I drive away), a medicine calculated to remove or cut short Fever (q. v.).

FEBRO'NIANISM, in Roman Catholic theology, a system of doctrine antagonistic to the admitted claims of the Roman pontiff, and asserting the independence of national churches, and the diocesan rights of individual bishops in matters of local discipline and church government. The name is derived from the *nom de guerre*, Justinus 'Febronius,' assumed by John Nicholas von Hontheim, coadjutor archbishop of Treves, in a work on these subjects, entitled *De Præsentis Statu Ecclesiæ*, which he published in the year 1767, and which, with its several successive volumes, led to a violent and protracted controversy, and elicited the severest censure of the Roman tribunals. See **HONTHEIM**, **GALICIAN CHURCH**.

FEBRUARY, the second month of the year, has ordinarily 28 days, but in leap-year it has an additional or intercalary day. Among the Romans, it had originally 29 days in an ordinary year, but when the senate decreed that the eighth month should bear the name of Augustus, a day was taken from February, and given to August, which had then only 30, that it might not be inferior to July. The name is derived from the circumstance, that during this month occurred the Roman festival called the *Lupercalia*, and also *Februalia*, from *februare*, to purify.

FEBRUUS (connected with Lat. *februare*, to purify) was the name of an old Italian divinity, whose worship was celebrated with lustrations during the month of February. The ceremonies instituted in his honor were believed to have the effect of producing fertility in man and beast. F., whose name in the Etruscan language is said to have signified god of the lower world, was also worshiped as such by the Romans, and identified with the Greek Pluto.

FECAAMP, a manufacturing town and seaport of France, in the department of the Seine Inférieure, is situated in a narrow valley, flanked on either side by steep cliffs, at the mouth of a stream of the same name on the English Channel, 23 miles north east of Havre. It consists mainly of one long street. Its principal building is the handsome church of Notre Dame, in the early pointed style, and dating from the 14th century. The harbor is frequented by colliers from Newcastle and Sunderland, and by Baltic timber-ships and fishing-vessels. F. has cotton-mills, sugar-refineries, tanneries, ship-building yards, and some linen-cloth and hardware manufactures. Pop. (1876) 12,074.

FECHTER, CHARLES ALBERT, an actor of eminence, was born in London about 1823, his father being a Frenchman. When only three or four years old, he went with his parents to France, and was there educated as a sculptor. His predilections were, however, in favor of the stage; and he soon became a popular actor. In 1860 he was announced to appear in an English version of *Ray Blas* at the Princess's, and so perfectly identified himself with the character, that people almost forgot his French accent, in admiring the energy and finish of his acting. On the 20th of March in the following year, he appeared in the character of

Hamlet. While abandoning the traditions of the English stage, F. showed himself capable of appreciating the difficulties he had to contend with, and in some measure of surmounting them. The impersonation was, upon the whole, one that marked F. as an actor of very high powers. The same may be said of his representation of Othello. Subsequently F. became the lessee of the Lyceum Theater, playing the chief part in most of the pieces produced. In 1870 F. paid a successful visit to the United States, where he thenceforward remained. There he died in August 1879.

FEC'ULA, or **FÆCULA**, a term applied to starch obtained from various sources; in France, generally restricted to the starch of the potato. See **STARCH**.

FECUNDA'TION, or **FERTILIZA'TION**, in plants, takes place according to laws similar to those which prevail in the animal kingdom. In plants, however, the organs of reproduction are not permanent as in animals, but fall off—the male organs generally soon after fecundation, the female after the ripening of the seed. The male seminal substance, called *pollen*, never exists in a fluid state, but always in that of granules of various forms (*pollen grains*), which consist each of one cell, whose covering is of various thickness, and contains the impregnating substance. After the dehiscence of the anthers, the pollen gets into contact with the stigma of the pistil, which in its lowest and thickest part (the *ovary* or *germen*) contains the rudiments of the future seeds (*ovules*).

The inner layer of the cell-covering of the pollen grain separates from the outer and thicker lay, as if it came out of a bag, and continuing to be elongated by growth, is carried down through the *style* to the *germen*, where it reaches the *foramen* or small opening of the embryo sac, and comes into contact with the ovule, or even in many cases penetrates into the ovule itself between its cells. By this time, one or other of the cells of the ovule has become considerably more enlarged than the other cells, and what is called the *amnion* has been formed, in the mucilaginous fluid of which (*protoplasma*), after the contact of the pollen-bag, through the dynamic operation of its contents, a *cell-germ* or *cytoblast* is soon developed. This cytoblast is the first commencement of a new and distinct cell, which divides into two cells. These increase, by continually repeated separation of new cells, into a cellular body, which forms the more or less perfect *embryo* of a new plant. If the organ from which the pollen has proceeded, and the organ which contained the ovule, belong to the same plant or to plants of the same species, the embryo arising from this fecundation becomes a plant of the same species. But if the pollen by which the fecundation is effected comes from a plant of another species than that to which the plant belongs in whose germen the embryo is formed, the seed resulting from this fecundation will not, when it grows, produce plants of the same species, but *hybrids*, intermediate between the parent plants, and with various degrees of resemblance to one or other of them, but not perfectly corresponding with either. Hence the production of hybrids, and multiplication of varieties of plants in gardens, by what is called the artificial impregnation of the stigma of one plant with the pollen of another, which, however, must be of an allied species, hybridization being confined by the laws of nature within very narrow limits. See **REPRODUCTION**.

FEDERAL GOVERNMENT (Lat. *fœderatus*, bound by treaty, from *fœdus*, a treaty). When several states, otherwise independent, bind themselves together by a treaty, so as to present to the external world the aspect of a single state, without wholly renouncing their individual powers of internal self-government, they are said to form a Federation. The contracting parties are sovereign states acting through their representatives; and the extent to which the central overrules the local legislatures is fixed by the terms of the contract. In so far as the local sovereignty is renounced, and the central power becomes sovereign within the limits of the federated states, the federation approaches to the character of a Union; and the only renunciation of sovereignty which a federation as such necessarily implies, consists in abandoning the power which each separate state otherwise would possess of forming independent relations with foreign states. 'There are,' says Mr. Mill, 'two different modes of organizing a federal union.'

The federal authorities may represent the governments solely, and their acts may be obligatory only on the governments as such, or they may have the power of enacting laws and issuing orders which are binding directly on individual citizens. The former is the plan of the German so-called confederation, and of the Swiss constitution previous to 1847. It was tried in America for a few years immediately following the war of independence. The other principle is that of the existing constitution of the United States, and has been adopted within the last dozen years by the Swiss confederacy. The federal congress of the American Union is a substantive part of the government of every individual state. Within the limits of its attributions, it makes laws which are obeyed by every citizen individually, executes them through its own

officers, and enforces them by its own tribunals. This is the only principle which has been found, or which is even likely to produce an effective federal government. A union between the governments only is a mere alliance, and subject to all the contingencies which render alliances precarious.'—*Representative Government*, pp. 301, 302. One of the chief difficulties which arise in organizing a federal government, consists in discovering by what means disagreements between one or more of the local governments and the central governments as to the limits of their respective powers, are to be disposed of. The arrangement by which this object was sought to be effected in America, of which M. de Tocqueville expressed his admiration, is thus explained by Mr. Mill: 'Under the more perfect mode of federation, where every citizen of each particular state owes obedience to two governments—that of his own state, and that of the federation—it is evidently necessary not only that the constitutional limits of the authority of each should be precisely and clearly defined, but that the power to decide between them in any case of dispute should not reside in either of the governments, or in any functionary subject to it, but in an umpire independent of both. There must be a supreme court of justice, and a system of subordinate courts in every state in the union, before whom such questions shall be carried, and whose judgment on them, in the last stage of appeal, shall be final. Every state of the union, and the federal government itself, as well as every functionary of each, must be liable to be sued in those courts for exceeding their powers, or for non-performance of their federal duties, and must in general be obliged to employ those courts as the instrument for enforcing their federal rights. This involves the remarkable consequence, actually realized in the United States, that a court of justice, the highest federal tribunal, is supreme over the various governments, both state and federal, having the right to declare that any new law made, or act done by them, exceeds the powers assigned to them by the federal constitution, and in consequence, has no legal validity.'—(P. 305.) 'The tribunals which act as umpires between the federal and state governments naturally also decide all disputes between two states, or between a citizen of one state and the government of another. The usual remedies between nations, war and diplomacy, being precluded by the federal union, it is necessary that a judicial remedy should supply their place.'

'The supreme court of the federation dispenses international law, and is the first great example of what is now one of the most prominent wants of civilized society, a real international tribunal.' Mr. Mill's confidence in this remarkable tribunal, in which De Tocqueville shared, was disappointed. It proved unequal to the strain on the constitution caused by the political jealousies which in 1860 culminated in the great Secession war. But, in ordinary circumstances, there is no reason to question its value in vindicating either federal or state rights.

FEE AND LI'FERENT (in the Law of Scotland)—the first of which is the full right of proprietorship, the second the limited right of usufruct during life—may be held together, or may co-exist in different persons at the same time. The settling of the limits of the rights which in the latter case they respectively confer, is of very great practical importance, and from the loose way in which both expressions have been used by conveyancers, by no means free from difficulty. 'In common language,' says Mr. Bell, 'they are quite distinct; liferent importing a life-interest merely, fee a full right of property in reversion after a liferent. But the proper meaning of the word liferent has sometimes been confounded by a combination with the word fee, so as in some degree to lose its appropriate sense, and occasionally to import a fee. This seems to have begun chiefly in destinations "to husband and wife, in conjunct fee and liferent and children in fee;" where the true meaning is, that each spouse has a joint liferent while both live, but that each has a possible fee, as it is uncertain which is to survive. The same confusion of terms came to be extended to the case of a destination to parent and child—"to A. B. in liferent, and the heirs of the marriage in fee"—where the word liferent was held to confer a fee on the parent. It came gradually to be held as the technical meaning of the words "liferent to a parent, with fee to his children nascituri," that the word liferent meant a fee in the father. Finally, the expression came to be held as strictly limited to its proper meaning by the accompanying word "allanarly," or some similar expression of restriction; or where the fee was given to the children nati and nominati; there being in that case no necessity to divert the word liferent from its proper meaning, or, on a similar principle, where the settlement was by means of a trust created to take up the fee.' (*Prin. s. 1712.*)

FEE, ESTATE IN, the largest estate in land in point of quantity of estate known to the law of England, being a Freehold (q. v.) of inheritance. Estates in fee are divided into fee-simple and fee-tail. A fee-simple is defined by Littleton (1, a.) to be a lawful and pure inheritance. In order to create an estate in fee-simple by deed, it is necessary that the word heirs should be used; for

a gift by deed to a man for ever, or to a man and his assigns for ever, creates only an estate for life. But words of perpetuity annexed to a gift to a man by will are construed as carrying an estate in fee.

The proprietor of an estate in fee-simple enjoys the fullest rights of property over his estate, which he may alienate or burden at pleasure, and out of which he may grant estates of a lower kind, as for life or years. He is owner of the soil '*a calo usque ad centrum*,' and is therefore entitled to every product of the land, as timber, &c., and to all minerals and other valuable productions found beneath the surface. On his death, the estate descends to his right heirs, except in the case of fees held by corporations, which descend to their successors in office. Where a man claims an estate in fee-simple in possession in a corporeal Hereditament (q. v.), he is said to be 'seized in his demesne as of fee.' Estates in fee-simple are divided into fee-simple absolute, qualified or base, and conditional. A qualified or base fee differs from a fee-simple absolute by having a qualification annexed which may determine the estate, as where it is granted to a man and his heirs 'tenants of the manor of Dale.' If, therefore, at any time the holder of the estate ceases to be the tenant of Dale, the estate, which depended on that qualification, determines.

A conditional fee was limited to a particular class of heirs, to the exclusion of others, as to a man and the heirs-male of his body. On failures of heirs-male of the body of the grantee, an estate of this kind reverted to the grantor or his heirs. But although the estate was thus limited, by the terms of the deed, to a particular series of heirs, the judges previous to the reign of Edward I. held that the gift was a fee-simple on condition of the birth of heirs of the body of the grantee, and that on the birth of an heir of the body, the condition on which the estate was held was purified. The estate did not indeed become *ipso facto* a fee-simple absolute, but the grantee was held entitled to sell the estate, to forfeit it for treason, and to burden it with encumbrances. But if the estate was not sold, and descended to the heir, he continued to hold a fee-simple conditional. This state of things led to the famous statute *De Donis Conditionalibus* (13 Ed. I. c. 1), whereby it was enacted that estates should be held *secundum formam doni*. Estates created by this statute were called estates in *fee-tail*. See **ENTAIL**.

The original mode of transferring an estate in fee was by Feoffment (q. v.), but the statute of Frauds (29 Char. II. c. 3) requiring that writing should be used in all transfers of land, estates in fee must now be conveyed by deed or will.

The proprietor of an estate in fee-simple in the present day is substantially absolute owner of the freehold, which he holds without owing duty or service to any one, except the allegiance due to the sovereign, who is regarded as supreme lord of all the lands in the kingdom. But originally this was not so; an estate in fee is in its nature a feudal benefice, a feud, and the owner of the fee held this estate subject to all the services incident to the feudal state. But these duties have been by degrees entirely abolished in England. See **FEUDAL SYSTEM, TENURES**. In Scotland, the feudal usages in regard to land are still retained to a very great extent. See Paterson's *Compendium of English and Scotch Law*. An estate in fee in Scotland must be held by one of the three existing tenures—viz., feu, blanch, or burgage, and is subject to the casualties (q. v.) attaching to these rights.

FEE-FUND, in Scotland, is the fund arising from the payment of dues of court on the tabling of summonses, the extracting of decrees, and the like. Out of this fund, the clerks and other inferior officers of the court were paid. If the fund was at any time insufficient for the purposes to which it was applied, the deficiency was supplied out of the moneys provided by the acts 7 and 10 Anne for keeping up the Scottish courts of law. The offices of collector and accountant of the fee-fund were abolished in 1868, and the duty is now collected by stamps.

FEEJEE. See **FEI**.

FEELING. See **EMOTION**.

FEES. Neither barristers nor physicians could recover their fees by legal proceedings against their clients or patients, except under a special contract. The ground of this rule was that they are regarded not as payment, but as an expression of gratitude for services the value of which cannot be appreciated in money. The origin of the rule in the case of the advocates, is traced to the relation which subsisted between patrons and their clients in ancient Rome. When the former appeared as the defenders of the latter, they practised, as Blackstone says (iii. 29, Kerr's ed.), *gratis*, for honor merely, or at the most for the sake of gaining influence; and so likewise, it is established with us that a counsel can maintain no action for his fees, which are given, not as *locatio vel conductio*, but as *quiddam honorarium*; not as a salary or hire, but as a mere gratuity, which a counsellor cannot demand without doing wrong to his reputation. The rule at Rome was maintained even under the emperors, and Tacitus mentions (*Ann. lib. ii. c. 5*) that it was directed by a decree of the senate that these *honoraria*

should not in any case exceed 10,000 sesterces, or about £80 of English money. It has further been decided in England, that no action lies to recover back a fee given to a barrister to argue a cause which he did not attend (Peake, 122). But special pleaders, equity draftsmen, and conveyancers, who have taken out certificates to practise under the bar, and therefore are not counsel, may recover their reasonable charges for business done by them (Pouchet v. Norman, 3 B. and C. 744). Another rule with reference to the fees of barristers and advocates is, that they are paid before they are earned; a rule which, by removing from its members all pecuniary interest in the issue of suits, has done much to maintain the independence and respectability of the bar. As regards physicians, the rule that a fee could not be recovered by an action at law, was applied in the case of Chorley v. Bolcott, June 30, 1791 (4 T. R. 317). If, however, either a barrister or a physician acted under a special agreement or promise of a certain payment, then an action might be brought for the money. But all medical practitioners were relieved from the above code of honor by the act of 21 and 22 Vict. 90, which applied to the United Kingdom, and enabled them to recover in any court of law their reasonable charges as well as costs of medicines and medical appliances used.

This rule applies to physicians, surgeons, and apothecaries as defined by the statute. Members of the inferior branches of both professions—attorneys, solicitors, &c., on the one hand, and surgeons, dentists, cuppers, and the like on the other—were always entitled to raise action for their fees. In Scotland, the same rules prevail as in England with reference to both professions. In France, though the delicate sense of honor of the bar has always been preserved with quite as much care as in England, the rule is somewhat different. In law, an action for the recovery of fees would be maintainable in that country by an advocate; but 'in Paris, the rule of the ancient bar, founded on the disinterestedness which was its characteristic, and according to which any judicial demand of payment of fees was strictly forbidden under pain of erasure from the table (of advocate), has been religiously preserved.'—*History of the French Bar*, by Robert Jones, 1855. The practice in France, however, seems to be for the fees of advocates to be paid afterwards, though any bargain with the client or his agent that their amount shall depend on the issue of a trial, is regarded as dishonorable; and on several occasions the bar has vehemently resisted regulations calling on them to acknowledge receipt of their fees, as wounding their sensibility. There can scarcely be a stronger proof of the value of what seem in themselves to be trifling and pedantic pieces of etiquette, than the dignified and independent position, which, from its scrupulous sense of honor, the French bar has maintained during all the political revolutions which the country has undergone.

FEHÉRVÁR (SZÉKES), the same as the Latin *Alba Regia*, or the German *Stuhlweissenburg*, is one of the most ancient royal free towns of Hungary, situated in a marshy district about 40 miles south-west of Pesth. Under the Arpadian kings, it was the metropolis of the realm, and the residence of the sovereigns, who have been often crowned and buried there. On many occasions, the diets also were held in F., where twelve kings—among which are St. Stephen, and the great Mathias Corvinus—lie buried. It is the seat of a bishop, and contains a pop. of (1880) 25,612, chiefly Roman Catholics, and all of the Magyar race. Water is supplied by an artesian well.

FÉIA, a large lake of Brazil, lies on the maritime border of the province of Rio Janeiro, and is distant 150 miles, to the north-east from the city of the same name. It is so near to the Atlantic that it has been connected with it by means of a canal. F. is about a degree to the north of the southern tropic.

FEIGNING OF DISEASE is much practised in the army and navy, and also by convicts and others anxious to escape from discipline, or procure a discharge from compulsory service. In the army, it is technically called *malingering*. The detection of feigned disease, of course, necessarily belongs to the highly educated physician, and is impossible without a thorough knowledge of the reality, unless, indeed, the imitation be very coarse and badly studied. The diseases most commonly simulated are epilepsy, catalepsy, convulsions, blindness, deafness, palsy, insanity, indigestion, neuralgia, rheumatism, palpitation of the heart, and generally all disorders which may exist without leading to any distinct external appearances.

Ulcers of the legs, however, have often been made, and kept open artificially through the application of irritant substances; and vomiting and coughing up of blood is very easily simulated, if the supposed patient can get access to the necessary materials in the slaughter-house or elsewhere. The detection of such impostures is easy or not according to the opportunities and knowledge and skill of the deceiver, as compared with those brought to bear on the discovery of the fraud. Many men in the public services, and women affected with hysteria, have become so expert as to deceive even men of high character and skill. The writer has

known of an instance in which a man submitted to successive amputations of the arm upwards, nearly to the shoulder, for an ulcer produced and kept open at will by local applications; and a case was some time ago recorded by Dr. Murchison in the *Medico-chirurgical Transactions*, in which there is no reasonable doubt that a large opening into the stomach was the result of caustic substances deliberately applied to the abdomen, with the view of exciting sympathy.

FEINT (from the Fr. *feindre*), in military or naval matters, a mock attack or assault, usually made to throw an enemy off his guard against some real design upon his position. See **FENCING**.

FEITH, RHIJNIS, a distinguished Dutch poet, who ranks next to Bilderdijk (q. v.) as a reviver of the national poetry, was born 7th February 1753, at Zwoll in Overijssel, studied law at Leyden, and returned to his native town in 1776, where he held the office of burgomaster. He died 8th February 1824. F. tried almost all kinds of poetry. In his earlier productions, he showed an excessive inclination for the sentimental; but in 1792 appeared his *Het Graf* (The Tomb), a didactic poem, which, though not free from the weakness referred to, is yet on the whole happily conceived, and contains some admirable passages. His *De Ouderdom* (Old Age), published in 1802, is deficient in plan. Among his lyrical pieces, *Oden en Gedichten* (Odes and Miscellaneous Poems, 4 vols., Amst. 1796—1810), are several marked by a high enthusiasm and warmth of feeling. Of his tragedies, the best known are *Thirza* (1791), *Johanna Gray* (1791), and *Ines de Castro* (1793). Along with Bilderdijk, he recast in a nobler form Haren's famous patriotic poem, *De Geuzen* (Les Gaens, or the Beggars), which celebrates the first struggles of the Dutch for independence. Of F.'s prose works, the most important are *Brieven over verscheiden Onderwerpen* (Letters on Different Subjects, 6 vols., Amst. 1784—1790). These letters, by their polished style and refined criticism, did much to improve the literary taste of Holland.

FELANI'TCHE, or **FELANITZ** (anc. *Canatix*), a town of the island of Majorca, 27 miles east-south-east from Palma. It is situated in a valley, surrounded by mountains, and is well built, with a number of squares and wide streets. It has a convent and a hospital. On a neighboring hill is an ancient Moorish castle, with subterranean vaults. Linen and woollen fabrics are manufactured; rope-making and brandy-distilling are also carried on. There is some trade in the products of the neighboring country—rice, coffee, sugar, wine, brandy, fruit, and cattle. Pop. 8102.

FE'LDMANN, LEOPOLD, a German writer of comedies, was born at Munich in 1802, of Jewish parents, to whose faith he remains attached. Apprenticed in 1815 to a saddler, and afterwards to a cobbler, he soon gave evidence of his determination to be a poet by sending, in a pair of shoes, which he had mended, a poetical expression of his devotion to their fair wearer. For this his master sent him back to school, where in 1817, when only 15 years old, he wrote a play, *Der Falsche Eid* (The False Oath), which was actually produced on the stage. After spending a few years in business at Pappenheim, and subsequently in Munich, he was induced by the reputation which he gained from some humorous pieces, entitled *Genrebilder*, to devote himself entirely to literature. In 1835, his *Höllen-lieder* (Hell-Songs) appeared; and his first comedy, *Der Sohn auf Reisen* (The Son on his Travels), was acted in Munich with applause. While traveling thereafter for five years, chiefly in Greece, he wrote 'Pictures of Travel' for Lewald's *Europa*, and the correspondence for the *Allgemeine Zeitung*. In 1841, his comedy was produced in Vienna and since 1850, he has been employed as histrionic teacher in the National Theater of that capital. F.'s works, which are numerous, are reckoned among the best specimens of modern German comedy, pleasing by their cheerful humor, and happy employment of contemporary ideas and events, though complained of as deficient in artistic finish. F. has published a collection of his comedies (*Deutsche Original Lustspiele*, Original German Comedies), 1844-52; new series, 1855-57.

FELEGYHA'ZA, a town of Little Cumania, Hungary, is situated on the railway between Pesth and Temesvar, 67 miles south-east from the former. It has an extensive trade in grain, fruit, wine, tobacco, and cattle. In the neighborhood, several Roman urns have been found. Pop. (1880) 23,912.

FELICU'DI. See **LIPARI ISLANDS**.

FE'LIDÆ, or **FELI'NÆ**, a family of digitigrade carnivorous quadrupeds (see **CARNIVORA** and **DIGITIGRADA**), corresponding to the genus *Felis* of Linnaeus, and sometimes collectively called *cats* or the *cat tribe*. They are, generally speaking, the most carnivorous of all the *Carnivora*, holding the same relative place among quadrupeds that the *Falconidæ* do among birds. Their organization is admirably suitable to their habits. They have a very little muscular frame; the body is rather long, and remarkably flexible; the limbs generally short. Few of the species possess much fleetness, but most of them excel in climb-

ing and in leaping. When moving rapidly over the surface of the ground, they generally advance by a series of zigzag bounds, rather than by direct running. They are mostly inhabitants of forests, and many even of the larger species live much among the branches of trees, although some of the largest do not leave the ground. They all advance stealthily on their prey, which all of them kill for themselves, and devour in a perfectly fresh state, and generally whilst warm and quivering. When they have approached within a sufficient distance, they complete the seizure by a spring, many of them uttering a roar or yell as they do so, and thus rendering their victory more secure by the consternation which paralyzes the object of their attack. Their movements are extremely noiseless, owing to the soft velvety pads with which their toes are provided.

Their claws are strong, much curved, very sharp, and retractile; being withdrawn by special muscles and ligaments into sheaths when not in use, and their points even turned upward, so that they are not blunted by unnecessary friction, and do not interfere with the movements of the animal by accidentally hooking objects which are in the way. The last bone (*phalanx*) and joint of the toe exhibit peculiarities requisite for the extension and retraction of the claws. The fore-feet have five toes, the hind-feet four. The head of the F. is characterized by great breadth of skull, whilst the muzzle is short, and sometimes even rounded; the jaws are moved by very powerful muscles, and the articulation of the lower jaw is such that it has no rotatory motion; the teeth also being so shaped, and those of the two jaws so fitting to each other, that they cut like scissors—the lower teeth shutting within the upper—and are not at all adapted to the trituration of food. There are six small incisors in each jaw, followed on each side by one very large canine tooth, adapted for prehension; and this by two premolars, or false molars, which, particularly in the lower jaw, are compressed and sharp-edged, their edges rising to a central summit, with inferior lateral cusps, so that flesh between them is subjected to a cutting action in various directions. Finally, there is on each side of each jaw one true molar, and in the upper jaw of many species, a second true molar. The crowns of all the teeth are covered with enamel. The tongue is rough, with horny papillæ directed backwards, by which it is fitted for cleaning the bones of the prey. The stomach is simple, the intestines short, and digestion rapid. The senses of sight and hear-



Characteristic Features of the Felidæ.

1, tiger's head; 2, showing the dentition; 3, portion of tongue; 4, right fore paw, showing claws; 5, claw, showing tendons.

ing are extremely acute; the eyes are adapted to seeing both by day and by night; the sense of smelling is also very acute, although apparently not equal to that of dogs; the sense of taste is supposed to be less acute; the bulbs from which the long whiskers arise appear to possess the sense of touch in great perfection, and the whiskers thus become useful in the progress of the animal through entangled thickets.

The F. agree so much in form and structure, that many naturalists still refuse to divide the Linnæan genus *Felis*. None of the F. are gregarious. Almost all of them, when taken young, seem capable of domestication, but in general they are little to be trusted. The species are numerous. They are distributed over Europe, Asia, Africa, America, and the islands adjacent to these continents; but none are found in Australia, where their place is supplied by the carnivorous marsupial quadrupeds. The largest species are chiefly found in warm climates. No species is known to be common to the Old and New worlds, although some are very nearly allied.

Vast numbers of the larger F. were brought from Africa and the East for those savage sports and shows in which the ancient Romans delighted. Five hundred lions were slain in five days at the opening of Pompey's theater, and five hundred panthers have been let loose at once in a similar Roman arena. The wealth

of Indian princes has also been often spent in fights of such beasts.

The principal F. are noticed in separate articles, as LION, TIGER, JAGUAR, PUMA, LEOPARD, PANTHER, CAT, TIGER-CAT, LYNX, CHEETAH, OUNCE, CARACAL, SERVAL, OCELOT, &c.

FELIX, ANTONIUS, a Roman procurator of Judæa (51—62 A.D.) in the time of the Apostle Paul, was a freedman of the Emperor Claudius I. The circumstances under which he received his appointment are related differently by Tacitus and Josephus. His government, politically considered, was in some respects good. According to Josephus and other authorities, he cleared the country of robbers, and vigorously suppressed the chaotic seditions of the Jews; but his cruelty, lust, and greed were unbounded. His wife was Drusilla, a beautiful but renegade Jewess, whom he induced to abandon her first husband, and to form a questionable connection with himself. It was therefore not at all wonderful that F. should tremble as Paul reasoned of 'righteousness, temperance, and judgment to come' (Acts xxiv. 25). He was recalled to Rome, 62 A.D., on account of the accusations preferred against him by the influential Jews of Cesarea, and narrowly escaped the sentence of death.

FELIX (POPE) I.—IV.—FELIX I., reckoned the 26th in the succession of popes, succeeded Dionysius in the see of Rome probably in the year 269. His pontificate is chiefly interesting as an early example of the relations of the Christian Church to the Roman Empire, and of the recognition by the state of the civil rights of Christians. In the pontificate of Felix's predecessor, Dionysius, Paul of Samosata, Bishop of Antioch, had been deposed by a council held in that city. Paul having resisted the sentence, the matter was laid before Felix, Dionysius being now dead; and, as Paul held possession of the church and church buildings, the bishops were obliged to claim the interference of the Emperor Aurelian, who was passing through Antioch on his return from Palmyra. Aurelian returned a decision which is often appealed to in modern controversy, to the effect that the buildings should belong to the person 'to whom they should be adjudged by the bishops of Italy and Rome.' Felix afterwards suffered martyrdom in the persecution of the same emperor, Aurelian, probably in 274.—FELIX II. occupied the Roman see during the banishment of Liberius, in 355. It is agreed on all hands that his first appointment was intrusive, but much diversity of opinion exists as to his subsequent career. In reply to the petition for the recall of Liberius, it was proposed by the Emperor Constantius that Liberius and Felix should exercise jurisdiction jointly; but this proposition was rejected by the Romans, and Felix appears to have been compelled to retire from the city.

According to the *Liber Pontificalis*, he suffered martyrdom in the end, at the hands of his former patron, Constantius; but this is not confirmed by any contemporary authority.—Felix III. occupied the see of Rome from 483 till 492. He was a native of Rome, and of the family from which afterwards sprung Pope Gregory the Great. His pontificate is historically memorable, as presenting the first commencement of the disruption of the Greek and Roman churches. The contemporary occupant of the see of Constantinople, Acacius, as well as the imperial court, was a favorer of the Monophysite party, who refused to accept the decision of the council of Chalcedon. See MONOPHYTES. By their influence, the patriarch of Alexandria was deposed, and replaced by the monophysite, Peter Mongus. The deposed patriarch having appealed to Rome, Felix sent two legates to Constantinople, to require his restoration; and the legates having failed in their trust, and Acacius still adhering to the heterodox party, Felix assembled a council at Rome, and excommunicated not only the offending legates, but also Acacius himself, the sentence being pinned by a monk upon the back of the patriarch's robes while he was actually officiating in the church. Felix had previously rejected the *Henoticon*, or Decree of Union, published by the Emperor Zeno. The schism thus inaugurated was not healed till the year 519. The only literary remains of this pontiff are the letters and other acts of this controversy. He died February 24, 492.—FELIX IV., a native of Benevento, succeeded John I. in 526. His pontificate presents no noteworthy event. He died in 530.—FELIX V. (antipope). See AMADEUS.

FELIXIANS, a Spanish sect of the latter part of the 8th c., so called from Felix, Bishop of Urgel. See ADOPTIAN CONTROVERSY.

FELLAH (plural, EL FELLAHIN), an Arabic word meaning peasant or agriculturist, specially applied to the agricultural or laboring population of Egypt by the Turks, in a contemptuous sense, as 'clowns,' or 'boors.' They form the great bulk of the population, and are descendants of the ancient Egyptians, intermingled with Syrians, Arabs, and other races who have been converted to Islam. In their physical conformation and features, they differ among themselves, those of the northern provinces of the Mediterranean being of whiter hue, while at Assuan they are almost black. They are described as having a large skull, facial angle almost

90 degrees, oval face, arched eyebrows, deep eyes, projecting lips, large mouth, thin beard, short nose, large chest, and small belly; arched back, and small hands and feet, and being of mean height. They form the fourth class of the population, and are distinguished from the Bedouin or free Arabs, who have entered the country later than the Saracenic conquest, and the Arabs of the towns and villages. Their dress consists of a shirt and linen drawers, over which is a larger blue shirt (*herie*), girdled by a leather or stuff belt, which is exchanged in the winter for a coat with sleeves (*zabou*). On their head, they wear the *tarboush*, turban, or a black or gray cap; the women tattoo themselves, and are nubile at an early age, being often married at 11 years, mothers at 12, and grandmothers at 24.

The food of the Fellahin consists entirely of vegetables, which they eat in a crude state, *dhourra* bread, and beans. Even rice is too dear for them and animal food unobtainable. Their drink is limited to the waters of the Nile and coffee, and the only luxury which they enjoy is the green tobacco of the country; yet on this diet they are robust and healthy, and capable of much labor and fatigue. In their social position, they are inferior to the Bedouin, who, although they will marry the daughters of the Fellahin, will not give to them their own in marriage. They appear to exhibit the moral qualities of the ancient Egyptians, being intelligent, grave, and calm, docile, pliable, and sober on the one hand; and idle, jealous, quarrelsome, satirical, licentious, and of unbending obstinacy, on the other, and inherit the traditional hatred of their ancestors to the payment of taxes, which are often only extorted by the *basinado*. Their political condition is most miserable. Each village is governed by a *Sheik-el-Beled*, who is responsible to the *Nazirs* and *Mamours*, or district officers for the conduct of the inhabitants, and their due payment of taxes. So oppressive, indeed, is the taxation and extortion, scarcely $\frac{1}{10}$ of the produce falling to their lot, that it would not be possible for them to live if it were carried to a higher pitch, and none cultivate the lands with diligence unless compelled by their superiors.—Gliddon, *Types of Mankind*, p. 319; Lepsius, *Egypt and Ethiopia*, p. 76; Lane, *Manners and Customs of Modern Egyptians*, pp. 125, 126, 192, 193; Clot Bay, *Aperçu générale*, i. pp. 159, 160.

FELLENBERG, PHILIP EMANUEL VON, the founder of the institution for the improvement of education and agriculture at Hofwyl in the canton of Bern, in Switzerland, was born at Bern in 1771. His father was a man of patrician rank, and in consequence, a member of the government. From him F. received a very careful education; but it was his mother, a great-granddaughter of the famous Dutch admiral, Van Tromp, who inspired him with the ardent desire of being useful to his fellow-creatures. In 1789, he went to the university at Tübingen, for the purpose of studying law, and subsequently traveled in various parts of Europe, taking up his quarters not in the hotels of the large towns, but in the cottages of the peasantry, that he might know at first hand the real condition and the manners of the poor, as well as the kind of education received by those whose life was to be spent in agricultural pursuits. When the revolution of 1798 broke out in Switzerland, F. took part in it for some time; but the faithlessness and want of public spirit on the part of the Bernese government induced him to withdraw from political life altogether, and to devote himself solely to philanthropic schemes. He now purchased the estate of Hofwyl, near Bern, and soon after entered into an alliance with Pestalozzi, the educationist.

Their different characters, however, rendered such a union impracticable, and they found it necessary to separate. F. now proceeded with redoubled zeal to increase the produce of his estate by new improvements, to influence the neighborhood by his example, and to make his experiments known to the world by his agricultural treatises. At the same time, he founded an asylum for forsaken children. He also opened a school of theoretical and practical agriculture, and connected with it an institution for the education of the children of the higher classes. The establishment at Hofwyl acquired for its founder a very great reputation, and pupils hastened to it from all quarters. Many foreign princes visited it, and on their return to their own countries, founded similar institutions. In the year 1830, F. founded a school of art, and some years later, an infant school. He died 21st November 1844. The institutions at Hofwyl were continued for some years by his son Wilhelm, and then entirely given up. Compare Hamm, *F.'s Leben und Wirken* (Bern, 1845).

FELLOWS, SIR CHARLES, an antiquary of considerable reputation, was born at Nottingham in 1799. In the beginning of 1838, he commenced those travels in the East by means of which his name has been brought so prominently into public notice. His researches were chiefly confined to the western peninsula of Asia Minor, and to the course of the ancient Xanthus, in the south of that peninsula. Commencing his investigations at Patara, at the mouth of the Xanthus, and proceeding inland along the valley of that river, he discovered, only nine miles from the coast, the ruins of the city of Xanthus, formerly the capital of Lycia.

Fourteen or fifteen miles higher up the river, he met with the ruins of another city, which, from inscriptions, he found to be the ancient Tios. Having made drawings of some of the fine remains of architecture and sculpture which he found in the ruins of these cities, and copies of some of the inscriptions, F. returned to England, and published *A Journal written during an Excursion in Asia Minor*, by Charles Fellows, 1838 (Lond. 1839). In 1839 he again visited Lycia, and in the course of another excursion, he discovered the ruins of no less than thirteen cities, each of which contained works of art. Another Journal, entitled *An Account of Discoveries in Lycia, being a Journal kept during a Second Excursion in Asia Minor* (London, 1841), was the result of this journey. In 1841 an expedition left England for the purpose of selecting works of art from the ancient cities discovered by F., who accompanied the expedition, and directed its operations. Authorized by a firman from the sultan, they made their selections, and returned in the spring of 1842. Another expedition sent out by the trustees of the British Museum brought home twenty cases of marbles and casts in 1844. These remains have been deposited in the British Museum in what has been called the Lycian Saloon. In 1845, F.'s labors were rewarded by the honor of knighthood. The other works of F. are—*The Xanthian Marbles: their Acquisition and Transmission to England* (1843); *An Account of the Ionic Trophy Monument Excavated at Xanthus* (1848); a re-issue of his earlier Journals under the title of *Travels and Researches in Asia Minor, particularly in the Province of Lycia* (1852); and *Coins of Ancient Lycia before the reign of Alexander; with an Essay on the Relative Dates of the Lycian Monuments in the British Museum* (1855). He died in 1860.

FELLOWSHIP, IN A UNIVERSITY. As the history of this institution will be treated under **UNIVERSITY**, we shall here only mention its leading characteristics, as it exists in the two great universities of England—Oxford and Cambridge. In these ancient and celebrated seats of learning, the fellowships were either constituted by the original founders of the colleges to which they belong, or they have been since endowed. In almost all cases, their holders must have taken at least the first degree of Bachelor of Arts, or student in the civil law. One of the greatest changes introduced by the commissioners under the University Act of 1854, was the throwing open of the fellowships to all members of the university of requisite standing, by removing the old restrictions by which many of them were confined to founder's kin, or to the inhabitants of certain dioceses, archdeacons, or other districts. Fellowships vary greatly in value. Some of the best at Oxford, in good years, are said to reach £700, or even £800, whilst there are others which do not amount to £100, and many at Cambridge which fall short of that sum. Being paid out of the college revenues which arise from land, they also vary from year to year, though from this arrangement, on the other hand, their general value with reference to the value of commodities is preserved nearly unchangeable, which would not be the case if they consisted of a fixed payment in money. The senior fellowships are the most lucrative, a system of promotion being established among their holders; but they all confer on their holders the privilege of occupying apartments in the college, and generally, in addition, certain perquisites as to meals or commons. Many fellowships are tenable for life, but in general they are forfeited should the holder attain to certain preferments in the church or at the bar, and sometimes in the case of his succeeding to property above a certain amount. In general, also, they are forfeited by marriage, though this disability may now be removed by a special vote of the college, permitting the fellow to retain his fellowship notwithstanding his marriage. With the single exception of Downing College, Cambridge, in which the graduates of both universities are eligible, the fellowships are confined to the graduates of the university to which they belong.

FELLOWSHIP. See **PARTNERSHIP**.

FELLO DE SE, in English Law, is where a man, of the age of discretion, and *compos mentis*, voluntarily kills himself. 'No man,' says Sir M. Hale (*Pl. of the Cr.* 411), 'hath the absolute interest of himself, but 1st, God Almighty has an interest and propriety in him, and therefore self-murder is a sin against God; 2d, The king hath an interest in him, and therefore the injunction in case of self-murder is *felonice et voluntarie se interfecit et murderavit contra pacem domini regis*.' A man or woman is considered of full age in regard to capital offences at the age of fourteen. A lunatic killing himself during a fit is not guilty of *felo de se*; but a merely melancholy and hypochondriacal temperament is not such a state of mind as will relieve a person from the consequences of this offence.

Where two persons agree to die together, and in pursuance of this design one or both die, it is suicide, or *felo de se*. And in some cases, where one maliciously attempts to kill another, and unwittingly kills himself, this is said (Hawkins, P. C. c. 27, s. 4) to be *felo de se*. But as a general rule the act must be voluntary. Formerly, the law punished this offence by inflicting ignominy on

the body of the offender, which was ordered to be buried by night at four cross-ways, and that a stake should be driven through the body. But by 4 Geo. IV. c. 52, this ignominious mode of burial is abolished, and it was also provided that a *felo de se* should be privately buried at night in a burial-ground. By 45 and 46 Vict. c. 19. Intermittents (*felo de se*) Act, 1882, this is repealed, and bodies can be interred in cemeteries or churchyards with the usual funeral rites, if a clergyman is pleased to perform them. All the chattels, real and personal, of a *felo de se* are forfeited to the crown. —In Scotland, the crime of self-murder is known as *Suicide* (q. v.).

FELON AND FELONY. The etymology of the word felon has given rise to much difference of opinion. By the majority of the most reliable lexicographers, it is supposed to have a common root with *fail*, and its original signification was supposed to be a vassal who failed in his fidelity or allegiance to his superior, thus committing an offence by which he forfeited his fee or feud. From this it came to signify traitorous or rebellious, and was gradually generalized till it reached its popular meaning of a crime of so heinous a nature as to infer a capital punishment.

The characteristic distinction of a felony, in the opinion of all legal writers, is, that it is a crime which occasions the forfeiture of the offender's goods. 'Felony,' says Blackstone, 'in the general acceptance of our English law, comprises every species of crime which occasioned at common law the forfeiture of lands and goods. Treason itself, says Sir Edward Coke, was anciently comprised under the name of felony. . . . And not only all offences now capital are in some degree or other felony, but many other offences not punishable with death, as suicide, manslaughter, and larceny, as they submit the committers of them to forfeitures.' When a person is now convicted of felony, he does not forfeit any of his property; but he forfeits and is disqualified for any government or public office. The court may order him to pay all the costs incurred in procuring his conviction, as well as compensation to persons defrauded or injured by his felonious act. The crown may during the sentence of imprisonment, or on the execution of the felon, appoint administrators to take possession of all his property, and hold it until the sentence expires, dealing with his affairs as if he were bankrupt, by paying his debts; and if there is a surplus, keeping or reassigning it for him or his heirs and representatives at the expiration of the sentence, 33 and 34 Vict. c. 23. Similar arrangements do not apply to Scotland.

FELSPAR (Ger. *feldspath*, field-spar), a mineral extremely abundant in almost all parts of the world. It is a principal constituent of many rocks, as granite, gneiss, greenstone, trachyte, &c.; and clays seem very generally to have resulted, at least in great part, from its decomposition. It occurs both massive and crystallized, in rhomboidal, pyramidal, and prismatic crystals, often having their edges and angles truncated, and thus very variously modified. There are many different kinds of F., which mineralogists have recently attempted to arrange in mineral species, distinguished by physical and chemical characters, and also by geognostic position, and by the groups of minerals with which they are associated. For these mineral species new names have been invented, *Orthoclase*, *Oligoclase*, *Albite*, *Labradorite*, &c. All the felspars are anhydrous silicates of alumina, and of an alkali or lime. Orthoclase, and the other more silicious felspars containing potash, abound chiefly in granite and the plutonic rocks; the less silicious, containing soda and lime, characterize the volcanic rocks—'as labradorite the basaltic group, glassy felspar the trachytic.' All the kinds of F. are so hard as not to be easily scratched with a knife, and are fused with difficulty. Some of them are soluble, some insoluble in acids.—The kind known as **COMMON F.**—referred to *Orthoclase*—is generally white or flesh-colored, has a glassy and somewhat pearly lustre, is translucent at least on the edges, and has an uneven or splintery fracture. Crystals four or five inches long are found in Aberdeenshire. This variety, under the name of *Petunse* or *Petuntze*, is used by the Chinese in the manufacture of porcelain; along with some of the quartz which is associated with it in the rock. It is used, with other materials, as a flux; and alone to form an enamel or glassy covering, without which the porcelain would absorb moisture and grease, and would be unfit for any except mere ornamental purposes.—**ADULARIA** is a transparent and almost colorless variety of F., often cut as an ornamental stone, the finest varieties, of which one is known as **MOONSTONE**, being prized almost as gems. A variety, found among rolled stones in Ceylon, and remarkable for the reflection of a pearly light, has been sometimes confounded with *Cat's Eye*.—**AVANTURINE F.** is similar to the variety of quartz called *Avanturine* (q. v.) in the play of light which it exhibits, and which is said to be owing to minute crystals of specular or titanite iron. It is much esteemed as an ornamental stone. A variety with golden yellow specks, called **SUNSTONE**, is very rare and very beautiful: it sells at a high price.—**LABRADORITE** exhibits rich colors and a beautiful opalescence, on account of which it is much used for ornamental purposes. A blue variety of F., found only in Styria, and a green variety, sometimes called

Amazon Stone, are also esteemed as precious stones. All the finer varieties of F. are characterized by a soft beauty, which well compensates for the want of that brilliancy which belongs to the true gems.

Kaolin, or *Poreclain Clay*, is regarded, as a decomposed felspar. —To F. also are referred, as chiefly composed of it, or apparently derived from it, Felstone, Tachyte, Claystone, Clinkstone, Pitchstone, Obsidian, and Pumice.

FELSTONE, a name introduced by Professor Sedgwick to designate those rocks which are composed, either in whole or to a large extent, of felspar. When they consist of a compact and apparently amorphous felspar, they are known as Trachytes—a variety of this rock, which splits into small slabs, that ring with a metallic sound, is called Phonolite. Trachyte, with distinct crystals of felspar scattered through it, becomes felstone porphyry; when the rock is in a vitreous condition, and has a resinous lustre, it is Pitchstone. Even in the most compact felstones, minute crystals may be detected, and these sometimes increase in size, till we have varieties which are completely granular and crystalline.

FELT, FELTING, a fabric formed without weaving, by taking advantage of the natural tendency of the fibres of hair and wool to interlace with and cling to each other. The hatters' tradition concerning the invention of felt affords as good an illustration as any we can find of the principle of this manufacture. In most Roman Catholic countries, the hatters celebrate as a festival the 23d of November, St. Clement's Day, as they formerly did in this country; and it is stated that St. Clement, when on a pilgrimage, put carded wool between his feet and the soles of his sandals, and found on his journey's end, that the wool was converted into cloth. Although this tradition is very questionable, as the manufacture of felt is of far more ancient origin, there can be no doubt that if carded wool were thus continually trodden, and at the same time moistened, it would become felt, and all the manufacturer's processes of felting are but modifications of such treatment.

This matting or felting of the fibres of hair and wool results from their structure, for, when examined by the microscope, the hair of all animals is found to be more or less jagged or notched on its surface; in some animals it is distinctly barbed; and this structure is so directed that the teeth or barbs all point towards the tip of the hair. See **HAIR**. If a piece of human hair (in which this structure is less marked than in most animals) be held between the finger and thumb, and rubbed in the direction of its length, it will invariably move between the fingers in the direction of its root; for the skin, while moving towards the tip of the hair, slides freely upon it, but moving in the other direction, against the inclination of the barbs, it brings the hair with it. It will be easily understood that when a number of hairs are pressed together, those which lie in opposite directions to each other and in contact will interlock at these barbs or teeth, and thus resist any effort to tear them asunder. When once this close contact and interlocking is established between any two or more hairs, they remain attached, but the others that are differently arranged, or not in contact, will still be free to move upon each other; and therefore, if subjected to continual blows, pushing, and pressure, like the treading of the feet in walking, the unattached hairs will be continually shifting until they reach others in suitable positions for clinging together, either by crossing obliquely or by lying in the same line, and overlapping at their ends or any other portion. When the hair has a natural tendency to curl, the felting is still more readily brought about by the additional interlacing. This is the case with wool to such an extent, that when free from grease it cannot be retained in the straight carded condition required for spinning and weaving. When it is required to be felted, the natural grease has to be removed. This tendency to felt is shown in the hard lumps formed in wool-mattresses that have been long used.

The beaver-hat maker produces his felt by taking a few ounces of the mixed fur, distributing it in an even layer by twanging a bowstring against the heap, and then condensing this into a felt by a sort of kneading process with his hands. See **HAT**.

The felt now extensively used for carpeting and other purposes is made by machinery, chiefly from the waste wool from the weaving-mills. Many patents have been taken out for the various details of felting-machinery, but the main principle is the same in all. The wool is carded more or less perfectly, and steamed or moistened with hot water, and passed between beaters, which act like the pilgrim's feet in a manner already described. When used as druggel for covering carpets, or as a substitute for carpet, the felt is printed by means of blocks with various patterns, or simply dyed. Felt is also used for padding coats and other garments, sometimes for cloaks and caps; for table-covers, some of which are beautifully embossed and printed; for carriage-linings, upholstery work, polishing cloths, pianoforte hammers, and various other purposes where a coarse

or thick cloth is required. A simple kind of saddle, cut out of very thick felt, is in common use in South America.

The 'felted sheathing' used as a non-conducting covering for retaining the heat in steam-boilers, is a substance intermediate between felt and paper, being composed of the commonest woolen refuse from paper-mills, &c., made into a semi-pulp, and beaten to produce a partial felting. This when dried hardens, and though possessing but little tenacity, and unfit for the wear of friction, is, from its compactness, better adapted than ordinary felt for the purposes to which it is applied.

Asphalted Roofing-felt is a very coarse felt saturated with pitch, asphalt or coal-tar—usually the latter, on account of its cheapness; it is retailed at one penny per foot, and used for covering sheds and other buildigs. A more expensive kind free from coal-tar, is called *Inodorous Felt*, and used as a lining for damp walls upon which paper has to be hung. Asphalted felt is also used as a flooring for granaries and similar buildings, and has been recommended for public schools, to prevent the noise from the shuffling of the children's feet.

FELTRÉ, a town of Northern Italy, in the province of Belluno, situated near the right bank of the Piave, 44 miles north-north-west of Venice. It suffered severely from the attacks of the Goths in the 5th century. The chief buildings are the cathedral, the college, ecclesiastical seminary, and gymnasium. F. has some trade in corn, wine, and oil. Pop. 6500.

FELUCCA, a small class of vessel used in the Mediterranean. It is propelled by from 10 to 16 oars, and by lateen sails. It has



Felucca.

frequently a rudder at each end, to be applied as occasion demands. During the French war, feluccas were armed with a heavy gun or two, and sent out as gun-boats against our ships, when becalmed near the Spanish ports; from their speed in smooth water, and the difficulty of hitting them, they were very troublesome antagonists.

FEMALE LABOR is prohibited in mines and collieries since 1st March 1843 (5 and 6 Vict. c. 99), under heavy penalties. As to the limits under which it is permitted in factories, see **FAC-TORY ACTS**.

FEMALE SHERIFF. There is only one instance on record of the office of sheriff in England having been held by a female; this was in the case of Anne, Countess of Pembroke. This lady, who was distinguished during the rebellion in the reigns of Charles I. and II. by her staunch adherence to the royal cause, was the wife of Philip, fourth Earl of Pembroke, and daughter of the Earl of Cumberland. On the death of her father, without male issue, in 1643, she succeeded to the hereditary office of sheriff of Westmoreland, and in that character she attended the judges of assize, and sat with them on the bench at Appleby.

FEMALE WHIPPING, as a public punishment, was abolished by 57 Geo. III. c. 75; and by 1 Geo. IV. c. 67, it was enacted that no female offender shall suffer the punishment of being whipped either publicly or privately; but that imprisonment or solitary confinement should be substituted therefor. See **WHIP-PING**.

FEME COVERTE (*femina viro co-operta*). In the language of the law of England, a woman by her marriage becomes subject to her husband, who has the control of her person, and is entitled to fix her residence. This control in the husband is admitted to a certain extent in criminal cases to excuse a married woman from guilt. Thus, in any felony, except murder or manslaughter, committed by a married woman, in presence of her husband, it is assumed that she acted under his compulsion. But this presumption

may be rebutted by evidence that she was the principal agent in the crime. A married woman cannot, in criminal cases, be a witness for or against her husband, except when he is tried for violence against her. In civil cases, a married woman may be examined in a suit where her husband is a party. In a petition for divorce on the ground of adultery, a married woman is not a competent witness; but where cruelty forms one of the grounds of complaint, she may be examined on that subject. Her property is to a limited extent transferred to the husband.

By 7 Will. IV. and 1 Vict. c. 26, even a will made before marriage is revoked by the marriage. But a deserted wife may, by 20 and 21 Vict. c. 85, s. 21, obtain an order to protect any money acquired by her own industry. By 33 and 34 Vict. c. 93 (1870) it is possible for a woman to retain her personal earnings, and gifts made to her during marriage in her own right (see HUSBAND AND WIFE). The landed property of a married woman is, during the marriage, under the administration of the husband, and during their joint lives, he is entitled to all the profits of the lands. Should there be a child of the marriage born alive, and capable of inheriting the land, he has, by the Courtesy of England (see COURTESY IN LAW), an estate for life in all lands in which he is seised in fee in her right. Formerly, a married woman could not, during marriage, execute a conveyance of lands without levying a Fine (q. v.); but by 3 and 4 Will. IV. c. 74, a married woman may now make a disposition of real estate as if she were a *feme sole*. But the husband must concur in the deed, which must also be acknowledged by the wife, in presence of one of the judges, a master in Chancery, or of a commissioner appointed under the act. Formerly, an action could not be maintained by a married woman unless with the concurrence and in the name of the husband. A married woman may now maintain an action and other remedies in her own name, as regards her separate estate. A married woman cannot bind her husband by any contract she may enter into, but as he is bound to support her, he is liable for necessities supplied to her while she lives with him, or if he wilfully deserts her, but not where she has left him of her own accord. Formerly, a wife could not obtain a divorce from her husband; but by 20 and 21 Vict. c. 85, she may now obtain a divorce on the ground of adultery coupled with cruelty or desertion. See DIVORCE. For the law of Scotland in regard to the rights of married women, see HUSBAND AND WIFE.

FE'MERN, an island in the Prussian province of Schleswig-Holstein, taken from Denmark in 1864. It is separated from Holstein by a strait called the Femern Sound, has an area of 70 square miles, and a population of about 10,000. The island is flat, fruitful, and destitute of wood. Agriculture, fisheries, and stocking-weaving for exportation, form the principal employments of the inhabitants. The chief town is Burg, which has about 2500 inhabitants.

FE'MGERICHT'E (derived from the old German *Fem*, punishment, and *Gericht*, court of justice, spoken of as the Holy Feme (or Fehme), and also known as the Westphalian or Secret Tribunals, were among the most remarkable phenomena of the middle ages, and supplied the place of the regular administration of justice, then in a deplorable condition. The origin of these courts has been ascribed to Charlemagne, who, it was pretended, had instituted them to prevent the relapse into Paganism of the Saxons who had been forcibly converted to Christianity. It is more probable, however, that they were a relic of the ancient German free courts of justice, the preservation of which may have been favored in Westphalia by special circumstances.

When Henry the Lion was put under the ban of the empire and deprived of his possessions in 1179, Westphalia, which then comprised nearly the whole district between the Rhine and the Weser, was granted to the Archbishop of Cologne; and from this time the secret tribunals gained in importance. In the general confusion which then prevailed in Germany, when all laws, both civil and ecclesiastical, had lost their authority, and the fabric of society seemed on the point of toppling into ruins, the Femgerichte were organized for the purpose of arresting and controlling the incipient anarchy that threatened to bring chaos back again, and of inspiring with feelings of salutary terror, through the agency of their mysterious powers and solemn judgments, all rapacious and lawless persons (but especially the feudal barons), who—on account of the impotence of the ordinary legal checks—committed crimes with impunity. In the causes, therefore, which led to their formation, and in their general design, the Femgerichte resemble the Hanseatic towns. They soon acquired tremendous influence, the emperors themselves having recourse to their assistance against powerful and rebellious nobles. It was in the 14th and 15th centuries, however, that they attained the summit of their dread authority, when they began to extend themselves over the whole of Germany. Beneficial as in many instances they proved to be, they could not fail, in the long-run, to degenerate, and to be frequently employed as a cloak to self-interest and malice. It is therefore by no means surprising that many voices were raised

against them, and that in 1461 various princes and cities of Germany, as well as the Swiss confederates, formed unions for affording justice to every individual, and preventing and from seeking it from the secret tribunals. Particular classes likewise obtained imperial letters of protection against the pretensions of these tribunals. The emperors themselves, however, could go no further than to make some unavailing attempts to introduce improvements into the constitution of the Femgerichte, as the latter were bold enough to oppose the imperial authority, and even summoned the emperor Friedrich III. to appear before them. Their influence came to an end only when the public peace (*Landfriede*) was established in Germany, and an amended form of trial and penal judicature was introduced. The last real Femgericht was held at Celle, in Hanover, in the year 1568. A remnant of the institution, however, existed in Westphalia until the year 1811, at which time it was performing the function of a society for the suppression of vice, when it was abolished by an order of Jerome Bonaparte. Beyond the limits of Westphalia, notwithstanding all their endeavors, the Femgerichte never succeeded in fully establishing their authority; and even in the *Red Land*, as Westphalia was called (probably from the color of the soil), they were restricted by the imperial privileges on which they founded their authority.

The members of the Feme were called *Wissende*, 'the knowing ones' or the *initiated*. It was necessary that they should be born in wedlock, be of the Christian religion, lead a blameless life, and bind themselves by a tremendous oath 'to support the holy Feme, and to conceal it from wife and child, father and mother, sister and brother, fire and wind, from all that the sun shines on and the rain wets, and from all that is between heaven and earth.' Originally, none but an inhabitant of the 'Red Land,' possessed real property, could be admitted a member of the *Wissende*; at a later period, this rule was relaxed. From the general body were elected officers called *Freischöffen* (free justices), who were assessors of the court, and executors of its sentences. The presiding judge was called the *Freigraf* (free count). The general superintendence and presidency of the secret tribunals belonged to the lord of the land—i. e., in Westphalia, to the Archbishop of Cologne. The highest office, however, as supreme president, was nominally held by the emperor, who was usually elected into the number of the *Wissende* on the occasion of his coronation at Aix-la-Chapelle. The court of a Freigraf was called *Freiding* (a free court of justice), and the place where he held court a *Freistuhl* (free bench or court). One of the most celebrated free courts had its seat at Dortmund. The sittings of the tribunal were either open or secret. The former were held by day in the open air, and decided in civil disputes; the secret tribunals took cognizance of those who had been unable to prove their innocence in the open courts, as well as of those who were accused of heresy, sorcery, rape, theft, robbery, or murder. The accusation was made by one of the *Freischöffen*, who declared, upon oath, that the accused had committed the crime. The citation was secretly affixed, with symbolical signs, to the door of the accused, who was to meet the *Wissende* at a certain hour and place, and be conducted by them before the tribunal. The accused could now clear himself by an oath, but the accuser and witnesses could oppose this with another. If the accused could now bring forward six witnesses to swear in his favor, the accused could strengthen his oath with 14 witnesses; and it was not till after 21 witnesses had made their affidavit in his favor that sentence of acquittal necessarily followed. The persons convicted, as well as those who refused to obey the summons, were given over to the *Freischöffen*. The first *Freischöffe* who met him was bound to hang him on a tree, or, if he made any resistance, to put him otherwise to death. A knife was left by the corpse, to show that it was not a murder, but a punishment inflicted by one of the *Freischöffen*. Compare Wigand, *Das Femgericht Westfalen's* (Hamm. 1825), and Usener, *Die Frei- und heimlichen Gerichte Westfalen's* (Frankfort, 1832); Geisberg, *Die Fehme* (1858).

FENCES, in Agriculture, serve the twofold purpose of enclosing animals on pasture-grounds, and of protecting land from straying animals. They are formed of a great variety of materials, and of very different structure. In countries where wood or stones are scarce, more especially where they have been long settled, hedges, formed of various kinds of plants, are common. These, when well kept and managed, give a clothed and picturesque appearance to the landscape. The Hawthorn is the favorite hedge-plant in this country. See HEDGES.

When stones are used as fences, they are built as walls. The form and mode of building varies with the nature and quality of the stones, and the degree of taste and nicety required. Aberdeenshire forms its walls or dykes surrounding its fields with the granite boulders that are strewn over the surface of the country. The graywacke affords slaty stones, which give the walls their peculiar form in other parts, and so with the various kinds of sandstone.

In new countries, where wood is abundant, the fences are all

of this material. The snake-fence, named from its zigzag form, is made by merely laying the ends of trees above each other, and requires no other means of fixing. As wood becomes more valuable, it is made into stobs and rails. The stobs are driven into the ground from two to three yards apart, and from four to five rails are nailed across, according to the purpose it is meant to serve. The stob and rafter fence is made by driving the stobs from three to four inches apart, and binding the whole by a rafter or rail nailed across the top. This is one of the strongest of wooden fences, but requires more material than the other.

Iron or wire fencing has come much into use of late. Vast stretches of waste land in this country as well as pastures in Australia, have been enclosed by means of wire-fencing. Strong wires are stretched on posts firmly secured in the ground, from 100 to 200 yards or more apart. Intermediate or lighter posts are put in at from two to three yards' distance. After the wires are fully stretched, they are fixed to the smaller posts; when of wood, by means of staples, or threaded, through, when of iron.

Law regarding Fences.—In England, it is held to be the duty of the occupier of lands to repair and uphold fences, and not of the landlord; and without any special agreement, the landlord may maintain an action against the tenant for not doing so. Though a tenant from year to year is not bound to put the fences and other buildings on the farm into repair, he must not do anything that amounts to waste, or to a breach of the rules of good husbandry. He cannot cut and sell hedgerows, or if he does so, he must make up the hedges and fences according to the course of good husbandry. 'If there be a quickset fence of white thorn, and the tenant shut it up, or suffer it to be destroyed, this is destruction; but cutting up quicksets is not waste, if it preserves the spring.'—Woodfall *On Landlord and Tenant*, pp. 456, 457, and cases cited. Where, in answer to a declaration against a tenant for not using premises in a husbandlike manner in repairing fences, on his implied obligation to do so, the tenant pleaded that the fence became out of repair by natural decay, and that there was no proper wood which he had a right to cut for repairing the fences, and that the plaintiff ought to have set out proper wood for the purpose of repairs, which he had neglected to do, the plea was held to be bad, because it did not aver any request to the plaintiff so to do, or a custom of the country in that respect.—*Whitfield v. Weedon*, 2 Chit. 685. By 7 and 8 Geo. IV. c. 29, ss. 23, 40, 44, the destruction of fences is declared to be punishable summarily with a fine of not more than £5; or in the case of a deer-park fence, with £50. The statute is limited to England.

In Scotland, the landlord is held bound to put the fences on the farm in due repair on the entry of the tenant, independently of any stipulation in the lease; whilst the tenant must maintain them and leave them, with the exception of ordinary tear and wear, in the state in which they were given over to him. But the landlord is not entitled to increase the burdens of his tenant by erecting new fences not stipulated for, unless they be march-fences, which he may be compelled to erect by contiguous proprietors, and half the expense of which he must share with them, under the act 1661 c. 41, ratified by 1685, c. 39, of the existence of which the tenant is presumed to have been aware when he entered to the farm. As regards fences erected spontaneously by the tenant, the rule is that if, being entitled to remove them, he allows them to remain, he must leave them in repair; but if they are fixtures (q. v.), which he is not entitled to remove, he is not bound to repair them. It is optional to the landlord, at the termination of the lease, to order removal of fences and other buildings voluntarily built by the tenant, except in the case of palings and movable fences, or to prevent their being removed without offering any indemnification.—*Hunter, Landlord and Tenant*, ii. p. 208. As buildings, fences, and other ameliorations made by the tenant, are supposed to be made for his own sake, and not for the sake of the landlord, he has no claim for the moneys which he may have expended for such purposes, at the end of the lease; except under a special stipulation to that effect. But if the tenant's occupation be terminated abruptly, and more particularly if his lease excludes assignees and sub-tenants, it is equitable that the landlord, getting the benefit beyond what was contemplated by the tenant, the family or the creditors of the latter should be allowed a proportion of the value of amelioration. Bell's *Princip.* s. 1255. The cases in which ameliorations are or are not removable will be explained under FIXTURES (q. v.). For the law as to fences in regard to trespassing, see TRESPASS.

FENCIBLE, a word of doubtful origin, meaning defensive. Regiments raised for local defence, or at—and only for—a special crisis, used to be denominated 'Fencible.' In the last French war, the local, as distinguished from the general militia, was called fencible, and many of the volunteer corps styled themselves the 'Royal—shire Fencible Infantry.' The only regiment of this character still bearing the title is the 'Royal Malta Fencible Artillery.'

FENCING may be described, for a general definition, as the art of defending one's own body or assailing another person's in fair fight by the aid of a side-weapon—i. e., by a sword, rapier, or bayonet. Technically, fencing is usually limited to the second of these; and works on the art touch only on attack and defence with the foil in pastime, and the rapier in actual personal combat. The present opportunity will, however, be taken to introduce the elements of single combat with foil, sword, and bayonet. The objection formerly existed that instruction in fencing encouraged a propensity to duelling; but as that absurdest of absurd customs has entirely ceased—at least in Britain—to demand its annual victims, no such objection now holds. Fencing may therefore be safely learned and taught as an elegant and manly accomplishment, developing gracefulness and activity, while it imparts suppleness to the limbs, strength to the muscles, and quickness to the eye.

This regards fencing with the foils (the rapier has disappeared with the duels which employed it); but instruction in fencing with the sword and bayonet, while conferring the same advantages, has in addition the recommendation of helping to fit the student for taking an active part in any general national defence that political circumstances might render necessary. The Foil (q. v.) is a circular or polygonal bar of pliable and very highly tempered steel, mounted as any other sword, and blunted at the point by a 'button,' to prevent danger in its use. From its nature, the foil can only be employed in thrusting, and, being edgeless, it can be handled without liability to cutting wounds. The length of the blade should be proportioned to the height of the person using it—31 inches being the medium length for men, and 38 inches from hilt to point the maximum allowable. As a protection against accidental thrusts, the face is generally guarded by a wire-mask. The two portions of the blade are known as the 'forte' and the 'feebler,' the first extending from the hilt to the center, and the other from the center to the point.

In drawing, advance the right foot slightly to the front, take the scabbard with the left hand, raise the right elbow as high as the shoulder, seize the hilt with right hand, nails turned inward, and having drawn the foil, pass it with vivacity over the head in a semicircle, and bring it down to the guard (of which presently) with its point towards the adversary, not higher than his face, nor lower than his lowest rib. Simultaneously with the weapon being brought into position, the left hand with fingers extended should be raised to a level with the head, as a counterpoise in the various motions to ensue. In establishing the position of guard, the right foot must be advanced 24 inches before the left, the heels in a straight line, and each knee slightly bent, to impart elasticity to the movements, but not too much, lest the firmness of the position be diminished.

In fencing, there are three openings or entrances—the *inside*, comprising the whole breast from shoulder to shoulder; *outside*, attackable by all the thrusts made above the wrist on the outside of the sword; and the *low parts*, embracing from the armpits to the hips. For reaching and guarding these entrances, there are five positions of the wrist—prime, seconde, tierce, carte (quarte), and quinte. The most important, and those to commence with, are carte and tierce, from which are derived the subordinate positions of carte over the arm, low carte, and fianconnade or octave.

To engage is to cross swords with your adversary, pressing against his with sufficient force to prevent any manœuvre taking you unawares. To disengage is to slip the point of your sword briskly under his blade, and to raise it again on the other side, pressing in a direction opposite to that of the previous case.

The guard in each position is a passive obstruction to the opposing thrust; the parade is an active obstruction, in which the guard is first assumed, and the blade then pressed outward or inward by a turn of the wrist against the adversary's sword, so that when thrust at your body it shall be diverted from its aim, and held off. The parade may therefore be regarded as a mere extension of the guard. If the parade were called the 'parry,' it would convey its meaning more readily to English ears. Another, and perhaps more appropriate name for thrust, is the 'lunge,' or 'longe,' as the thrust is almost always accompanied by a lunge forward of the right foot, to give at once greater force and longer command to the blow.

The following are directions for the principal guards and thrusts, which may also be seen depicted roughly in the sketches below.

Carte, Guard.—Turn wrist with nails upwards; hand on a line with lower part of breast; arm somewhat bent, and elbow inclined a little to the outside; point of foil elevated at an angle of about 15°, and directed at upper part of adversary's breast.

Thrust.—Being at the guard in carte, straighten the arm, raise the wrist above the head, drop the foil's point to a line with the adversary's breast, throw first the wrist, and then the whole body, forward by a lunge with the right foot of two feet from the 'guard,' the left foot remaining firm. The left hand should be

dropped during the lunge to a level with the thigh, and to a position distant about a foot from the body; it will then afford a good counterpoise to the sword-arm. During the whole action, the body must be perfectly upright. When performed briskly, it appears that the point and foot are advanced simultaneously, but in fact the point has, or should have, priority, in order that the instantly following lunge may drive it home. Most of these observations concerning thrust in *carte* apply equally to all other thrusts.

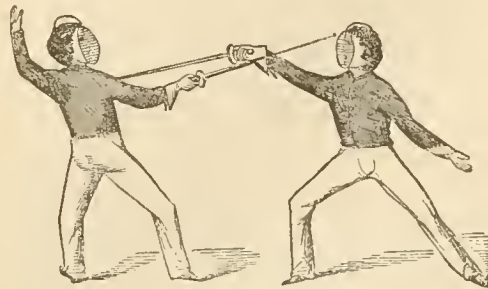


Fig. 1.—Carte.

Carte over the arm is a variety of this thrust. The sword is driven outside the adversary's blade, from the *carte* position, but in the *tierce* line.

Low Carte.—Engage adversary's blade in *carte*, then drop point under his wrist, in a line to his elbow, and thrust at his flank, the body being considerably bent.

Flanconnade or Octave.—Engage adversary's blade in *carte*, and bind it with yours, then carry your point behind his wrist and under his elbow: without quitting his blade, plunge your point to his flank.

Tierce, Guard.—As in *carte*, the nails and wrist being somewhat more downward, and the arm stretched a little outward, to cover the outside.

Parade.—Move arm, from the guard, obliquely downward to the right about six inches, and oppose the inside of the adversary's blade.

Thrust.—From the guard, turn wrist with nails downward, the same height as in *carte*, the inside of the arm in a line with the right temple; then thrust and lunge as in *carte*.

Seconde, Parade.—Nails and wrist downward, hand opposed outward, and blade, pointing low, should form an angle of about 45° with the ground.

Thrust.—The same as *tierce*, but delivered under the adversa-

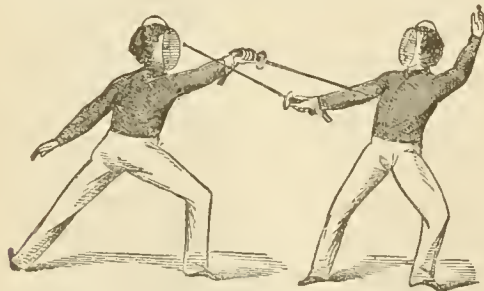


Fig. 2.—Tierce

ry's wrist and elbow, to a point between his right armpit and right breast: the body to be more bent than in *carte* or *tierce*.

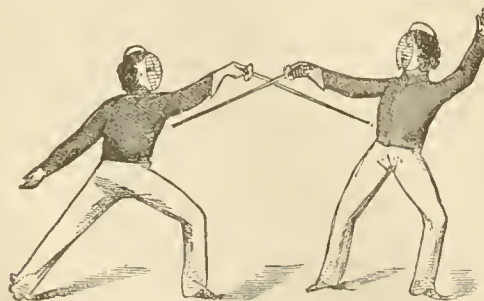


Fig. 3.—Seconde.

Prime, Parade.—In using *prime* to parry the thrust in *seconde*, pass your point over the adversary's blade, lower it to the waist, keeping your wrist as high as your mouth, nails downward, elbow

bent, and body held back as far as possible. The left foot should also be drawn backward a few inches, to remove the body further from the hostile point.

Thrust.—An extension movement from the parade.

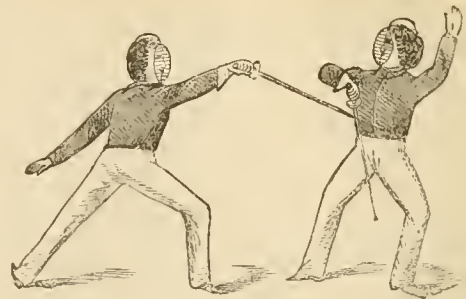


Fig. 4.—Prime.

Quinte, Parade.—Wrist in high *carte*, sword-point low, and oppose adversary from the forte of the outside edge of your blade.

Thrust.—Make a feint on the half-circle parade, with the wrist in *carte*; disengage your point over the adversary's blade, and thrust directly at his flank.

Half-circle, Parade.—One of the principal defensive parades: straighten arm, keep wrist in line with shoulder, nails up: by quick

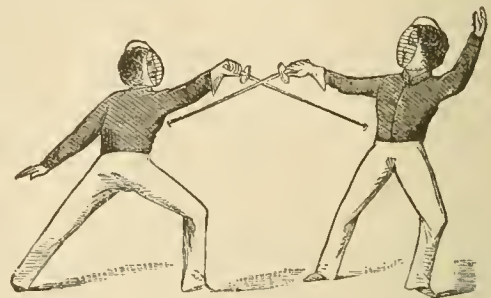


Fig. 5.—Quinte.

motion of wrist sweep point from right to left in a circle covering your body from head to knee, until the adversary's blade is found and opposition established.

The parades parry thrusts as follows:

Carte, with wrist low, parries low *carte* and *seconde*; with wrist raised, all the thrusts over the point on the inside of the sword and the *flanconnade*.

Tierce parries high *carte*; with raised wrist, parries *tierce*.

Seconde parries all lower thrusts, both inside and outside.

Half-circle parries *carte*, high *carte*, *tierce*, and *seconde*.

Prime parries *carte*, low *carte*, and *seconde*.

Quinte parries *seconde* and *flanconnade*.

In all parades or parries, care must be taken that in covering the side attacked, the parade is not so wide as to expose the other side to the enemy. A steady countenance, showing no disquietude at any attempt he may make, is, above all, necessary in parades.

Every parade has its return, which should be made with vivacity and decision. A thrust can be returned when the adversary thrusts, or when, baffled in his attack, he is recovering to his guard. In the first case, no lunge is necessary, the return being made from the wrist: this return requires great skill and quickness, since the adversary should receive the thrust before, by finishing his own, he has touched your body.

Ordinary Returns.—After *carte* parry, return in *carte*; after *tierce*, return in *tierce*; after parrying high *carte*, return *seconde*; after parrying *seconde*, return in *quinte*; after parade in *prime*, return *seconde* or low *carte*.

Feints, of which there are many varieties, consist in threatening an attack on one side of the sword, and then executing it on the other. The best parade against a feint is that of the half-circle, which will be sure to find the adversary's point.

Advance and Retreat are motions of attack or withdrawal, performed by advancing the right, or withdrawing the left foot suddenly about 18 inches, and instantly following it with the other foot. As the adversary advances, you must retreat, unless prepared to receive him at the sword-point.

Salute.—The salute is a courteous opening of the fencing, and consists in gracefully taking off the hat, while, with the foils, your adversary and yourself measure your respective distances.

Appels or beats with the right foot, *beats* on the adversary's blade, and *glissades* or glidings of one sword along the other, are

motions intended to confuse the enemy, and give openings for thrusts.

Voltes, *demi-voltes*, and *disarming*, were manœuvres formerly taught with care, but they are now quite discarded in the academies of England and France, as useless and undesirable.

In Spain and Italy considerable differences of practice from that in France and England prevail. The left hand is used as an auxiliary in parrying, and in Italy is aided by a dagger, or sometimes a cloak. The Spaniard, though trusting to his sword and left hand only, has his blade five feet long, with sharp edges; his guard is nearly straight, and one of his favorite attacks is by a *cut* (not thrust) at the head.

In an article limited in length as this must necessarily be, it is impossible to give more than the merest outline of the various motions; but, of course, in actual practice, there are endless variations of the different modes of attack and defence, which will be severally adopted according to the skill and option of the fencer. There is no finer indoor exercise than fencing, as the muscles in every limb are developed and strengthened by it. The great requirements for success are a steady eye and hand, a quick purpose as quickly executed, and, perhaps above all, perfect equanimity of temper.

THE SWORD EXERCISE differs from fencing with the foil; in that, the weapon employed has one cutting edge as well as a point, and is therefore intended to cut and thrust. The sword is the arm of all officers in the army and navy, of many non-commissioned officers, and constitutes the sole mode of attack and defence for the officers of the British volunteers. A certain degree of proficiency in its use is therefore always serviceable. In practice, the usual substitute is a stout, straight stick, called a 'single-stick,' having a basket-handle to protect the knuckles.

The position of the combatant is the same as that assumed in fencing with the foil; the lunge is similar, as are also the 'advance' and 'retreat,' and other minor points. According to the instruc-

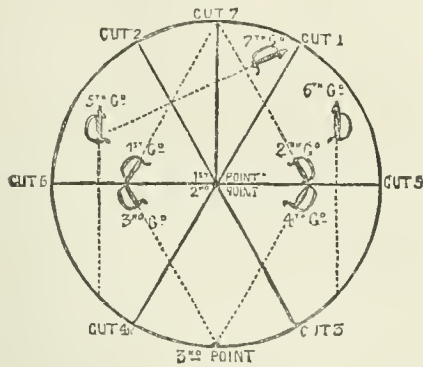


Fig. 6.

tions of drill-masters, there are seven cuts, with seven corresponding guards, and three thrusts. The theoretical directions of all these are shown on the accompanying diagram, which represents a target placed opposite a pupil, so that he may see the motions he is expected to perform displayed before him. The center of the target is supposed to be in a line with the center of his breast.

The cuts proceed from the circumference towards the center along the *thick* lines. Nos. 1, 3, and 5 are inside cuts, and attack the left cheek, left side, and inside of the right leg respectively; 2, 4, and 6 are outside cuts, attacking the enemy's right cheek, right side, and right leg on the outside. No. 7 is a vertical cut, aimed at the head.

The dotted lines show the position of the sword in the several guards by which the cuts are opposed. The sword-handles illustrate the situation of the right hand with reference to the center of the body.

The points or thrusts are shown by the black circles. That towards No. 1 should be directed with the wrist and edge of the sword upwards to the right; towards 2, with the edge upwards to the left; and in the 3d point, with the wrist rising to the center, and the edge upwards to the right.

The 'parry' is an additional defensive movement, and consists in bringing the wrist nearly to the right shoulder; whence, as center, a circular sweep of the sword is made from left to right.

A considerable latitude is allowable in regard to the cuts, as to the part of the adversary's body at which they are directed, provided the general inclination of the blow be observed; similarly, the cut may at times be parried by a guard other than that intended specially for it, according to the discretion of the fencer.

In engaging, or joining swords, with the enemy, press the blades but lightly together, so that the hand and wrist may be readily susceptible of any motion. In making the guards, care must always be taken to receive, if possible, the feeble of the enemy's blade on the forte of your own, so as to offer the greater

opposition. It should also be borne in mind that, in all cuts at the leg, when at proper distance, the shifting of your own leg, and delivering a cut at the same moment, becomes the most effectual and advantageous defence, particularly if you happen to be taller than your adversary, as you will then probably be out of his reach, while he is within yours.

In contending with bayonet or pike, the most effectual guard is the 5th, which, if well timed, enables the swordsman to seize the musket or pike with his left hand, and then make the 6th cut at his opponent's neck. In an encounter with the rapier, the best cuts are Nos. 3 and 4, as they attack the enemy's arm, which must be advanced within reach before he can touch your body, and also constitute a defence against his thrust. If the enemy—no matter how armed—be on horseback, the dismounted swordsman (provided he have proper nerve and agility) has decidedly the advantage. Endeavor to place yourself on his left, where he has less power of defending himself or his horse, and cannot reach to so great a distance as on his right: an attack on the horse will probably render it ungovernable, and it becomes easy then to avoid the rider's blows, while he himself may be attacked with impunity in almost any direction.

BAYONET EXERCISE.—If the sword exercise be of use to volunteer officers, there are thirty times as many volunteers themselves

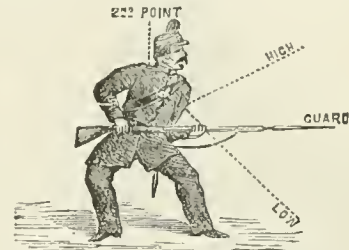


Fig. 7.

to whom a proper command of the bayonet is indispensable. In close-quarter engagements, there is no weapon more formidable: from its length and weight, the thrust of the bayonet gives a terrible wound, and its force is such that there is great difficulty in parrying the attack. Like other small-arms, it is most serviceable when handled on scientific principles; and the art of using it to advantage is so simple as to be very easily acquired, while the exercise, from the weight of the rifle, admirably aids in developing the muscles of all parts of the body.

Of course, the bayonet is always fixed at the end of the musket, when it becomes virtually a pike. The position of the feet in the bayonet exercise remains always the same relatively, and absolutely until advance or retreat be effected. The right foot is thrown back 24 inches, and the weight of the body thrown upon it. The heels are kept in a line with each other, both knees bent and well apart; the right knee directly over the foot, the left easy and flexible, pointing to the front. In this position of the

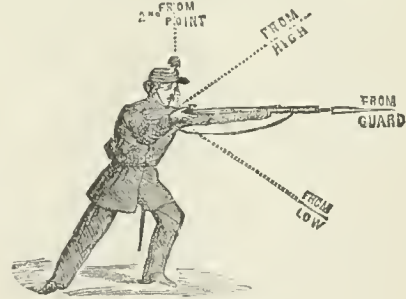


Fig. 8.

body, all the defensive motions of the bayonet are made. In 'guard,' the bayonet is brought nearly to a horizontal direction, level with the waist, and pointing towards the breast of an advancing enemy. Similarly, to 'guard,' the positions 'low,' 'high,' and 'second point' are assumed, the bayonet pointing as shown by the dotted lines in fig. 7. The butt of the rifle is always kept well to the right side, the hand behind the trigger-guard, and the whole body in attitude to offer great resistance. In 'low,' the barrel is turned downwards; but in all the other defensive motions it is held upwards. The position of the arms is in each case that which would naturally be taken in placing the bayonet and musket in the required direction.

The offensive position of the body is acquired by the extension of the right leg, and bending forward of the left without moving the feet. The butt of the rifle is at the same time pressed firmly to the shoulder. This position is called 'point,' and constitutes

an extension of the weapon in a direction parallel with either of those previously taken. As there were four 'guards,' so there are four points, which are shown in fig. 8. The barrel is in each case upward, and the motions for each are similar, except in pointing from '2d point,' when the rifle, seized by the right hand round the small of the butt, is thrust straight up above the head to the full extent of the arm, the left hand falling along the thigh, and the legs being straightened so as to form an isosceles triangle.

'Shorten arms' is a useful motion, both as a defence and as a preparation for a strong attack. It consists in carrying the butt back to the full extent of the arm, while the barrel (downwards) rests upon the thick part of the left arm. The body is thrown upon the right leg, and the left straightened. This powerful position is seen in the annexed cut.

In all the guards and points, and also 'shorten arms,' the bayonet may be turned directly to the front, to the right, or to the



Fig. 9.

left, as circumstances may suggest. In contending with a swordsman, the action of changing from right to left, when at the 'high' or 'low,' is sufficient defence against the ordinary cuts of the latter.

Among the treatises consulted for this article have been the works on fencing by Angelo and Roland, as well as the shorter instructions issued by the military authorities.

FENELON, FRANCIS DE SALIGNAC DE LA MOTHE, was born, August 6, 1651, in the château Fenelon, province of Périgord, now included in the department of Dordogne, of a family which has given many celebrities both to the church and to the state in France. His education was conducted at home up to his 12th year, when he was transferred to Cahors, and afterwards to the Plessis College in Paris. At the close of a most blameless collegiate career, he selected the church as his profession, and entered, in his 20th year, the newly founded seminary of St. Sulpice, then under the direction of the celebrated Abbé Tronson, where he received holy orders in 1675. Unlike but too many ecclesiastics of his own rank at that period, he gave his whole heart to his sacred calling. For some time after his ordination, he was employed in attendance at the hospitals, and in other parochial duties of the parish of St. Sulpice; and in the year 1678, he was named director of an institution recently founded for the reception of female converts to the Roman Catholic faith, in Paris. During his tenure of this office, he wrote his first work, *On the Education of Girls*, which is still a standard authority; and the gentleness, moderation, and charity with which he discharged his duties towards the young converts, led to his appointment as head of a mission, which, on the revocation of the Edict of Nantes in 1685, was sent to preach among the Protestant population of Saintonge and Poitou. In 1688, he resumed his duties in the Maison des Nouvelles Converties, at Paris; and in the following year, he was named by Louis XIV. to the highly confidential post of preceptor of his grandson, the young Duke of Burgundy. F.'s management of this most important and delicate trust showed how well he understood the true nature and objects of education. All his own instructions, and all the exercises enjoined upon his pupil, were so contrived, as, while they imparted the actual knowledge which it is the ordinary business of a master to communicate, at the same time served to prepare the mind and the heart of the pupil for what was to be the real business of his life, by impressing upon him a sense of the responsibility which awaited him, of the great principles of truth and justice upon which these responsibilities are founded, and of the hollowness and futility of all earthly glory, power, and happiness, which do not rest upon this foundation. To this wise design of the preceptor we are indebted for many works still popular in educational use; for the *Fables*, for the *Dialogues of the Dead*, for the *History of the Ancient Philosophers*, for the germ at least of the *Telemachus*, and for the *Life of Charlemagne*, the manuscript of which last work, unfortunately, was burned in the fire which destroyed the archiepiscopal palace of Cambrai in the year 1697. As an acknowledgment of these great merits, he was presented by the king, in 1694, to the Abbey of St. Valery, and in the following year, to the Archbishopric of Cambrai, which he only accepted on the express condition, that for nine months of each year he

should be exempted from all duties as preceptor of the prince, and left at liberty to devote himself exclusively to the care of his diocese. It is to this period of F.'s life that the history of the unhappy controversy about Quietism belongs.

Without entering into the details of this singular revival of the ancient Mysticism (see MYSTICISM), it will be enough to say that two separate schools of Quietism are to be distinguished, the moral character, or at least the moral tendency, of which was exceedingly different. See QUIETISM. In one of these, the common mystic principle of the absorption of the soul in the love and contemplation of God, led to the conclusion, that the soul, in this state of absorption, became entirely passive; that it was thenceforth independent of the external world; that it suffered no contamination from the material actions of the outer man, and that no acts of virtue, not even of prayer, were any longer required. See MOLINOS. The other school, while it maintained the theory of passive contemplation and love, yet repudiated the dangerous and immoral consequences which were deduced therefrom. It was exclusively the latter and less objectionable form of Quietism, the professors of which for a time claimed, although not the patronage, yet at least the indulgent consideration of Fenelon. He formed, in the year 1687, the acquaintance of the celebrated Madame Guyon, who may be regarded as the foundress of the French school of Quietism. See GUYON. The extraordinary piety and exemplary life of this remarkable woman, and his own natural bias towards the tender and lofty spirituality which she professed, appear to have blinded F. to the true nature and to the practical consequences of the system which she followed. Fully convinced of the unfairness of much of the outcry which was raised against her, and which made her responsible for all the principles of the grosser Quietism of Molinos, his generous mind was perhaps attracted to her cause by the very injustice of her opponents. He advised her to submit her works to the judgment of Bossuet, who was then in the zenith of his fame, and with whom F. was in the most friendly relations. In the condemnation of the book of Madame Guyon by this prelate, F. acquiesced; but as she made a formal submission to the church, he refused to join in any condemnation of herself personally. Nevertheless, when a commission was appointed to examine the whole affair, F., although not a member, took a part in the proceedings; and he even suggested certain changes in their report, which he subscribed in common with the rest. To the articles prescribed for her signature by this commission, Madame Guyon readily subscribed; but it was further considered necessary not only to publish a condemnation of her several works, but also to prepare a special exposition of the true doctrine of the church on these questions. When the work of Bossuet on this subject was completed, he submitted it to F. for his approval. This F. not only refused to give, but even composed his own *Maxims of the Saints in the Interior Life*, in explanation and defence of certain at least of Madame Guyon's doctrines. He submitted his book to the Archbishop of Paris, and introduced into it some modifications which were suggested by the diocesan censors, cheerfully agreeing to the stipulation of the archbishop, that it should be kept back from publication until the completion of the rival treatise of Bossuet, *On the States of Prayer*.

An unfortunate violation of this engagement, committed without the knowledge, and in the absence of F., was the last of a long train of causes which led to the painful and disedifying rupture between these two great prelates. F.'s book was received with much clamor, that of Bossuet was universally approved; and in the controversy which ensued, all the weight of the displeasure of the court, which F. had provoked by the covert strictures upon the existing state of things, in which he was believed to have indulged in his works of fiction, was brought to bear against him. He was ordered to submit his book to the judgment of an ecclesiastical tribunal, of which Bossuet was a member. F. refused to accept Bossuet as judge, on the ground that he had already prejudged the cause; and in the end he appealed to the judgment of the holy see. Unfortunately, even while the affair was pending at Rome, the controversy was still maintained in France. Bossuet published a succession of pamphlets. Several of the bishops who had espoused the side of Bossuet, issued pastorals in the same sense. F. defended himself vigorously against them all in several publications, explanatory as well of his principles as of the personal imputations in which some of his adversaries did not scruple to indulge. The last blow against the ancient friendship of the great rivals was struck by Bossuet in his celebrated *Relation sur le Quietisme*. F. was wounded to the heart. The copy of Bossuet's pamphlet which first came into his hands is still preserved in the British Museum; and the margin is literally filled with remarks, annotations, replies, denials, and rejoinders, in the singularly delicate and beautiful handwriting of the indignant archbishop. The copy now in the British Museum is most probably one which, as we learn from his correspondence, he sent to his agent at Rome, and on the margin of which he corrected, for the guidance of his friend, the many false and exaggerated charges of his great antagon-

gonist. The substance of these replies he gave to the public in a most masterly defence, written, printed, and published within little more than a fortnight from the appearance of Bossuet's *Relation*. From this point, the controversy assumed a more personal, and therefore a more acrimonious character; and it was maintained on both sides till the long delayed decision of the pope brought it to a close, March 12, 1699, by a brief, in the usual form, condemning the *Maxims of the Saints*, and marking with especial censure 23 propositions extracted from it. The conduct of F. under this blow constitutes, in the eyes of his fellow-churchmen, one of his highest titles to glory. He not only accepted, without hesitation, the decision of Rome, but he took the very earliest occasion to publish from his own pulpit the brief of his condemnation; he issued a pastoral address to his flock, to apprise them of the judgment of Rome, and of his own cheerful acquiescence; and he presented to his cathedral, a magnificent piece of church-plate, a gold ostensory, in which the Angel of Truth is represented trampling under foot many erroneous works, the most prominent of which bears the title of *Maxims of the Saints*! Bossuet is said to have been greatly touched by the conduct of his noble adversary, and to have earnestly desired a reconciliation. But the adverse influence of the king, Louis XIV., and of the court, stood in the way.

The jealousy with which the political principles of F. were already regarded was heightened about this time into open hostility by the appearance of his *Telemachus*, which was printed from a copy surreptitiously obtained by his servant, and which the king regarded as but a masked satire upon his own court: Sesostris being supposed to represent the Grand Monarque himself; Calypso, Madame de Montespan; Protesilaus, Louvois; and Eucharis, Mademoiselle de Fontanges. Louis's anger knew no bounds. F. was strictly restrained within his diocese; measures were taken to give the condemnation of his book every character of publicity; and what wounded him most of all, all intercourse with him, whether personal or by letter, was forbidden to his old and much-loved pupil, the Duke of Burgundy. From this date, F. lived exclusively for his flock. He founded at Cambrai a seminary for his archdiocese, which he made his own especial charge. He was assiduous in preaching, and in the discharge of the other duties of his office; and the fame of his benevolence, charity, and enlightened liberality is attested by the order given in the campaign of 1709 to spare the palace and the stores of the Archbishop of Cambrai. The only later controversy in which he appears is the revival of the Jansenistic dispute in the well-known form of 'The Case of Conscience' (see JANSEN), in which F. engaged earnestly on the side of orthodoxy. Notwithstanding the prohibition of his grandfather, the young Duke of Burgundy retained all his old affection for his preceptor; and the highest hopes were entertained as to the future career of the pupil of such a school. These hopes were unfortunately cut short by the premature death of the duke in 1712. F. survived him but a short time. He died January 7, 1715.

The works of F. are very voluminous. The latest collected edition extends to twenty 8vo volumes, and embraces every variety of subjects—theology, philosophy, history, literature, ancient and modern, oratory, especially the eloquence of the pulpit, asceticism, and spirituality in all its branches. His correspondence is very extensive and most interesting. Of his early sermons (one of which was delivered in his 15th year), a volume was printed in 1744. Of his mature discourses, two only have reached us in a finished state. They are of the very highest order of sacred eloquence. Of the rest, we can only judge from the skeletons which it was his habit to prepare with great exactness, and of which very many have been preserved. His literary and historical works, many of which were composed for the instruction of his pupil, are filled with allusions and suggestions illustrative of the principles of government and of the relative duties of sovereigns and subjects, far in advance of the time in which he lived. His work on the *Temporal Power of the Medieval Popes* presents that doctrine in a form which divests it of many of those characteristics which are most objectionable in the eyes of Protestants; and even his spiritual writings in general may be read, and indeed are not unfrequently read, not only without offence, but even with positive advantage, by Christians of all denominations. See Card. Bausset's *Histoire de Fenelon* (3 vols. 1808-9); also the *Vie de Bossuet* of the same author. See also the Life prefixed to the collected edition of the *Ouvrages de Fenelon*; the voluminous correspondence contained in that collection; *Vie de Fenelon*, by M. Gosselin; Wunderlich's *F.* (1873) and Hummel, *Das Leben F.'s* (1873).

FENESTELLA, or FENESTRELLA, a genus of Polyzoa, resembling the recent 'lace coral,' very common in Palaeozoic rocks, from the Lower Silurian to the Permian. Thirty species have been described.

FENIAN SOCIETY, a political association of Irish or Irish Americans, the object of which is the overthrow of the English authority in Ireland, and the establishment of a republic. The etymology of the name has been the subject of some discussion.

It is traced to the ancient Irish military organization called Fionna Eirinn, which took its appellation from the celebrated hero of Irish legend, Finn (or Fionn) MacCumhail. The accounts of this renowned hero, with which the bardic literature of Ireland abounds, are most curious. It was designed as a national militia, and its origin is ascribed, by Keating, to Sedna II., who was monarch of Ireland about 400 years B.C. In time of peace it consisted of three bodies, each formed on the model of a Roman legion, and consisting of 3000 men; but in war, it was capable of being enlarged to any required limit. Candidates for enrolment were required to be of an honorable family, to be irreproachable in morals, and to bind themselves to observe the laws of justice and morality; they were required to be of a certain height, and strong, supple, and vigorous of body; each being submitted, before enrolment, to an ordeal, in which his powers of speed, strength, endurance, and courage were tested by trial with his future comrades. The bardic accounts of some of those conditions are extravagant and amusing in the highest degree, but the generally historical character of the institution is unquestionable; and it subsisted until the reign of Carbery, son of Cormac MacArt, by whom the body of Fionna Eirinn was disbanded, and the members having, in consequence, transferred their allegiance to Mucorb, king of Munster, suffered an almost total extermination in the battle of Gavra, 284 A.D., which formed the theme of many a bardic poem from the days of Oisín (known in Gaelic legend as Ossian), son of Finn MacCumhail, downwards.

Adopting the name of this ancient military association, the modern Fenians (or Finians) are a secret association for the purpose of overthrowing the alien ascendancy of the Saxon, and of restoring to the ancient Celtic population their legitimate status and influence in their native country. It had its first seat in America, where the Irish population has largely increased since the famine of 1846-1847. Many of the emigrants being driven from their homes by arbitrary ejection, or from inability to pay rent, carried with them a sense of bitter wrong, which prepared them for almost any enterprise which seemed to promise revenge. Others had been sympathisers, if not participants in the insurrection of 1848; and almost all were deeply imbued with general political and social discontent. By all these, the prospect of a secret organization for the establishment of Irish independence was eagerly accepted. The most openly active seat of the organization was in the western states, especially Chicago; but the movement was directed from New York, and possessed ramifications in almost every city of the Union. It was conducted by a senate, and consisted of 'circles,' each directed by a center.

The duty of the centers was to enrol members, who bound themselves, generally by oath, 'to be faithful to the Irish Republic as at present virtually established;' to instruct and practise them in military exercises; to raise funds for the purposes of the association, especially for the purchase of arms and munitions of war; and to extend the organization by every means at their disposal. Agents were sent into Ireland, and to the chief seats of the Irish population in England; and while the work of secret enrolment was industriously carried on in Ireland, measures were openly concerted in America, as well for the raising of funds by private contributions, as for the purchase of arms and military stores. Opportunely, too, for the purposes of the enterprise, the termination of the civil war in America set free a large number of military adventurers who had served as privates or as officers in one or other of the American armies, and whose experience of service was turned secretly, but most actively to account in the training of the young recruits enrolled in the Fenian conspiracy in Ireland. Newspapers, moreover, both in America and in Ireland, were established or subsidized for the purposes of the conspiracy; and journals, broadsides, ballads, and other inflammatory publications were largely circulated among the peasantry and artisans. Taverns, alehouses, and other places of entertainment were the ordinary places of meeting; and one of the most formidable of the plans of the conspiracy was an organized attempt to seduce the Irish soldiers from their allegiance, and to prepare the way for their deserting to the ranks of Fenianism, when it should have reached the expected degree of maturity. It became apparent, moreover, that in this, unlike almost all similar movements, pains were taken by the organizers to exclude the Catholic clergy, by whom the Fenian confederation had from the first been steadily resisted, from all knowledge of its character and objects, as well as of the names or number of its members in the several localities; and many of the most active of the leaders were distinguished by the freedom of their religious opinions, and by their unconcealed disregard of clerical authority.

For a time, these designs were carefully concealed and even when a certain publicity was given to them, the scheme appeared so wild and impracticable that it was regarded as an attempt on the part of a body of unprincipled adventurers, to practise upon the patriotic susceptibilities of the ignorant and excitable Irish, especially in America. By degrees, however, the movement acquired more solidity, and the government ascertained by reliable information

that Fenianism, however corrupt in some of its sources, and however wild and extravagant in its aims, was nevertheless a reality with which it had become necessary to grapple. Measures were taken with great promptness and determination. The Habeas Corpus Act having been summarily suspended, all the known leaders in Dublin and in the provincial districts of Ireland (most of them Irish Americans) were at once placed under arrest. The chief journal of the conspiracy was suppressed and seized; additional troops were moved into Ireland, and other measures of repression were vigorously carried out.

By these energetic measures, public tranquillity was maintained in Ireland; and although prosecutions were instituted, and a few individual conspirators convicted, so universally was the movement condemned by the public opinion of the country, that most of the prisoners were discharged, on condition of their leaving Ireland. But although thus in appearance extinguished, the embers of discontent continued to smoulder among the poorer peasantry and the working population of the towns; and a certain prestige was given to the fallen cause by the escape from prison, under circumstances of much mystery and a high degree of romance, of the most active and crafty of the leaders of the conspiracy. His return and that of other exiles to America renewed the agitation in that country. In the early summer of 1866, a raid was attempted into Canada, and although it proved so utter a failure as to cover its projectors with ridicule, an organization was secretly pursued, both in America and in Ireland, which resulted, in the spring of 1867, in an insane and utterly abortive attempt at insurrection at home. The plan of the conspirators was to seize the castle and military stores at Chester, and, having cut off telegraphic communication, to convey these arms to Dublin, and effect, throughout the country, a simultaneous rising in concert with the enterprise at Chester. The attempt was defeated through the treachery of one of the conspirators, by whom the plot was revealed. A partial insurrection, however, took place concurrently with the intended attack on Chester, in the county of Kerry; and a few weeks later, a more extensive movement was attempted in the counties of Dublin, Louth, Tipperary, Limerick, and Cork. But the persons engaged in it were for the most part either American and Irish-American adventurers, or artisans, day-laborers, mechanics, generally unprovided with arms, and in many cases scarcely beyond the years of boyhood. The only military enterprises undertaken by them consisted in a series of attacks on the barracks of the rural constabulary, in almost every instance unsuccessful; most of the parties dispersed, or were made prisoners after a single night's campaign. The rest betook themselves to the mountains, and after a few days of exposure and hardship, in which they managed to evade pursuit, and carefully avoided all encounter with the military, they were either captured or dispersed. The leaders were tried at a special commission held within the spring of the year 1867, and tranquillity for a time seemed to be restored in Ireland. Much discontent, however, still continued to exist; and as the foreign organization was uncontrolled, and was still maintained, it remained as a standing element of danger, and a persisting incentive to domestic disaffection. Considerable alarm was created in England and Scotland by the extent and daring of the organization among the Irish population of the large manufacturing towns. In September 1867, an attack was made, in open day, on a police-van in Manchester; the officer in charge was killed, and the prisoners, who were suspected Fenians, were released. A few weeks later, a still more daring attempt was made to blow down Clerkenwell Prison wall, with the same object. Alarms were circulated of intended burnings in the cities and towns; gunsmiths' shops and even government stores of fire-arms were broken open and pillaged; and a vague but widespread feeling of apprehension was for a time created. In 1869, the Fenian brotherhood was formally chartered in the United States under the Act for incorporating benevolent societies.

The U.S. government in 1871 frustrated another Fenian raid on Canada by the apprehension of its leaders and the seizure of its arms. At the tenth congress of the brotherhood in 1871, it was reported that in about twelve years above 626,000 dollars had been raised, of which 425 000 were expended 'for Irish revolutionary purposes direct.' Gradually the Fenian prisoners whose offence was political merely were released. The disestablishment of the Irish Church in 1869 and the Land Act of 1870 removed grievances; the action of the Home Rule party (see HOME RULE) was kept within constitutional bounds. In October 1879, the extreme section of the Home Rulers constituted the Land League, which formally insisted on fixity of tenure, fair rents, and free sale (of tenant right); and demanded, publicly but unofficially, the stoppage of all evictions and the abolition of 'landlordism.' The agitation conducted by this body was accompanied by armed intimidation and outrage. Its funds came mainly from America, and were understood to be largely derived from Fenian sources. The *Skirmishing Fund* was promoted by an Irish party in the U.S. who advocated the free use of dynamite for the destruction of English public buildings and English commerce. The 'Patriotic

Brotherhood' seems to have been one of several societies sprung from the Fenian Society; and many of the 'Invincibles' who were to 'make history' by removing tyrants, and were the chief agents in the assassinations of the Irish Secretary and others in 1881 and 1882, had been Fenians.

FE'NNEC, or ZERDA (*Megalotis*), a genus of *Canidae*, peculiar to Africa, resembling foxes in general form and in the bushy tail, but having eyes adapted for diurnal and not for nocturnal vision, and remarkably large ears. The species are small and beautiful. They feed partly on dates and other vegetable food, also on eggs, and on insects, which they adroitly snap as they pass.

FE'NNEC (*Feniculum*), a genus of umbelliferous plants, allied to Dill (q. v.), but distinguished by the cylindrical strongly ribbed fruit. The flowers are yellow. All the species are aromatic, and have much divided leaves with thread-like segments. The best known is the COMMON F. (*F. vulgare*), a native of the south of Europe and of some parts of England. It is a biennial, three or four feet high, and is cultivated in gardens, chiefly for the sake of its leaves, which are boiled, and served up with mackerel, with salmon, and occasionally with other kinds of fish, or are employed to form a sauce for them.—SWEET F., ITALIAN F., or CRETAN F. (*F. dulce*), is a plant of much humbler growth, and annual, much cultivated in the south of Europe, but too tender for the climate of Britain.

The young sprouts from the root are sweeter and less aromatic than those of Common F., and when blanched, are a very agreeable salad and potherb. The fruit (seed) is longer and paler than that of Common F., has a more agreeable odor and flavor, is the favorite aromatic condiment of the Italians, and is used in medicine as a carminative and aromatic stimulant. Oil of F., an aromatic stimulant, and carminative essential oil, is also made from it.—CAPE F. (*F. Capense*), found in the interior of the Cape of Good Hope, has a thick, aromatic, esculent root.—The PANMUHOREE of India (*F. panmorium*) is a species of F. much cultivated in its native country for its sweet, warm, and aromatic fruit, which is much used as a carminative, and in curries.—The GIANT F. of the south of Europe is a plant of a different genus (*Ferula*), and abounds in a fetid juice. It is indeed closely allied to asafetida, but forms a favorite food of buffaloes in Apulia, where it particularly abounds. The dry dead stem is full of a white pith, which is used in Sicily as tinder.

FENS. See BEDFORD LEVEL.

FE'NUGREEK (*Trigonella*) a genus of plants of the natural order *Papilionaceae*, sub-order *Leguminosae*, allied to clover and melilot. The leaves have three obovate leaflets and scythe-shaped stipules. The flowers generally have the keel very small, so that the wings and standard present the appearance of a tripetalous corolla. The COMMON F. (*T. fenum Græcum*) is a native of the south of Europe, and of some parts of Asia; it is much cultivated in India as a fodder-plant, and derives its name (*Fenum Græcum*, Greek hay) from its use as fodder in Greece. Its pods are many-seeded, and cylindrical; its seeds have a strong peculiar smell, and an oily bitter taste; the flour made from them is used for emollient poultices, but only in veterinary practice. The seeds of F. were formerly held in great esteem in medicine.—Another species (*T. incisum*), growing spontaneously in many parts of India, is much used as fodder for cattle. The legumes of the ESCULENT TRIGNELLA (*T. esculenta*), also an Indian plant, are used as human food.



Fenel (*Feniculum vulgare*):
a, a flower.



Fenugreek (*Trigonella fenum
Græcum*).

One species only, the BIRD'S FOOT F. (*T. ornithopodioides*), is a native of Britain, a small plant, growing in sandy pastures near the sea, and not very common.

FENYES, ELEK (Alexius), a Hungarian geographer and statistical author, was born in 1807 at Csokaj, in the county of Bihar. After the usual career of studies in philosophy and law, F. became barrister-at-law as early as 1829; but instead of frequenting the law-courts, he began traveling all over the country, with the purpose of making himself thoroughly acquainted with the state of the Hungarian kingdom, of which there had never before been an authentic survey. The first fruits of F.'s enterprise appeared in 1840, under the title, *Hungary and its Annexed Parts, Geographically and Statistically considered* (6 vols., Pesth). The great prize of 200 ducats was awarded to the author by the Hungarian Academy. *The Statistics of Hungary*, in 3 vols., followed (1843); *General Atlas for Hungary* (1845); *Description of Hungary* (1847); *Geographical Dictionary of Hungary* (1851)—all of which were published at Pesth. The whole of F.'s works are written in the Magyar tongue, but several of them have been translated into German, and repeatedly published. Besides that these works are the first true exponents of the state of Hungary, it is also generally admitted that, as to their completeness, solidity, and exactness, they will bear a comparison with the best of kindred works in European literature. During the national government of Hungary (1848), F. was made the chief of the statistical section. After a respite of several years, from failing health, F. again busily engaged for a time in the periodical press as editor of an agricultural paper, but soon retired finally into private life.

FEODO'SIA, or THEODO'SIA. See KAFFA.

FEOFFMENT (*inféudare*), the oldest, and for a long period the only, method for the conveyance of land in England. Feoffment consisted in the formal conveyance of the land from the feoffor to the feoffee, the former stating distinctly the measure of the estate conferred, whether it was in fee, in tail, or for life. Where no mention of the duration of the estate was made, the gift was presumed to be for life. This conveyance of the land, in order to be complete, required to be accompanied by delivery of *Sasine* (q. v.). Livery of *sasine* was of two kinds—viz., by deed, and in law. In the former case, the parties being actually upon the land, the feoffor, by delivery of a twig, or a turf, testified his conveyance of the land. In livery in law, the parties being in sight of the land, the feoffor, referring to the land gave possession to the feoffee. This mode of feoffment was ineffectual unless the feoffee entered into possession during the life of the feoffor. Livery in deed might be effected by attorney; but livery in law only by the parties themselves. In the earliest times, these ceremonies completed the conveyance. But by degrees the practice of embodying the transaction in a deed was introduced. When a deed was used, it became customary, but not essential, to endorse on the deed the fact that livery of *sasine* had been made. By the statute of Frauds (29 Car. II. c. 3), it was declared that no estate created by livery of *sasine*, unless accompanied by writing, signed by the party or his agent, should be of any effect, except as an estate at will, and by 8 and 9 Vict. c. 106, s. 3, a feoffment is void unless accompanied by deed.

The law formerly gave so great an effect to a feoffment, that even when the party ostensibly making the conveyance was not lawfully seised in the estate, the feoffment was sustained. This was called a tortious conveyance; the party in whose favor it was made was said to have acquired an estate by wrong, the rightful owner was disseised, and was left to his right of Entry (q. v.). But by the act last mentioned, this tortious effect of a feoffment was removed. It must be observed that the practice of feoffment above described, and which has existed in England from time immemorial, differed materially from the old form of investiture in use in strictly feudal times, and from that which still prevails in Scotland. In England, the transaction was simply a conveyance by the actual holder of the land to a new tenant, testified by certain ceremonies, but requiring no confirmation by a third party to complete it. But by feudal usages, every holder of land was the vassal of some superior lord, to whom he owed suit and service, and without whose consent he could not even part with his land; hence no conveyance was complete without the reception of the new tenant by the lord paramount as his vassal. In like manner, to this day, in Scotland, no transfer of heritage is complete without the formal confirmation of the superior; and although by recent legislation the old feudal usages, which for two centuries have existed as landmarks, telling us of a system now passed away, have been abolished, yet the fact of acceptance by the superior, and the performance of the pecuniary services attendant on that acceptance, are still preserved. See INFEEFMENT, SASINE, FEUDAL SYSTEM.

Feoffment to Uses.—This was an application of the feudal form of feoffment in England in order to effect a conveyance in trust. The common law courts, adhering to feudal rules, refused to recognize any interest in the land but that of the person actually

infeft; but where a feoffment was made to one man to the use of another, the equity courts gave effect to the transaction by compelling the party infeft to hold in trust for the third person, called the *cestui que use*, who was said to have an equitable estate, in contradistinction to the legal estate which remained in the feoffee to uses. By the statute of Uses, it was enacted that in all such conveyances the actual legal estate should pass to the *cestui que use*. See USES.

FER OLIGISTE is a mineralogical term applied to a variety of anhydrous red oxide of iron (Fe_2O_3), otherwise called *Specular Iron Ore*. The famous Swedish, Russian, and Elba iron are in greater part prepared from this iron ore. The natural position of fer oligiste is in the primary rocks. See IRON.

FERÆ (Lat. *ferus*, wild), in the Linnean system of zoology, an order of *Mammalia*, nearly corresponding to the *Carnaria* (q. v.) of Cuvier.

FERÆ NATURÆ (Lat. of a wild nature). Those animals which flee the dominion of man, whether beast, bird, or fish, and retain their natural freedom, are thus characterized in the Roman law. According to that system, such animals became the property of any one who might catch them, irrespectively of the ownership of the soil on which they were taken, on the principle that 'natural reason gives to the first occupant that which has no owner.'—*Inst. ii. tit. i. s. 12*. But this regulation did not prevent the prohibition of trespass. 'Of course, any one who enters the ground of another for the purpose of hunting or fowling, may be prohibited by the proprietor, if he perceives his intention of entering' (*Id.*). This right on the part of the proprietor did not affect the property of the animal taken, though it gave him an action against the trespasser.

If a wild animal escaped from its captor, his proprietorship instantly ceased, and the animal might again be appropriated by its captor. This occurred even though the animal was not out of sight, if it could not be pursued without great difficulty. Even a wounded animal was not the property of the sportsman till it was caught, though the point which is decided in this sense (*Inst. ii. tit. i. s. 13*) is said to have been one on which difference of opinion had prevailed. Except in so far as it is modified by the statutes, which will be explained under GAME-LAWS, these provisions form part of the common law both in England and Scotland. Animals which are said to be *feræ naturæ*, or of a wild and untamable disposition, any man may seize upon and keep for his own use or pleasure; but if they escape from his custody, though without his voluntary abandonment, it naturally follows that they return to the common stock, and any man else has an equal right to seize and enjoy them afterwards (Stephen's *Blackstone*, i. 161). The law of Scotland followed the law of Rome so closely in this, as in other respects, that the passage from the *Institutes* of Justinian above referred to was translated into one of the oldest collections of Scottish laws—that, viz., contained in the *Cromortie MS.*, the date of which may be assigned to the latter part of the 14th c., and which certainly is not later than the reign of Robert III. (Irvine's *Game-laws*, p. 20, and statutes published by the Record Commission, Appendix v. p. 385); see also *Stair*, ii. 1, 5, and 33; and *Ersk. ii. 1, 10*. Under animals, *feræ naturæ*, the law of Rome included *bees*, unless included in a hive, or *skep*, as it is still called in Scotland, or unless the proprietor be in pursuit of them, and has kept them in sight. See BEE. Domestic animals, though they stray, do not cease to be the property of those to whom they have belonged, but as regards animals which have a tendency to return to a state of nature, the rule of the Roman law was, that property in them continued so long as they had the intention of returning (*animus revertendi*), or rather, one would imagine, the habit of doing so. This rule applied to peacocks and pigeons, but not to fowls and geese; with reference to which it was provided, that though they should be frightened and take to flight, they were still yours, though you might have lost sight of them, and that whoever detained them with a view to his own profit, was guilty of theft. See DOVECOT, WARREN, FOREST-LAWS; FISHES. ROYAL.

FERDINAND I., emperor of Germany, 1556—1564, was born in Spain, 1503. He was the son of Philip I., and brother of Charles V., whom he succeeded in the empire in 1556, having been previously elected king of Rome. F. had married, in 1521, Anna, daughter of Ladislaus VI., king of Bohemia and Hungary. When her brother Louis fell in 1526 in the battle with the Turks, leaving no issue, the crown was claimed by F. in right of his wife. This involved him in a long and bloody struggle with a rival, John of Zapolya, who laid claim to Hungary, and who, as well as his son Sigismund, was supported by Soliman, sultan of the Turks. F. at last gained the upper hand, bought off the Turks by a yearly tribute, and finally secured Hungary and Bohemia to the House of Austria. When he was elected emperor, the concessions he had made to the Protestants caused the pope, Paul IV., to refuse to acknowledge him. That pope dying, his successor, Pius IV., was more complaisant, but the electors re-

solved that for the future the consent of the pope should not be asked; and this was carried out. F. made several attempts to reconcile the Protestants and Catholics, and urged, though fruitlessly, the reformation of abuses on the Council of Trent. He died in 1564, leaving the reputation of a prudent and enlightened ruler, and was succeeded by his son, Maximilian II.

FERDINAND II., emperor of Germany, 1619—1637, was born at Gratz, 9th July 1578. He was grandson of Ferdinand I., his father being Charles, Archduke of Styria, the younger brother of Maximilian. F.'s mother, Maria of Bavaria, early inspired him with hatred against the Protestants. He was educated by the Jesuits at Ingolstadt, along with Maximilian of Bavaria; and at Loretto, he had taken a solemn oath, before the altar of the Mother of God, to reinstate Catholicism as the sole religion of his dominions, at any cost. As soon as he succeeded to the government of his own duchy of Styria, he set about putting down Protestantism by force. He attempted the same in Bohemia and Hungary, of which countries he had been elected king during the lifetime of Matthias Corvinus; but though at first unsuccessful, and even in danger of losing his dominions, he ultimately managed, with the aid of the Catholic league and of the Elector George I. of Saxony, to subdue them. Bohemia lost all its privileges. By hanging, confiscation of property, and the banishment of innumerable families, the wretched land was reduced to obedience; and the introduction of the Jesuits, and rigorous persecution of the Protestants, re-established Catholicism. Meanwhile, F. had been elected emperor of Germany (1619). The war, which properly ended with the subjugation of Bohemia, was at the same time transferred to the rest of Germany, and took the character of a religious war—the famous 'Thirty Years' War' (q. v.). The two imperial generals, Tilly and Wallenstein, were opposed by a confederacy of the Protestant states of Lower Saxony, with Christian IV. of Denmark at their head; but the confederates were defeated by Tilly at the battle of Lutter, in Brunswick, and forced to conclude peace (Lubeck, 1629). Confident in the ascendancy which he had acquired, F., in the same year, issued an Edict of Restitution for the whole of Germany, taking away from the Protestants nearly all the rights they had acquired by a century of struggles; and the troops of Wallenstein and of the league were immediately set to work to carry it out in several places. But further proceedings were soon arrested by the dismissal of Wallenstein, on which the diet of the empire at Regensburg had insisted; and by the opposition of Richelieu, who put every wheel in movement to curb the power of the House of Austria. At this time also, a formidable opponent to the schemes of the emperor appeared in the person of Gustavus Adolphus of Sweden (q. v.). After the murder of Wallenstein, the connivance at which is an ineffaceable blot on F.'s memory, the imperial commander, Gallas, gained, 1634, the battle of Nordlingen, which had the effect of detaching Saxony from the Swedish alliance; but the ability of the Swedish generals, for whom Austria had none that were a match, and the open part that France now took in the contest, brought back the balance of victory so far to the Protestant arms, that when F. died, February 15, 1637, he had given up the hope of ever attaining his objects. His reign is one of the most disastrous in history; for Germany owes him nothing but bloodshed, and misery, and desolation.

FERDINAND III., emperor of Germany, 1637—1657, the son of Ferdinand II., was born 11th July 1608. He was not so much under Jesuitical and Spanish influence as his father. Having accompanied the armies in their campaigns after the death of Wallenstein, he had witnessed the miseries of war, and was inclined for peace; but the conflicting interests of the individual belligerents hindered any unity of view, and made it necessary to proceed with the contest. Thus was this miserable war protracted, ever extending in circuit, and increasing in devastation owing to the growing licentiousness of the soldiery. At last, in 1643, a congress met at Münster to arrange terms of peace, which was concluded in 1648, and is known as the Peace of Westphalia. At the diet of the empire, 1653—1654, the last presided over by an emperor in person, F. effected important alterations in the administration of justice. He died, 20 April 1657, shortly after concluding an alliance with Poland against Sweden. His son, Leopold I., succeeded him in the German empire.

FERDINAND I., emperor of Austria (1835—1848), eldest son of Francis I. by his second marriage with Maria Theresa of the House of Naples, was born at Vienna, 19th April 1793. He was from the first of a weak constitution, and was unfortunate in those to whom his education was intrusted. Yet he showed on all occasions a goodness of heart, which was fostered by the example of his uncle, the Archduke Charles, to whom he was much attached. While crown-prince, he traveled through his Italian provinces, Switzerland, and part of France, and took great interest in manufacturing industry. In 1835, he succeeded his father on the throne. It was expected from his character that he would inaugurate a more liberal policy than his predecessors had pursued,

but the absolutist principles that seem destined to rule for ever the Austrian cabinet, triumphed, and Metternich was allowed to carry on the government. It now became obvious that F. sadly lacked moral decision, and his 'goodness' exhausted itself in numerous acts of clemency and benevolence. Nevertheless, during his reign, the industry of Austria made a great advance, and the great network of railroads and highways was begun. The insurrection in Galicia, 1846, led to the annexation of Cracow to Austria. No country was more effected by the European movement that began in the winter of 1847—1848 than Austria, though the revolutionary storms that shook the empire cannot be attributed to any want of good-will to his people on the part of Ferdinand, but only to a complete want of political wisdom. On the disturbances breaking out in March, he consented to the dismissal of Metternich, the appointment of a responsible ministry, and granted the outlines of a constitution. In May, he retired with his court to Innsbruck, but was induced to return to the capital in August. At last, the October insurrection in Vienna made him again leave the palace of Schönbrunn, and retire to Olmütz, where, on 2d Dec. 1848, he abdicated in favor of his nephew, Franz Joseph. He afterwards resided at Prague, where he died, June 29, 1875. He married, 27th February 1831, Caroline, daughter of Victor-Emmanuel I., king of Sardinia, but had no children.

FERDINAND THE CATHOLIC, 5th of Castile, 2d of Aragon, 3d of Naples, and 2d of Sicily, was born 10th March 1452. He was the son of John II., king of Navarre and Aragon; and in 1469 married, at Valladolid, Isabella, sister of Henry IV. of Castile. Even in the lifetime of his father, events were paving the way for the subsequent union of the two kingdoms of Castile and Aragon. On the death of Henry IV. of Castile in 1474, the Cortes refused to acknowledge the legitimacy of his daughter Juana, and proclaimed Isabella and her husband F. joint-sovereigns. A war ensued, in which they were completely successful. In 1479, F. becoming king of Aragon on the death of his father, the two kingdoms of Aragon and Castile were united in the persons of F. and Isabella. Isabella, however, as long as she lived, maintained her position as queen of Castile, and allowed her husband no other share in the government than the privilege of affixing his signature to the decrees, and of uniting his arms with her own. F.'s whole reign was an uninterrupted series of successful wars. In Castile, he distinguished himself by the effectual suppression of the banditti, who had become formidable in the confusion resulting from the civil wars. This he accomplished by re-organizing and putting in force against them the *hermandad*, or brotherhood, a kind of Spanish militia, composed of the citizens and the country-people. But F., whose craft and vigor were quite Machiavelian, was not content with taking strong measures against the Castilian outlaws; he also resolved to break the power of the feudal nobility, and made good use of the *hermandad* in carrying out this design. Cities and towns were encouraged to make themselves independent of the nobles, who were deprived of many important privileges. Among other humiliations, they were subjected to the ordinary tribunals of justice. The establishment of the Inquisition in 1478—1480, although primarily and mainly intended to further 'religious' ends, likewise helped to lessen their influence. F. also strengthened his power by vesting in himself and his successors the grand-mastership of the military orders of Calatrava, Alcantara, and Santiago. In all his schemes, F. was ably seconded by his queen Isabella, and by the celebrated Cardinal Ximenes. The year 1492 was the most brilliant in his reign, and is one of the most important in the history of the material progress of the world. It was signalized by the discovery of America by Christopher Columbus, though the honor of having aided the great navigator belongs not to F., but to Isabella. The same year witnessed the capture of Granada, and the retreat of the last Moorish monarch into Africa. F., who had a true Spanish hatred of heresy, immediately issued an order for the expulsion of the Jews from the conquered kingdom; and, in consequence, 160,000—some say 800,000—of his new subjects were compelled to scatter themselves over Europe. This act was neither wise nor Christian, but it was in accordance with the religious barbarism of the age, and especially of Spain.

It was followed, several years after, by the persecution and expulsion of the Moors—an act still more unwise than the former, for the Moors of Granada were unquestionably the most industrious, civilized, and refined inhabitants of the Peninsula. F. was as successful abroad as at home. He was victorious over Alfonso V., king of Portugal; while his general, Gonzalvo de Cordova, twice wrested Naples from the French—the second time in 1503—after which it remained permanently in F.'s possession. In the following year, Isabella died; and in 1505, he married Germaine de Foix, a niece of Louis XII. of France. He took part in the famous league of Cambrai formed against Venice in 1508; made himself master of various towns and fortresses in Africa; and in 1512, conquered the kingdom of Navarre; thus becoming monarch of Spain from the Pyrenees to the Rock of Gibraltar.

He died at Madrigalejo, January 23, 1516; and was succeeded by his grandson, Charles V. To F. and Isabella Spain owes her unity and greatness as a nation; and, in the no less skilful hands of their successor, she exercised an imperial influence over Europe, which it required Luther and the Reformation to check. See Prescott's *History of the Reign of Ferdinand and Isabella of Spain* (1838).

FERDINAND VII., king of Spain, born 14th October 1781, was the son of King Charles IV. and the Princess Maria Louisa of Parma. Although he had the advantage of excellent preceptors, especially the Canon Escoiquiz, in his youth, yet the machinations of the notorious Godoy, minister of Spain, prevented him from enjoying any opportunities for the intelligent exercise of his faculties. A deliberate attempt was made by his mother and Godoy to degrade him into a lover of mere animal pleasures, that their influence and authority might be unrestrained. F. soon conceived an aversion to the minister, which was increased by his marriage in 1802 with the amiable and accomplished Maria Antonietta Theresa, daughter of Ferdinand I, king of the Two Sicilies. This lady, who endeavored to maintain her husband's dignity, died, 21st May 1806, of grief, as is supposed, at the insults offered to her by Godoy, the king himself, and above all by the queen. Suspicions of foul play, however, were entertained by Ferdinand. Mainly for the purpose of gratifying their hatred towards Godoy, a number of the nobles, headed by the Duke of Infantado, assembled round the crown-prince. A false step that the latter now took proved the beginning of great misery to Spain. By the advice of the Canon Escoiquiz, he wrote a letter to Napoleon, in which he expressed a wish to marry the eldest daughter of Lucien Bonaparte. This letter fell into the hands of the minister himself, and the prince was in consequence arrested in the Escorial, 28th October 1807, and declared a traitor by a royal proclamation, written in Godoy's own hand, and addressed to the Council of Castile. The animosity of the people towards the minister led to the revolution of Aranjuez, and the king abdicated in favor of F., 19th March 1808. Almost immediately, after, however, Charles wrote to Napoleon, declaring his abdication to be forced. Napoleon, who had designs of his own upon Spain, refused to recognize F. as king, but sent him an invitation to meet him at Bayonne.

In spite of all warnings to the contrary, F. repaired to Bayonne, at which place he arrived on the 20th April, and was received with distinction by Napoleon. Meanwhile, however, the French troops under Murat had marched across the Pyrenees, and taken possession of the Spanish capital. The wretched squabbles and recriminations that now took place between Charles and his son, and which were encouraged by Napoleon, ended in F.'s renouncing the crown of Spain unconditionally, receiving for himself and his posterity an annual income of 600,000 francs from the crown revenues of France, and likewise the palace and parks of Navarre. The château of Valençay, belonging to Prince Talleyrand, was assigned to him as a residence, along with his brother Don Carlos, his uncle Don Antonio, the Canon Escoiquiz, and the Duke of San Carlos. Here his proceedings were watched with the utmost vigilance; and it was not till the end of the year 1813, when the splendid series of British triumphs in the Peninsula had made a longer occupation of the country by the French impossible, that Napoleon offered to reinstate him on the throne of Spain. On the 14th of March, F. returned to Spain, where he was received with every demonstration of loyalty and affection. Very unfortunately for Spain, and also for his own comfort, F. had, in the meantime, learned to associate liberalism with Jacobinism, and both with Bonapartism, so that, on his reaccession to power, he threw himself into the hands of the clergy and the reactionary portion of his nobility. Even before his arrival in Madrid, he refused to swear or accede to the constitution of the Cortes, as interfering too much with the free exercise of regal authority, though he promised another in its place. From the moment, however, that he assumed the reigns of government, a series of transactions took place which excited the astonishment and disgust of all liberal-minded politicians in Europe. Instead of the promised constitution, there commenced a fearful system of persecution against all who were suspected of holding liberal opinions; and executions, imprisonment, exile, and confiscation of property reigned in all parts of the kingdom. The monastic orders, the Inquisition, and the rack were restored, and every expression of opinion rigorously repressed. At length, in January 1820, an insurrection broke out, and F. was compelled to restore the constitution of the Cortes of 1812; but the French government interfering by force of arms, absolutism was restored in Spain in 1823. In 1829, F. married the notorious Maria Christina. She was his fourth spouse. By the first three, he had no children. Maria, however, bore him two children: Isabella II., the late queen of Spain, and the Infanta Maria Louisa, who married the Duke of Montpensier. By the influence of Maria Christina, F. was induced to abrogate the Salique law excluding females from the

throne, and restore the old Castilian law of cognate succession. This step led to a dangerous combination among the adherents of the king's brother, Don Carlos, even during the lifetime of the former, and after his death, to a civil war. See **DON CARLOS, ESPARTERO**, &c. On the 20th June 1833, the deputies, Cortes, and grandees of the kingdom took the oath of fealty, and did homage to the Princess of the Asturias, and F. died on the 29th September of the same year.

FERDINAND I., king of the Two Sicilies, was the son of Charles III. of Spain, and born 12th January 1751. When Charles ascended the Spanish throne in 1759, F. though a minor, succeeded him on that of Naples under a regency. After his marriage, in 1768, with Maria Carolina, daughter of the Empress Maria Theresa, he fell completely under her influence, and lost all his former popularity. The queen and her favorite minister Acton (q. v.) ruled the kingdom. F. joined England and Austria against France in 1793, but in 1801 was forced to enter into a treaty with the First Consul. A subsequent violation of this treaty compelled him, in 1806, to take refuge in Sicily, under the protection of the English. A French army marched into Naples, and took possession of the kingdom, which Napoleon bestowed first on his brother Joseph, and afterwards on Murat. F. was reinstated by the congress of Vienna, and entered Naples, after Murat's flight, in June 1815. His queen had died in 1814. During the revolution of 1820, he was obliged to introduce the Spanish constitution of 1812, but abolished it next year with the help of Austrian arms. He, however, expelled the Jesuits, and abolished superfluous convents; acts that may, perhaps, partly atone for his bloody persecution of the republicans in 1800, and his general antipathy to enlightened principles of government. He died January 4, 1825; and was succeeded by his son Francis I., who died in 1830.

FERDINAND II., king of the Two Sicilies, was the son of Francis I. by his second wife, Isabella Maria of Spain, and was born 12th January 1810. He succeeded his father in 1830. The country was in the most wretched condition; and all eyes were turned to the young king, the beginning of whose reign was marked by various acts of clemency towards political enemies, and also by the introduction of reforms in the economy and government of the country. But it was not long before he began to listen to foreign councils, which saw danger for the whole peninsula in liberal measures. From that time, Naples became the scene of incessant conspiracy, insurrection, bloodshed, and political prosecutions. Ferdinand yielded to the storm of 1848, and granted a constitution to both parts of his dominions; he was even obliged to take part in the war against Austria in Northern Italy. The Sicilians mistrusted, and with reason, the king's proceedings, and declared that he and his family had forfeited the Sicilian crown. F. followed the constitution so far as to call the chambers together, but quickly dismissed them, impatient of any interference with his authority. After the subjugation of Sicily in 1849, when the reaction began to set in all over Italy, he hastened completely to set aside the new constitution; while all who had taken any part in state reforms were subjected to those cruel persecutions that the Letters of Mr. Gladstone have held up to the execration of the world. F. died 22d May 1859, and was succeeded by his son Francis II.

FERDINAND III., Grand Duke of Tuscany, and Archduke of Austria, was born at Florence, 6th May 1769. In 1790, he succeeded his father, Leopold II., in the government of Tuscany, when the latter obtained the imperial throne at the death of the Emperor Joseph II., Leopold's brother. F.'s rule in Tuscany was one of combined mildness and ability; and during his reign were inaugurated many judicial, economical, and legislative reforms: commerce was protected and encouraged; hospitals and asylums founded, good roads opened through the state, and the greatest attention bestowed on the welfare of his subjects, which an enlightened and good prince could exercise. A lover of peaceful progress, he remained strictly neutral in the first coalition against France, and was the first sovereign in Europe to recognize and treat diplomatically with the French Republic in 1792. In 1793, intimidated by the combined menaces of the Russian and British cabinets, F. was constrained to relinquish his neutral policy, and become a passive member of the coalition formed by the above governments against France. In 1795, on the French occupation of Piedmont, he speedily reassumed friendly relations with France. In 1797, in order to save his states from annexation to the Cisalpine Republic, F. concluded a treaty with Bonaparte on most unfavorable terms; undertaking to pay a war-levy to France, and to transfer to the Museum of Paris some of the chief master-pieces of the Florentine galleries, including the 'Venus de' Medici.' Owing to the continued intrigues of France in his states, F. was forced to seek an Austrian alliance, which furnished Bonaparte with a pretext for declaring war simultaneously against Austria and Tuscany. In 1799, F. retired to Vienna, leaving the French troops in occupation of Tuscany. In 1801, at the peace of Luné-

ville, he was forced to renounce all claim on Tuscany. In 1814, the peace of Paris reinstated him in Tuscany, and even restored his artistic treasures. He died 17th June 1824, leaving his states to his son Leopold II.

FERENTI'NO, a town of Central Italy, in the province of Rome, and about 50 m. S.E. of the city of Rome. Portions of the ancient walls, built in the cypoleoan style of large irregular and polygonal blocks of limestone, and patched or surmounted with Roman masonry, no mortar having been used, are still extant. F. is the ancient Ferentinum, a city of the Hernici. Pop. 10,200.

FERGUSON, ADAM, a Scottish philosopher and historian, was born (1724) at Logierait, in Perthshire, where his father was parish minister. He studied at the universities of St. Andrews and Edinburgh, and was appointed (1744) chaplain to the 42d Regiment, in which capacity he was present at the battle of Fontenoy, and is said to have charged the enemy, sword in hand, among the foremost of the regiment. In 1757, he succeeded David Hume as keeper of the Advocates' Library in Edinburgh. He was next appointed professor in the Edinburgh University, first of natural philosophy, in 1759, and subsequently (1764), of moral philosophy—a subject which had always had great attractions for him. While holding this office, he accompanied the young Earl of Chesterfield (1774) on his travels on the continent; and in 1778—1779, he acted as secretary to the commission sent out by Lord North to try to arrange the disputes between the North American colonies and the mother-country.

The state of his health induced him, in 1784, to resign his professorship, in which he was succeeded by Dugald Stewart. In 1793, he visited various parts of the continent; and on his return, took up his residence for some time at Neidpath Castle, in Tweeddale, and latterly in St. Andrews, where he died, 23d February 1816. His chief works are—*Essay on the History of Civil Society* (Lond. 1767), *Institutes of Moral Philosophy* (Lond. 1769), *History of the Progress and Termination of the Roman Republic* (Lond. 1783), and *Principles of Moral and Political Science* (Lond. 1792). The work by which he is best known is his *History of the Roman Republic*; this, together with the *Essay and Institutes*, have gone through a number of editions. All his works have been translated into German and French, and the *Institutes* has been used as a text-book in several foreign universities. F. was distinguished for the decision and manliness of his character.

FERGUSON, JAMES, was born (1710) near Keith, a village in Banffshire, Scotland. His father being a poor day-laborer, he enjoyed only three months of instruction at school, and his subsequent acquirements were the result of his own insatiable thirst for knowledge. His tastes lay principally for practical mechanics and astronomy; and while keeping sheep, to which he was early sent, he was constantly employed in making models of mills, &c., and at night in studying the stars. After working at various country employments, he took to drawing patterns for ladies' dresses, and copying pictures and prints with pen and ink. He then supported himself and his parents by drawing portraits, first in Edinburgh, and afterwards (1743) in London; his leisure time being all the while given to astronomical pursuits. In 1748, he began lecturing on astronomy and mechanics with great acceptance. He was elected a Fellow of the Royal Society in 1763, and received from George III. a pension of £50. He now gave up portraits, and devoted himself to lecturing and writing on his favorite subjects. He died in 1776. F. was held in high esteem for the worth and amiability of his character, as well as for his extraordinary and self-taught acquirements. Few men have done more to promote a knowledge of the results of science, among those who have not the advantage of regular scientific training. His principal works are—*Astronomy explained upon Sir Isaac Newton's Principles* (1756; Sir David Brewster's ed., 2 vols. 1811); *Lectures on Mechanics, Hydrostatics, Pneumatics, and Optics* (1760); also edited by Sir David Brewster in 1805; and *Select Mechanical Exercises*, with an Autobiography (1773).

FERGUSON, ROBERT, a Scottish poet, was born at Edinburgh on the 17th October 1751, and received his education at the university of St. Andrews, where he was in possession of a bursary founded by a person of his own name, and resided four years. Subsequently, he removed to Edinburgh, and was employed in the office of the commissary clerk. His poems were chiefly contributed to *Ruddiman's Weekly Magazine*, and gained him considerable local reputation. Unhappily, this reputation proved his ruin. His society was eagerly sought; and in that convivial time, he was led into excesses which permanently injured his health. He fell into a religious melancholy, and finally, through an accidental fracture of the skull, became totally deranged. He died on the 16th October 1774, at the age of twenty-three. His poems were published in 1773.

F.'s poems are distinguished by considerable humor, fancy, and purity of language, and he possessed great mastery over Lowland Scotch. He sketches with liveliness contemporary life and incidents, and much of our knowledge of old Edinburgh is derived

from his verses. His fame however, rests quite as much upon his unhappy life and early death, and upon the circumstance that he was to some extent the forerunner of Burns, as upon the essential merits of his verse. Burns admired his works, was indebted to them for hints, called him 'his elder brother in the Muses,' and when he came to Edinburgh, erected a memorial-stone over his grave.

FERIÆ (Lat.), holidays during which political and legal transactions were suspended in ancient Rome, and slaves enjoyed a cessation from labor. Feriæ were thus *dies nefasti*, the opposite of the *dies fasti*. See **FASTI**. Days which were consecrated to a particular divinity, on which any public ceremony was celebrated, and the like, were feriæ. In contradistinction to these which were *feriæ publicæ* (public holidays), there were *feriæ privæ*, which were observed by single families, in commemoration of some particular occurrence of importance to them or their ancestors. Birthdays, days of purification after a funeral, &c., were also observed as family feriæ. The public feriæ were divided into those which were always kept (*stativæ*) on certain days marked in the calendar; and those which were kept by command of the consuls or other superior magistrate on the occasion of any public emergency. 'The manner in which all public feriæ were kept bears great analogy to our Sunday. The people generally visited the temples of the gods, and offered up their prayers and sacrifices. The most serious and solemn seem to have been the *feriæ imperatiæ*; all the others were generally attended by rejoicings and feasting.' See an elaborate article by Dr. Schmitz in Smith's *Dictionary of Greek and Roman Antiquities*. In Scotland, those days during which it was not lawful for courts to be held, execution to proceed, or any other judicial step to be taken, used to be called *feriat* times, but the expression is obsolete.

FERMA'NAGH, an inland county in the south-west of the province of Ulster, Ireland. It is 45 miles long, and 29 broad; area, 714 square miles, $\frac{2}{3}$ arable, $\frac{1}{3}$ in wood, and above $\frac{1}{4}$ in water, including Upper and Lower Lough Erne, and the smaller lakes. Melvin and Macnean. The surface is mostly a succession of mountains and hills, and the scenery varies. The chief rocks are limestone, with many cavities and underground water-courses, millstone grit, and old red sandstone. Some coal, iron, and marble occur. The chief rivers are the Erne and its tributaries, the Colebrooke, Woodford, and Arney. The soil in the low grounds is a deep rich loam, but in the limestone and sandstone districts it is cold and thin. The climate is mild and moist. Marsh-fever prevails in summer and autumn near Lough Erne.

In 1880, 104,622 acres were in crop; oats, barley, wheat, potatoes, turnips, and hay being the chief products. The chief exports are oats, butter, and eggs. F. is divided into 8 baronies and 23 parishes. It returns 2 members to parliament. Principal towns: Enniskillen, Lisnaskea, and Lowtherstown. Pop. (1851) 116,047; (1861) 105,372; (1871) 92,688; (1881) 84,633, of whom 47,228 were Roman Catholics, 30,832 Episcopalians, and 1672 Presbyterians. A little coarse linen is manufactured in the county. In 1880 there were 16,844 pupils attending the national schools of F. The chief antiquities are raths or rude hill-forts, and some ecclesiastical ruins.

FERMAT, PIERRE DE, a French mathematician, was born at Toulouse in 1590, and at an early period, in conjunction with his friend Pascal, hit upon a very ingenious mode of considering figurate numbers, upon which he subsequently based his doctrine of the calculation of probabilities. F. employed himself greatly with the properties of numbers, and made many acute discoveries in regard to their composition and analysis. He also squared the parabola in a much simpler way than Archimedes at an earlier period had done, and made many other discoveries in geometry. His method of finding the greatest and least ordinates of curved lines was analogous to the method of the then unknown differential calculus. In addition to his scientific attainments, F. possessed an extraordinary knowledge of ancient and modern languages. He died at Toulouse in 1665. A collection of F.'s works appeared at Paris in 1679.

FERMA'TA, in Music, is the name given to a pause, or resting-point, generally marked by the sign $\text{ fermata } \curvearrowright$. The notes over which this sign is placed are prolonged beyond their true length. The fermata is frequently found near the end of a part of a composition, which affords an opportunity for the singer or player to introduce an extempore embellishment.

FERMENTATION is the term applied to the change which occurs in one organic substance when influenced by another in a state of decay or putrefaction. The process was originally understood to include all the changes which matter of plant and animal origin undergoes when disquieted from the living force, but is now restricted to certain of the changes. Thus, there are many substances, such as starch and sugar, which have no power of themselves to pass into decay, or change in composition through lengthened periods of time; whilst there is another

class of substances, including albumen, fibrin, and caseine, as well as gelatinous tissues, mucus, &c., which, when exposed to moderately heated air in a moist condition, more or less rapidly begin to putrefy or decompose. The latter substances, viz., those which spontaneously pass into a state of change, are called *ferments*, and when they are brought in contact with sugar, &c., which otherwise would not be altered, they cause the latter to be broken up into simpler compounds; it is this process that constitutes fermentation. The ferment is always a body which has the power of rotting or becoming putrid, and is actually in a state of decomposition.

Every substance which is liable to putrefy becomes, while putrefying, a ferment; and in this condition acquires the property of setting agoing the process of fermentation in any second body capable of it, and retains the power till it so far decomposed that the putrescence is over. The ferments are very widely distributed in organic matter, and hence, whenever a plant or an animal dies, the process of fermentation proceeds more or less rapidly. The most important kind of fermentation is that known under the designation of *vinous*, and which forms part of the processes in the preparation of alcohol, beer, wine, &c. It consists in the action of a peculiar ferment called Yeast (q. v.) upon a saccharine liquid, when the sugar ($C_{12}H_{22}O_{11}$) is decomposed into two atoms of alcohol (each C_2H_5O) four atoms of carbonic acid (each CO_2), and two atoms of water (each HO). In this change it will be observed that the yeast, whilst it causes the change, does not unite directly or indirectly with any of the constituents of the sugar. The vinous fermentation proceeds best at a temperature ranging from 60° to 80° F., the mean and more desirable being about 70° F. The process itself causes the development of heat, and recourse must be had therefore, to large airy rooms, where, the fermenting tuns or vessels are arranged, and also to the circulation of cold water in pipes distributed round the interior of the vessels, and in contact with the liquid. See BEER.

The *lactic acid* fermentation takes place in milk when it begins to sour. The caseine of the milk acts the part of the ferment, and it causes the change in the sugar of milk, which is in part resolved into lactic acid ($C_3H_5O_3 + HO$). The latter then curdles the caseine, and the milk becomes clotted. When the milk still further sours, and the material is kept at a temperature of 77° to 86° F., the *butyric acid* fermentation takes place, in which the putrefying caseine changes the Sugar (q. v.) of milk into butyric acid ($C_4H_7O_2 + HO$).

The *viscous* or *mucus* fermentation occurs when the juice of the beet root, dandelion, ash-tree, &c., is allowed to decompose at a temperature of 90° to 100° F. when the albuminous matter present causes the sugar to ferment into lactic acid, mannite, a gummy substance, some alcohol, and various gases. The same kind of fermentation occurs when boiled yeast or boiled gluten is added to ordinary sugar.

The remaining processes of fermentation are the *benzoic* fermentation, yielding, amongst other matters, the Essential Oil of Bitter Almonds (q. v.); the *sinapic* fermentation, which occurs in mustard when moistened with water, and during which the pungent oil of mustard is developed; and the *acetic* fermentation, which is, however, not a true instance of fermentation, as the oxygen of the air is required to complete the change. See ACETIC ACID.

FERMENTED LIQUORS are alcoholic beverages made by fermentation of saccharine fluids and juices; the principal being the different kinds of *ale* or *beer*, made by fermentation of an infusion of malt, chiefly of barley, but also sometimes of other kinds of grain; and *wine*, made by fermentation of grape-juice. *Cider* is made by fermentation of the juice of apples; *perry*, of that of pears; *palm-wine*, by fermentation of the sap of different kinds of palm. Fermented liquors, commonly called wines, are also made from the juice of various kinds of fruit, as currant wine from that of the red currant; and from the juice of some roots, as parsnip wine from that of the parsnip, &c. The sap of the American Aloe, or *Agave* (q. v.), yields the fermented liquor called *Pulque*, much used in Mexico. A wine is made from the sap of the birch, and that of some other trees is used for a similar purpose. *Mead* is a fermented liquor made from honey. From every fermented liquor, a kind of *spirit* may be obtained by distillation.

FERMENTED AND DISTILLED LIQUORS, STATISTICS OF. Under the headings BEER, SPIRIT, and WINE, will be found particulars as to the history, manufacture, &c., of these liquors. All that is contemplated in the present article, is a statement of the quantities manufactured and consumed in the United Kingdom of Great Britain and Ireland. In 1801, the consumption of spirits, British, colonial, and foreign, in the United Kingdom was 8,800,840 gallons. In fifty years, it had considerably more than trebled, having risen in 1851 to 28,760,224 gallons. In the same time, the population had risen from 15,506,794 to 27,452,262. In the former period, therefore, the consumption was at the rate of little more than half a gallon per head, while in the latter

period it amounted to more than a gallon. There would seem, however, to have been something exceptional in the year 1801 to reduce the consumption to the low point we have mentioned, as in the previous year, the consumption was nearly 12 million gallons, and in the succeeding year, more than 15½ million gallons; and in no subsequent year did it fall so low as in 1801. The consumption at the two periods was divided over the three countries as follows: England, 1801, 6,150,983 gallons—namely, 2,555,920 British; 1,687,839 colonial; and 1,907,224 foreign. In 1851, 13,916,313 gallons—namely, 9,595,368 British; 2,542,395 colonial; and 1,778,550 foreign. In the former period, the consumption of each individual was less than three-fourths of a gallon; in the latter, nearly seven-ninths of a gallon. Scotland, 1801, 930,490—namely, British, 295,931; colonial, 349,237; and foreign, 285,322. 1851, 7,090,894—namely, British, 6,830,710; colonial, 179,883; and foreign, 80,301. The consumption per head in Scotland in 1801 was thus only three-fifths of a gallon, while in 1851 it was 2½ gallons. Ireland, 1801, 1,719,367—namely, British, 355,105; colonial, 1,057,316; foreign, 306,945. 1851, 7,753,017—namely, British, 7,550,516; colonial, 158,147; foreign, 44,352. In the former period, the consumption per head was two-thirds of a gallon; in the latter, about 1½ gallon. But there is every reason to believe, that the consumption in 1801 was much larger in the United Kingdom generally than the statistics indicate.

Between the periods we have mentioned, the duty on British spirits varied considerably. In England, in 1802, it was 5s. 4½d. per gallon; in 1819, it had risen to 11s. 8½d.; and in 1851, it stood at 7s. 10d. In Scotland, in 1802, the duty was 3s. 10½d. per gallon; it rose to 9s. 4½d. in 1815; and in 1851, was 3s. 8d. In Ireland, in 1802, it was 2s. 10½d.; in 1815, it had risen to 6s. 1½d.; in 1851, it stood at 2s. 8d. The duties in the three countries have now been equalized, the sum fixed being at first 8s. per gallon, since raised to 10s. The duty formerly levied on malt was in 1880 transferred to beer. In 1879–80, there was manufactured in Great Britain 28,219,721 gallons of spirits; imported for home consumption, 8,528,890; exported, 2,060,193: the consumption was therefore 38,808,804 (the population being about 35,000,000), or over one gallon to each. Of the total number of gallons of proof-spirits distilled in the United Kingdom in 1879–80 (28,219,721), there were 13,249,891 in England; 8,041,959 in Scotland; and 6,927,871 in Ireland. The number of gallons on which duty was paid in the United Kingdom in 1879–80 was 28,219,721, the duty amounting to £14,109,865. Of this sum £6,624,946 was paid in England, £4,020,979 in Scotland, and £3,463,940 in Ireland. The number of gallons on which duty was paid in 1879 was 29,796,134. Of the whisky distilled in Scotland in 1880, 1,806,499 gallons were exported into England, and 16,261 into Ireland; Scotland receiving in return from England 27,750, and from Ireland 232,073. Ireland sent to England 1,648,934 gallons, and got back in return 27,723. Of foreign spirits, there were imported into the United Kingdom in 1880—rum, 6,107,661 gallons, of which 4,637,635 were for home consumption; brandy, 3,006,335 gallons; and other sorts, including Geneva, 254,503 gallons, nearly all being for home consumption.

The quantity of wine entered for consumption in 1802 was 5,449,710 gallons, upon which a duty of £1,724,339 was paid. In 1851, 6,280,653 gallons; duty, £1,776,246. In 1880, 17,385,496 gallons were imported, of which 15,852,382 were entered for home consumption.

The quantity of beer manufactured in Great Britain and Ireland can only be arrived at approximately. The general estimate is, that two bushels of malt produce one barrel, or 36 gallons of beer. In 1880, the quantity of malt brewed in the United Kingdom was 50,341,799 bushels. This beer was made chiefly in England, 44,873,174 bushels of malt being consumed there; in Scotland, the quantity used was 2,613,823 bushels; and in Ireland, 2,854,802.—See 23d Report of H. M. Commissioners of Inland Revenue (for year 1879–80).

FERMOY, a town of Italy, in the province of Ascoli Piceno, is situated on a rocky height 4 miles from the Adriatic, and 32 miles south-south-east of Ancona. It is well-built and fortified, surrounded with walls and ditches, is the seat of an archbishop, and has a cathedral and an elegant theater. Formerly A. possessed a university. It has some trade in corn and wool. Pop. 15,682. In the immediate vicinity are the ruins of the ancient Firmum, whose name F. inherits. Firmum had been a Roman colony from the year 264 B.C.

FERMOY, a town in the east of Cork county, Ireland, chiefly on the right bank of the Blackwater, 19 miles north-east of Cork city. Its origin dates from the 12 c., when it was the seat of a great Cistercian abbey; but its present importance, which commenced in the end of last century, is due to Mr. (afterwards Sir John) Anderson, who introduced mail-coaches into Munster. The hills to the south of the town rise in Knockinskeagh 1388 feet. F. is handsomely built and regularly laid out. A large ecclesiastical establishment (Roman Catholic), consisting of a church, a bishop's

house, two convents with large schools, and a college with nearly 100 students, has recently been erected on a hill rising from the Blackwater. A bridge of 13 arches, built in 1689, crosses the river. Infantry and cavalry barracks for 3000 men stand on the left bank of the river, and command the approach to Cork. F. has a trade in agricultural produce. Pop. (1871) 7611; (1881) 6454. The town-rates in 1871 were £341.

FERN. MALE, a name given, in consequence of an erroneous notion, long since exploded, to a fern very common in the woods of Britain and of the continent of Europe, the *Aspidium filix mas* of some botanists, and *Lastrea filix mas* and *Nephrodium filix mas* of others. The fronds are bipinnate; the pinnules oblong, obtuse, and serrated; the sori near the central nerve, orbicular, kidney-shaped, and fixed by the sinus; the stripes and rachis chaffy. If not one of the finest of our ferns, it is certainly a chief ornament of many of our woods, and a plant of very considerable beauty. The subterranean stem (rhizome) is officinal. It is about a foot long, and of the thickness of a quill, almost inodorous, with a nauseous sweet taste, becoming astringent and bitter. It was anciently used as an anthelmintic, and its use has been revived, especially in cases of tapeworm, in which it is believed to be very efficacious. Its anthelmintic powers are due to a thick, almost black volatile oil which it contains, and which is now itself also used in medicine.

FERN. SWEET (*Comptonia asplenifolia*), a shrub of the natural order *Amentaceæ*, sub-order *Myricæ*, a native of the mountain-woods of North America, forming a small bush with linear pinnatifid, fern-like leaves. Its leaves have a powerful aromatic fragrance when rubbed. It is tonic and astringent and is much used in the United States as a domestic remedy for diarrhoea.

FERNA'NDO DE NO'RONHA, a lonely island of the Atlantic, about 125 miles from the coast of Brazil, to which it belongs. It is about eight miles in length. Pop. 2000 (largely convicts).

FERNA'NDO PO, an island on the west coast of Africa, in the Bight of Biafra, is situated about twenty miles from the nearest point on the shore, and is about 44 miles long and 20 miles broad. The appearance of this island from the sea is exceedingly picturesque and beautiful. It is traversed by a mountain-ridge, which, in Clarence Peak, rises to the height of 10,650 feet, and is fertile, well-watered, and in many parts thickly wooded. Besides swarms of monkeys, some of which are of great size, the island contains many goats and sheep in a state of nature. The climate, always excessively hot, is rendered more intolerable, during the rainy season, by a pestilential wind from the continent. The native population, who are of negro race, are said to amount to from 10,000 to 12,000 in number, and to inhabit fifteen villages. The English, with the consent of Spain, into whose hands F. P. had fallen, made an attempt in 1827 to form a settlement on the island, but abandoned it in 1834. In 1844, it was again taken possession of by Spain. The colony has a population of about 900, most of whom are liberated Africans.

FERNAN-NUNEZ, a small town of Spain, in the province of Cordova, and 10 miles south of the town of that name. It has some linen and woollen manufactures. Pop. 5500.

FERNS (*Filices*), an order of acrogenous or cryptogamous plants, divided by some botanists into several orders; whilst some make *Filices* a sub-class, and include in it *Lycopodiaceæ*, *Marsileaceæ*, and *Equisetaceæ*. See these heads. F. are either herbaceous perennial plants, or more rarely trees, the root-stock or the stem producing leaf-like fronds (often called leaves), which are sometimes simple, sometimes pinnated, or otherwise compound, exhibit great variety of form, and are generally coiled up (*circinate*) in bud (see accompanying illustration). The fronds are traversed by veins, generally of uniform thickness, which are simple or forked, or netted, sometimes produced from the sides of a midrib or primary vein, sometimes from a primary vein on one side, sometimes radiating from the base of a frond or segment of a frond. The fructification takes place either on the lower surface or on the margin of the fronds, and arises from the veins.

The spores are contained in capsules or spore-cases (*thecæ*, spo-

rangia), which are often surrounded with an elastic ring, and are either naked or covered with a membrane (*involucre* or *indusium*), and are generally clustered in round or elongated or kidney-shaped masses (*sori*). The margin of the frond is sometimes folded so as to cover the spore-cases, and sometimes, as in the Flowering Fern (*Osmunda*) (q. v.), the fertile part of the frond is so transformed that its leaf-like character entirely disappears, and it becomes a spike or panicle. The spore-cases burst at their circumference, or irregularly, scattering the spores, which germinate into the *prothallus*, a minute kidney-shaped cellular expansion with unicellular root hairs. On the under surface of this, arise



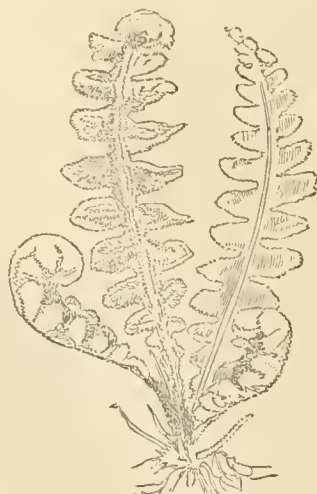
Ferns:—Showing the Sori on the back of the Fronds.

male and female reproductive organs, the *Antheridia* and *Archegonia*. The former develop ciliated spiral filaments, the 'antherozooids'; the latter, an oosphere from which, when fertilized, the 'fern' arises, an alternation of Generations (q. v.) thus taking place.—The species of F. are about 2500. They are found in all parts of the world, but are fewer toward the poles than within the tropics, and fewer in continental than in maritime countries, abounding exceedingly in mountainous tropical islands, as in Jamaica. Many of them delight in moisture and shade, although some are found in the most exposed situations. Some of them resemble mosses in size and appearance; whilst Tree Ferns (q. v.) resemble palms, and sometimes attain a height of forty feet. A few are climbers. One climbing species (*Lygodium palmatum*) is found in North America as far north as Boston.—F. are divided into *Polypodiæ*, *Hymenophyllæ*, *Gleicheniæ*, *Schizææ*, *Osmundæ*, *Danææ*, and *Ophioglossææ*, of which sub-orders (or orders) the first, second, fifth, and seventh alone contain British species, and the first contains a great majority of all ferns.—The root-stocks of some F. contain so much starch that they are either used as food, or food is prepared from them, particularly those of the Tara (q. v.) Fern in New Zealand and Van Diemen's Land, and those of *Aspidium* (or *Nephrodium*) *esculentum* in Sikkim and Nepal; also the stems of some of the tree-ferns, as of *Cyathea medullaris* in New Zealand, and *Alsophila spinulosa* in India. The young and tender fronds of some F. are occasionally used as pot-herbs in the Highlands of Scotland, Norway, the Himalaya, &c. The fronds are generally mucilaginous, slightly aromatic and astringent. Those of some species of Maidenhair (q. v.) are used for making *capillaire*; whilst the bitter and astringent root-stocks of some F. are occasionally used in medicine, as those of the Male Fern (see FERN MALE) and the Peruvian *Polipodium Caligala*, particularly as anthelmintics.

The fronds of a few species are delightfully fragrant.—The cultivation of F. is now in many places successfully conducted on a somewhat extensive scale, both in the open air and in hothouses; and to such an extent has the occupation of fern-collecting reached, that many excellent treatises on this subject alone have been written and elaborately illustrated. Amongst others, we may mention *British Ferns* (1s.), published by Routledge, London, as an excellent handbook; while the magnificent Nature-printed work, published in 2 volumes, royal 8vo. by Henry Bradbury, supplies all needful information. Wardian cases, filled with them, have also become common, and are most pleasing ornaments of apartments. The principal species will be noticed under their particular heads.

FEROZABA'D, a town of India, North-West Provinces, 24 miles east from Agra. It was formerly named Chandwar, and was a place of much greater importance than at present. Its fine edifices are mostly in ruins. Pop. (1872) 14,255.

FERO'ZÉ PORE (so called from its founder, Feroze Toghluk, who reigned in Delhi from 1351 to 1388), in the Punjab, stands about 3 m. from the left or S.-E. bank of the Sutlej, in lat. 30° 55' N. and long. 74° 35' E. At one time, a large and important town, as its massive fortification and extensive ruins still indicate, it had sunk into poverty and insignificance, before it actually came, in 1835, into the possession of the English. Since then, the place has regained much of its former consequence, holding out, with its wide streets and its colonnaded bazars, the promise of a grand emporium of commerce. Politically, too, F. P. has become prominent under British supremacy, having been a starting-point, whether for war or for negotiation, in many of our



Ceterach officinarum.

dealings with Afghanistan and the Punjab. In connection with this feature in its history, the city contains a monumental church in honor of the memory of those, both privates and officers, who fell in the various conflicts with the Sikhs. The pop. in 1868 was 20,592.—The *district* of the same name has an estimated area of 2696 square miles, and a pop. (1868) of 549,253. It is now in part either barren or covered with jungle, but the ruins of towns and villages indicate that it must have been at one time both more fertile and more populous.

FEROZE SHAH, a village apparently within the district of Feroze Pore, and situated about 10 miles east-south-east of the town of that name, is in lat. $30^{\circ}52' N.$, and long. $74^{\circ}50' E.$, lying about 12 miles from the left bank of the Sutlej. It claims notice mainly as the scene of the second in order of the four great battles of the first Sikh war. The conflict in question, which lasted two days, took place in December 1845, ending in the rout of the natives and the capture of their intrenchments. The British army was commanded by Sir Hugh Gough and Sir Henry Hardinge; and, as in the victory of Mudki, gained only three days before, it sustained heavy loss.

FEROZE SHAH CANAL, a work, including its branches, of 230 miles in length, demands detailed notice as well as for its historical interest as for its economical value. It dates back as far as 1356, owing its origin, as well as its name, to Feroze Toghluk, king of Delhi. Viewed as a whole, it leaves the right bank of the Jumna in lat. $30^{\circ}19' N.$; and after sweeping round so as to skirt Sirhind, a territory on the Sutlej, it rejoins its parent stream at Delhi in lat. $28^{\circ}39'$, thus measuring in mere difference of latitude, 100 geographical miles. This artificial water-course, intended principally for the purposes of irrigation, seems to be equally creditable to native enterprise and native skill. But, as nothing of the kind appears to be permanent in the East, this noble channel was so much neglected, that, in the beginning of the 17th c., it was cleared out by Vizier Ali Mardan Khan, who in point of fact, was the first to carry it, through its lower half, back into the Jumna. Finally, the entire line has, during this 19th c., been again repaired and improved by the British government. In the light of repeated drought and famine, the importance of such undertakings as the Feroze Shah Canal can scarcely be overrated.

FERRANDINA, a town in the south of Italy, in the province of Basilicata, stands on a height on the right bank of the Basento, 35 miles east-south-east of Potenza. Good wine is produced in the neighborhood. Pop. about 6000.

FERRARA, the most northern of the Italian provinces that are washed by the Adriatic. It extends immediately south of the Po, between the main branch of which, and the Po di Primaro, it is for the most part enclosed. As one of the old delegations, it had an area of 1180 square miles, with a population amounting to 244,524; but according to the *Statistica Administrativa del Regno d'Italia*, published in 1861, the province had undergone certain modifications, and its pop. was then only 194,161; in 1871, it was 215,369. The area consists, for the most part, of swamp and lake; and many rivers and canals intersect it. Between the Po di Volano and the Po di Primaro, the marshes become very extensive, and receive the name of *Valli di Comaccio*. This province produces great quantities of fish, affords good pastures, and carries on a great trade in corn and hemp. It was at one time a dukedom under the House of Este, but on the failure of a legitimate male heir, Pope Clement VIII. wrested it from this family, and annexed it to the States of the Church in 1598. It became part of the kingdom of Italy in 1860.

FERRARA, an ancient city of Italy, capital of the province of the same name, is situated in a low marshy plain in the delta of the Po, and about 4 miles south of the main branch of that river, 38 miles north-north-east of Bologna, and 40 miles north-west of Ravenna. F. was first made a walled city by the exarch of Ravenna about the close of the 6th c., and in the following century (661 A.D.) became the seat of a bishop.

In the middle ages, it was the great commercial emporium of Italy, and the seat of a court renowned throughout Europe; but now the city has a peculiarly deserted and melancholy appearance; grass grows on the pavements of its broad and regular streets, and its churches and palaces are either rapidly falling, or have already fallen into decay. It is surrounded with walls, and is strengthened by bastions and a fortress. The old castle, or ducal palace, once the residence of the Dukes of Este, but recently, until 1860, occupied by the papal legates, rises like a huge rock, is strengthened with corner-towers, and surrounded by a ditch. Its ecclesiastical edifices, which are very numerous, and of which the churches of Santa Maria degli Angeli and of San Benedetto are the most remarkable in point of architecture are rich in paintings by the great masters of the Ferrara and Bologna schools. Besides their valuable paintings, these churches contain numerous sculptured monuments of famous persons; the church of San Francesco

has a curious echo, with sixteen reverberations. The university, founded in 1264, was reorganized in 1402, closed in 1794, and reopened in 1824. It is in high repute as a school of medicine and jurisprudence, and is attended by from 100 to 200 students. It has an excellent library, which, besides a variety of MSS., missal paintings, and old editions of printed works, contains several of the works of Tasso and Ariosto in their own hand. F. is specially remarkable for its art associations. Under the patronage of the Dukes of Este, it produced a school of painters who rank high in the history of art; while in literature the name of F. is immortalized through its connection with those of Tasso, Ariosto, and Guarini. At the period of its greatest prosperity, F. had about 100,000 inhabitants; pop. (1881) of town, 28,814; of commune, 75,513.

In 1849, the Austrians took possession of the town, but were compelled to abandon it at the commencement of the Italian campaign in June 1859. In April 1860, F., with the state of which it is capital, was formally annexed to the kingdom of Italy under Victor Emanuel.

FERRARI, GAUDENZIO, sprung from a family which followed a career of art as if by inheritance, was born at Valduggia, in the Milanese, in 1484. A scholar of Andrea Scotto and Perugino, and the chosen associate and friend of Raphael, his own creations may be said to have caught some inspiration from each of these three great masters, while they also unmistakably reflect genius of a bold, unshackled originality. The chief characteristics of F.'s style are correct and vigorous delineation, extreme vividness and delicacy of coloring, noble grace of form and attitude, and unsurpassable art in the classic disposal of drapery. Being one of the most laborious artists of his day, he has executed innumerable paintings both in *fresco* and in oil, the greater part of which are possessed by the Lombard galleries. His most comprehensive work, the frescoes at Barallo, in Piedmont, represents the Passion; the 'Martyrdom of St. Catharine,' to which he owes his brightest fame, is in the Milanese collection of paintings. He died in 1549, having formed some good scholars, the chief of whom is Andrea Solario.

FERRATES are combinations of ferric acid (FeO_3), a weak unstable compound of iron and oxygen with bases. See IRON.

FERREIRA, ANTONIO, one of the classic poets of Portugal, was born at Lisbon, 1528. He was educated at Coimbra, where he occupied himself with the study of the Italian and Latin authors, more especially Horace, whom he almost rivalled in conciseness, but not in elegance of expression. After holding for some time the office of a professor at Coimbra, he obtained a civil appointment of some importance at the court of Lisbon. He carried to perfection the elegiac and epistolary styles, already attempted with success by Sá de Miranda, and transplanted into Portuguese literature the epithalamium, the epigram, ode, and tragedy. His *Ines de Castro* is the second regular tragedy that appeared after the revival of letters in Europe, the first being the *Sophonisba* of Trissino. It is still regarded by the Portuguese as one of the finest monuments of their literature, for its sublime pathos and the perfection of its style. The works of F. are not numerous, as his official duties left him little leisure. He died 1569. All his works are distinguished by soundness and depth of thought. His expression is strong rather than sweet, is extremely animated, and full of that fire which elevates the mind and warms the heart. His efforts after brevity, however, frequently led him to sacrifice harmony to thought. His *Poemas Lusitanos* were first published at Lisbon, 1598, and the *Todas as obras de Ferreira* in 1771. Compare Sismondi's work, *La Littérature du Midi* (Paris 1813), and Bouterwek's *Geschichte der neuern Poesie und Beredsamkeit* (12 vols. Gött. 1801—1819).

FERRET (*Mustela furo*), an animal of the weasel family (*Mustelidae*), so nearly allied to the Polecat (q. v.), that many regard it as a mere domesticated variety. It is of rather smaller size, the head and body being about fourteen inches long, the tail five inches and a half, the muzzle rather longer and more pointed, the head rather narrower; and the color is very different, being yellowish, with more or less of white in some parts, there being two kinds of hair, the longer partly white, the shorter yellow. The eyes are pink. It is, however, much more susceptible of cold than the polecat, and requires careful protection from it in climates where the polecat is a hardy native. It was imported into Europe from Africa, and was well known to the Romans, being anciently employed, as it still is, in catching rabbits, for which purpose it is often sent into their burrows muzzled, or 'coped,' by means of a piece of string, to drive them out into nets, or, with a string attached to it, it is allowed to seize a rabbit in the burrows, and is then drawn out, holding it fast. The usual plan, however, is to let the F. have free range of rabbit-holes unmuzzled, the rabbits being shot as they bolt. Attention to warmth and cleanliness is essential to the health of ferrets. They are capable only of partial domestication, acquiring a kind of familiarity with man, and submitting with perfect quietness to his hand-

ling, but apparently never forming any very decided attachment; and they never cease to be dangerous if not carefully watched, especially where infants are within their reach. If allowed any measure of freedom, they are ready to attack poultry, and kill far



Ferret (*Mustela furo*).

more than they can devour, merely sucking the blood. They generally breed twice a year, each brood consisting of six or nine. The female sometimes devours the young ones, in which case another brood is speedily produced.

FE'RRIDCYA'NOGEN is a compound organic radical which has not been isolated, but which forms with potassium a well-known compound used in the arts, called the ferridecyanide of potassium or red prussiate of potash. In the preparation of this salt, a solution of ferrocyanide of potassium is acted on by a stream of chlorine gas until the color of the liquid passes from yellow to deep red, and thereafter, on evaporation and cooling, fine red crystals are obtained. The chlorine (Cl) acts upon two equivalents of the ferrocyanide of potassium (twice $2K_2FeC_6N_8 = 4K_2FeC_{12}N_{16}$), removing one equivalent of potassium (K), forming chloride of potassium (KCl), whilst the remaining constituents combine together, and produce one equivalent of ferridecyanide of potassium ($3K_2FeC_{12}N_{16}$, or $3K_2Fe_3Cy_6$, or $3K_2Fdcy$). The latter is known commercially in red crystals, readily soluble in water, and yields a fine deep *Prussian blue* (Turnbull's blue) when mingled with solution of protosulphate of iron (green vitriol), and hence is used largely in dyeing and calico-printing.

FERRIER, JAMES F., LL.D., a metaphysician, was born in Edinburgh, November 1808. After studying at Oxford, where he took the degree of B.A. in 1832, he was admitted to the Scottish bar in 1833. In 1842, he was elected to the chair of History in the university of Edinburgh, and in 1845 to that of Moral Philosophy in the university of St. Andrews. Mr. F. early attracted notice by some metaphysical essays, which appeared in *Blackwood's Magazine*; and in 1854 he published the *Institutes of Metaphysics*, in which he endeavors to construct a system of idealism in a series of propositions, demonstrated after the manner of Euclid. He afterwards edited the collective works of his father-in-law, the late Professor John Wilson of the University of Edinburgh. F. died at St. Andrews, June 11, 1864.

FERRIER, SUSAN EDMONSTON, aunt of the above, a successful novelist, was born in Edinburgh in 1782, and died in 1854. Her father, James Ferrier, one of the principal clerks of the Court of Session, and the colleague in that office of Sir Walter Scott, lived on terms of intimacy with the wits and literati of his day in Edinburgh, and Miss F.'s talents and quick powers of observation were early called into play in the midst of the literary society in which her youth was passed. Her first work, *Marriage*, appeared in 1818, and this was followed by *The Inheritance* (1824), and *Destiny* (1831). The merit of these tales, which are characterized by genial wit, a quick sense of the ludicrous, and considerable ability in the delineation of national peculiarities, is sufficiently proved by the fact, that they have stood their ground, notwithstanding the enormous number of works of fiction which have flowed from the press since their publication. Miss F. enjoyed the esteem and friendship of Sir Walter Scott, who, in the lays of his strength, repeatedly gave expression to his appreciation of her talents, and who derived consolation from her sympathy in the season of gloom which darkened the close of his life.

FE'RRO, or HIE'RRO, the most western of the Canary Isles, was formerly considered the most westerly point of the Old World, and for this reason geographers at one time took it as the point of departure in reckoning longitudes, as is still done by the Germans and others. Hence, in all probability, originated the present hemispherical division of the maps of the world, F. being taken as the boundary-line. The English, however, have adopted the meridian of Greenwich as the first meridian and in this their example is fol-

lowed by the Dutch, and in sea-charts generally; area, 82 square miles; pop. 4400. The meridian of F. is $18^{\circ} 9'$ west of that of Greenwich. See LONGITUDE.

FE'RROCYA'NOGEN is a compound organic radical, generally regarded by chemists as existing in ferrocyanide of potassium, or the yellow prussiate of potash, but which has not yet been obtained in a separate state. The principal compound of ferrocyanogen is the ferrocyanide of potassium, which is prepared by heating to redness in a covered iron pot a mixture of 3 parts by weight of of nitrogenized matter, such as dried blood, hoofs, parings of hides, scrapings of horn, or the flesh of old or diseased horses and other animals, 3 parts of carbonate of potash, and one part of iron filings. The carbon, nitrogen, and iron combine together, and form ferrocyanogen ($FeC_6N_8 = FeCy_3$, or Cfy), which at the same time, unites with the potassium, and produces ferrocyanide of potassium, or yellow prussiate of potash ($2K_2Cfy$). The compound which is obtained from the heated iron vessel is impure, but by repeated solutions in hot water, and recrystallization on cooling, the salt is obtained pure in fine large tabular crystals of a lemon-yellow color. The ferrocyanide of potassium is largely used in dyeing and Calico-printing (q. v.) in the production of many shades of *Prussian blue*; and when it is treated with sulphuric acid, and subjected to heat applied, hydrocyanic or prussic acid ($HCyN = HCy$) distils off from the mixture. The ferrocyanide of potassium is characterized by giving no indication of the presence of iron in its radical on the application of any of the tests for iron. It gives a light-blue precipitate on the addition of a solution of proto-sulphate of iron; a dark blue precipitate with perchloride of iron; a ruddy brown precipitate with sulphate of copper; and a white precipitate with acetate of lead.

FE'RROL, a strongly fortified seaport town of Spain, in Galicia, is most advantageously situated on a narrow arm of the sea, 14 miles north-east of the town of Corunna. It was originally a fishing-town, until selected for its natural advantages as a seaport by Charles III., who erected here what was at one time the finest naval arsenal in the world, and destined it exclusively for the Spanish royal navy. The entrance to the harbor, formed by a narrow inlet from the Bay of Betanzos, admits of the approach of only one ship-of-the-line at a time, and is defended by the castles of San Felipe and Palma. The town is defended by walls and fortifications, is on the whole, regularly built, and has several squares and pleasing alamedas or public walks. The arsenal, in which fifteen ships-of-the-line could be simultaneously built, covers a great space; and though now in a somewhat ruinous condition, is still the most important in Spain. F. had manufactures of hats, naval stores, hardwares; and exports corn, brandy, vinegar, and fish. Pop. (including the garrison) (1877) 23,811.

FE'RROTYPE, a term applied by Mr. Robert Hunt, the discoverer, to designate some photographic processes, in which salts of iron play an important part. Like many of the earlier paper processes, the ferrotype is far inferior in sensibility to the more modern collodion process or Archetype, and is on that account seldom if ever used even for landscapes.

FERRU'GINOUS is a term employed in chemistry to denote the presence of iron in natural waters, minerals, &c. It is synonymous with the term chalybeate. See CHALYBEATE WATERS.

FERRY (from Sax. *faran*, Ger. *fahren*, to move, proceed, allied to the Lat. *fero*, Eng. *bear*) a passage by boat across water. By the law of England, a man may have a right to keep a boat and to ferry passengers for a consideration, just as he may have a right to hold a fair, either by royal grant, or by prescription, from which a royal grant at some previous time will be presumed. No other title, unless conferred by act of parliament, will suffice, for no fair, market, or ferry can be set up without license from the crown either actual or presumed. The possessor of such a title need not necessarily be the proprietor of the soil on which the market is held, or of the water over which the right of ferry is exercised. In the latter case, he need not be the proprietor of the soil on either side of the river, though he must possess such rights over it as will enable him to embark and disembark his passengers. As fulfilling his part of the bargain with the public, the owner of a ferry is bound to keep a boat fit for the purpose of carrying passengers, whilst on the other hand he has a right of action not only against those who refuse or evade payment of the toll or passage money, but against those who disturb his franchise by setting up a new ferry so near as to diminish his custom.—Stephen, i. pp. 663, 664. It has been more than once decided, that the erection of a second ferry in such circumstances is a nuisance to the owner of the old one, who is bound to keep his ferry in readiness for use of the Queen's subject's, a burden which is not shared by his rival (North and South Shields Ferry Co. v. Barker, 2 Exch. 136). The rule in Scotland as to rival ferries is the same; but a grant of ferry from the crown to one heritor does not prevent his neighbors from keeping private boats for the

transport of themselves and their families and servants. Where ferries have not been given out by royal gift, either express or presumed as above described, they are *inter regalia*, i. e., they belong to the crown for the public benefit. In this case, they are under the management of the trustees of the roads connected with them, or are regulated by the justices of the peace for the county, or by special acts of parliament. By 8 and 9 Viet. c. 41, certain rules are laid down for the regulation of ferries. The act is confined to Scotland.

Common rowing-boats are generally used for ferrying foot-passengers, but when horses and carriages have to be taken across, a flat-bottomed barge, with an inclined plane at one end, to rest upon the shore, for landing and embarking, is generally used. This is either rowed across or pulled by a rope. When the current is strong, and the river of moderate width, the latter is best. The rope stretched across the river passes through rings or over pulleys attached to the barge, and the ferrymen move the barge across by pulling the rope. The chief advantage of the rope is to restrain the barge from drifting in the direction of the stream. With a small boat, this is obviated by the ferrymen rowing obliquely, as though he were steering for a point higher up the river; thus he moves through the water upwards to the same extent that the water moves over the land downwards; and by a composition of these motions, and his tending to the other side, he is carried directly across. Broad estuaries are now traversed in many places by steam-ferry.

Rafts are sometimes used for ferrying. On the Nile, a sort of raft is made of inverted earthen-pots full of air. For further information on the crossing of rivers, see FORD, FORDING.

Flying-bridge is the name given to a kind of ferry-boat which is moved across a river by the action of the combined forces of the stream and the resistance of a long rope or chain made fast to a fixed buoy in the middle of the river. The boat thus attached is made to take an oblique position by means of the rudder; the stream then acting against the side, tends to move it in a direction at right angles to its length, while the rope exerts a force in the direction towards the buoy. If these two forces be represented by the sides of a parallelogram, the actual course of the boat would be in the direction of the diagonal (see COMPOSITION AND RESOLUTION OF FORCES); but as the length of the rope remains the same, the boat must continue always at the same distance from the buoy, and therefore its course is a curve, a portion of a circle, of which the buoy is the center, and the rope the radius. The course of the boat and the action of the two forces are strictly analogous to the path of a rising kite, and to the forces of which this path is the resultant. The holder of the kite corresponds to the buoy, the wind to the tidal stream, and the tail to the rudder. Flying-bridges are used for military purposes, and the modes of adapting them to the varying circumstances of the width of rivers and the velocity of their currents, forms a part of the study of military engineering. An important element in the problem, is the determination of the right point of attachment for the rope. In case of a wide river, the rope or chain requires to be of considerable length, and must be supported by movable buoys or by small boats.

FERTILIZATION OF PLANTS. See FECUNDATION.

FESA, or FASA, a town of Persia, in the province of Fars, 80 miles south-east of Shiraz, is situated in a mountain defile, is of considerable size, and is said to have a population of 18,000. It has manufactures of silken, woollen, and cotton fabrics, and some trade in a superior kind of tobacco which is grown in the vicinity.

FESCENNINE VERSES, a branch of the indigenous poetry of ancient Italy, were a sort of dialogues in rude extempore verses, generally in Saturnian measure, in which the parties rallied and ridiculed one another. It formed a favorite amusement of the country-people on festive occasions, especially at the conclusion of harvest and at weddings. As was to be expected, it often degenerated into licentiousness, that at last required the curb of the law. The Fescennine verses are usually considered to be of Etruscan origin, and to have derived their name from the Etrurian town Fescennium; but there is little probability in this etymology. Verses of this sort were and are popular to this day all over Italy. The name is more likely connected with *fascinum*, fascination, enchantment, or the evil eye, against which the chanting of verses may have originally been intended as a protection.

FESCH, JOSEPH, Cardinal and Archbishop of Lyon, was born 3d January 1763 at Ajaccio. His father, a Swiss officer in the service of Genoa, had married a widow, whose daughter by a former husband, Letizia or Lætizia Ramolino, became the mother of Napoleon Bonaparte. F. was thus the half-brother of Letizia, and the uncle of the future Emperor. He had entered the clerical profession, but left it at the outbreak of the French Revolution, and, in 1795, became commissary to the Army of the Alps under his nephew in Italy. The First Consul having resolved on the restoration of the Catholic worship, F. resumed the clerical habit,

and was active in bringing about the concordat with Pope Pius VII. in 1801. He was now (1802) raised to be Archbishop of Lyon, and in the following year to be cardinal. In 1804, he was sent as French ambassador to Rome, where he ingratiated himself with the pope by his adroit management and ultramontane sentiments, and contributed to induce the pope to undertake his mission to Paris to consecrate Napoleon as Emperor. F. accompanied the pope, and assisted at the coronation; and for his services at Rome, he was rewarded by the office of Grand Almoner and a seat in the senate. In 1806, the Archbishop of Regensburg, Arch-chancellor and first Prince Elector of the just-expiring German Empire, and about to become the Prince Primate of the nascent Confederation of the Rhine, chose F. to be his coadjutor and successor; and, along with all these dignities, he received a stipend of 150,000 florins a year. In 1809, Napoleon wished to invest him with the Archbishopric of Paris, but F. declined it, as he had long been dissatisfied with the Emperor's policy in regard to the papal chair. In 1810, he presided at a national conference of clergy assembled at Paris, and the views which he maintained there, with even more than usual keenness, brought him into disgrace with the Emperor, who was still further exasperated against him on account of a letter which F. wrote to the pope, then (1812) in captivity at Fontainebleau, and which was intercepted. He lost his imperial dignities and pension, and after this lived in a sort of banishment at his bishopric of Lyon. At the approach of the Austrians in 1814, he fled to Rome with his sister Letizia, the mother of the Emperor, where he was received with open arms by the pope.

The return of Napoleon brought him back to France, and during the Hundred Days, he was nominated a member of the Chamber of Peers, though he never took his seat; but, after the battle of Waterloo, he had again to take refuge in Italy. The royalist clergy now persecuted him with accusations and lampoons which he in no way deserved. His resistance to the will of his nephew, and indeed his whole conduct, seem to have been actuated by sincere zeal for what he considered to be the interests of the church. When called upon by the Bourbons to resign his episcopal office, he obstinately refused; and it was not till 1825, after receiving a papal brief interdicting the exercise of his clerical functions, that he resigned the charge, but not the title. In 1837, an attempt was made to reinstate him, to which, however, the French government refused assent. He lived in the greatest friendship with his sister, Madame Mère, as she was styled, till his death. He died 13th May 1839. Of his famous and very large collection of paintings, he bequeathed a part to the city of Lyon, and the rest was disposed of in a series of auctions at Rome after his death.

FESCUE (*Festuca*), a genus of grasses, very nearly allied to Bromegrass (q. v.), and having in some species a loose, in some a contracted panicle; the spikelets many-flowered, with two unequal glumes, which they much exceed in length; each floret having two lanceolate paleæ, the outer palea rounded at the back, and acuminate or awned at the summit; the stigmas growing from the apex of the germen. The species are numerous, and are very widely diffused over the world, both in the northern and southern hemispheres. Among them are many of the most valuable pasture and fodder grasses. None are more valuable than some of the British species.—MEADOW F. (*F. pratensis*), a species with spreading panicle and linear spikelets, from two to three feet



Fescue Grass (*Festuca pratensis*): a, germen and stigmas; b, a spikelet.

high, common in moist meadows and pastures of rich soil, in Britain and throughout Europe, in Northern Asia, and in some parts of North America, is perhaps excelled by no meadow or pasture grass whatever.

It is suitable both for alternate husbandry and for permanent pasture.—SPIKED F. (*F. loliacea*)—by many botanists regarded as a variety of Meadow F., although it departs from the habit of the genus in having the branches of the panicle reduced to a single spikelet, and forming a two-rowed raceme or spike—is regarded as an excellent grass for rich, moist meadows.—HARD F., (*F. durincola*), a grass from one foot and a half to two feet high, with a somewhat contracted panicle, mostly on one side, is one of the

best grasses for lawns and sheep-pastures, particularly on dry or sandy soils. Several varieties are known to seedsmen and farmers.—CREEPING F. or RED F. (*F. rubra*) is probably a mere variety of Hard F., being distinguished chiefly by its extensively creeping root, which particularly adapt it to sandy pastures, and to places liable to occasional inundations.—SHEEP'S F. (*F. ovina*) is a smaller grass than any of these, not generally exceeding a foot in height, and often much less, abundant in mountainous pastures, and especially suitable for such situations, in which it often forms a principal part of the food of sheep for many months of the year. It is common in all the mountainous parts of Europe, and in the Himalaya, it is also a native of North America, and species very similar, if not mere varieties, abound in the southern hemisphere. Its habit of growth is much tufted.—TALL F. (*F. elatior*) is a grass of very different appearance, four or five feet high, with spreading much branched panicle, growing chiefly near rivers and in moist low grounds, and yielding a great quantity of coarse herbage, which, however, is relished by cattle.—Of foreign species, which have been introduced into Britain, *F. heterophylla* best deserves notice, a tall species with narrow root-leaves, and broad leaves on the culm; a native of France and other parts of the continent of Europe, and pretty extensively cultivated in some countries, particularly the Netherlands.—All these species are perennial.—Some small annual species occasionally form a considerable part of the pasture in dry sandy soils, but are never sown by the farmer.—A Peruvian species (*F. quadridentata*), called *Pigouil* in its native country, and there used for thatch, is said to be poisonous to cattle.

FESS. The fess in heraldry consists of lines drawn horizontally across the shield, and containing the third part of it, between the honorpoint and the nœmbril. It is one of the honorable ordinaries, and is supposed to represent the waist-belt or girdle of honor, which was one of the insignia of knighthood.

PER FESS.—A shield, or charge in a shield, is said to be *party per fess*, when it is horizontally divided through the middle, or, as the French say, simply *coupé*.

FESSWISE is said of a charge placed in fess; that is to say, horizontally across the shield.

FE'SSLER, IGNAZ. AURELIUS, a celebrated Hungarian historian, was born in 1756, in the county of Soprony or Oedenburg. During a long life full of adventures, F. served successively the Emperor Joseph II., the King of Prussia, and the Emperor of Russia; and also held the office of Professor of Oriental Languages at different universities. He died at St. Petersburg 15th December 1839. Among his works of a lasting value are—*Attila* (Breslau, 1794), *Muthias Corvinus* (2 vols. 1793; 2d edition, 1806, Breslau), and the *History of the Hungarians*, &c. (*Geschichte der Ungarn und deren Landsassen*, 10 vols., Leip. 1812–1825). His autobiography, entitled *Recollections of my 70 Years' Pilgrimage* (*Rückblicke auf meine 70 jährige Pilgerschaft*, Breslau, 1826; 2d edit. Leip. 1851), is also a very interesting work. Deep learning, coupled with a rare beauty of style, render F.'s works (all written in German) attractive in the highest degree.

FESTIVAL PLAYS. See **MORALITIES**, **MIRACLE PLAYS**, **MYSTERIES**.

FESTIVALS, or **FEASTS** (Lat. *festum*, probably from the same root as *fast* (q. v.); according to some from Gr. *hestia*, hearth), a term denoting certain periodically recurring days and seasons set aside by a community for rest from ordinary labor of life, and more or less hallowed by religious solemnities. Originating within the narrow circle of the family, and commemorating momentous events affecting one member or all, these pauses became more frequent, and of wider scope, as the house gradually expanded into a tribe, a people, a state. The real or imaginary founders, legislators, heroes, became objects of veneration and deification, and the salient epochs of their lives the consecrated epochs of the year. National calamities or triumphs were, in the absence of annals, best remembered by corresponding general days of humiliation or exultation. Earliest of all, however, did the marked stages in the onward march of nature: spring and autumn, seed-time and harvest-time—symbols of life and death; the solstices—turning-points of summer and winter; the new moon and full moon; the termination of cycles of moons and cycles of years, present themselves as opportune halting-places for man himself. No less were the all-important periodical rises of fertilizing rivers, and the anniversaries of importations and inventions of new implements for the better cultivation of the soil, or tending of the flocks, befittingly celebrated. The inherent human tendency towards referring all things of graver import, life and death, abundance and want, victory and defeat, to a higher power, could not but infuse a religious feeling into epochs so marked. Fostered and guided by priests and lawgivers, this property of our nature ere long found its expression in common sacrifices, prayers, and ceremonies, consecrated to the various superior and minor deities who presided over and inhabited the elements of the visible and invisible creation, and who, working

all the changes within them, acted, each in his sphere, as a partial providence over man.

According to the event which called them forth, these festivals were mournful or joyous, jubilant, or expiatory. Even when sorrow was to be expressed, the mortification of the body did not always suffice, but plays, songs, dances, and processions full of boisterous mirth, were resorted to—as in the festivals of Isis at Busris, of Mars at Papremis, in the Adonia of Egypt, Phœnicia, and Greece—because the divine wrath or sorrow was, like that of man, to be changed into satisfaction. Besides the relation between the common tutelary deity and those he protected, the bond also by which the otherwise disconnected members of the body politic were held together was, by means of these festive gatherings, periodically brought in view, and invested with greater strength and importance. Apart, however, from this their historical, astronomical, religious, and political end, festivals served another purpose—that of growing civilization. It was the glowing spirit of emulation which, stimulating the gifted in mind and body to strive for the festive laurel in contests of genius and skill, in honor of the gods, and in the face of all the people, matured all that was noble and brilliant within the community. Archaic rudeness and rustic extravagance became refined grace and classic harmony. The stirring drama, the glorious anthem, the melodious dance, the elegant game, which accompanied the festive sacrifice of some nations at their highest stage of development, had arisen out of those very mimicries and shouts, rude and savage beyond expression, of generations not long before them. Enthusiastic, wild, metaphysical Egypt invested the countless days consecrated to her deified stars, plants, animals, and ideas, to the Nile, to Ammon, Kneph, Menes, Osiris; to Horus, to Neitha, to Ptah, with a mystery, sensuality, and mournfulness always exaggerated, sometimes monstrous. The Hindu, no longer daring to offer human sacrifices, shows his odd and cruel materialism by throwing into the waves, on his festival of rivers, some of his costliest goods, gold, jewels, garments, and instruments; while in the licentiousness and debaucheries perpetrated on the festival of Shiva, the god of procreation, or on the Bacchantics of the goddess Bhavani, he exceeds even those of the Egyptians on their Neitha feasts at Bubastis, and the Greek worship of Venus in her Cyprian groves. Phœnicians and Assyrians, Babylonians and Phrygians, according to the little we know of their religions and manners, appear to have feasted, thanked, propitiated, mourned all at different times, and in the way most befitting their several natures, even in the case of those gods and festivals which they had in common.

The ancient Persians alone of all nations had no festivals, as they had no temples and no common worship. These 'Puritans of Polytheism,' who worshiped the sun only, and his representative on earth, fire, scorned show and pomp, and large religious gatherings. A striking contrast to them is formed, in another hemisphere, by the ancient Mexicans, who were found to possess one of the most richly developed calendars of festivals, scientifically divided into movable and immovable feasts. As a strange and singular phenomenon among festivals, we may also mention here that 'of the Dead or Souls,' celebrated among the wild tribes of North America. At a certain time, all the graves are emptied, and the remains of the bodies buried since the last festival are taken out by the relatives, and thrown together into a large common mound, amid great rejoicings and solemnities, to which all the neighboring tribes are invited.

Greece had received the types of civilization, religion, and art from Egypt and the East generally, but she developed them all in a manner befitting her glorious clime and the joyous genius of her sons. At the time of the *Iliad*, two principal festivals only—the harvest and the vintage—seem to have been celebrated (ix. 250); but they increased with such rapidity, that in the days of Pericles they had reached the number of a thousand; some indeed being an epitome only of their memorable feats of arms, others restricted to one town, or province, or profession, or sex, or to a few initiated, or recurring only at intervals of several years; but there were still so many kept by the whole people, that ancient writers bitterly denounce them as merry beginnings of a sad end, as the slow but sure ruin of the commonwealth. Their forebodings proved true enough; and yet Greece would certainly never have reached the highest place among nations, as far as literature, the arts and philosophy are concerned, had it not been for the constant contests attached to her many festivals. She resisted Asia, because her citizens were always alert, always ready. The religious part of the festival—homage offered to personified ideas—consisted mostly in the carrying about of the deity of the day to the sound of flute, lyre, and hymns, and in a sacrifice, followed by a general meal upon certain portions of the animal offered. Then followed scenic representations symbolizing the deeds of the gods; after which came games and matches of all kinds—foot, horse, and chariot races, leaping, boxing, throwing, wrestling, &c. Separate accounts are given of some of the more remarkable Greek festivals. See **BACCHUS**, **ELEUSIMIAN MYSTERIES**, **PANATHENÆA**, &c. There were also special times set aside for the 'Holy Games'

proper. The most important of these were the Olympian, the Pythian, the Nemean, and the Isthmian. (See these heads.) As all these festivities were provided out of the public purse—from the confiscated estates of the 'tyrants' and political delinquents—the individual did not suffer more than a welcome interruption of his usual business, and under that genial sky the penalty to be paid for occasional indolence was not too heavy.

Rome, founded amid pastoral festivities in honor of some god Pales, adopted and acclimatized, as she went on from conquest to conquest, the foreign deities, exactly as, with her usual prudence and practical sense, she conferred her right of citizenship on her foreign inhabitants, and on whole nations subjected to her rule. Her yoke was thus less galling to the new provinces, while at the same time the populace at home found sufficient distraction in the many ancient and newly imported festivals, with their quaint rites and gorgeous pageantry. Yet the Romans—more parsimonious and abstract by nature than the vivacious Greek neighbors from whom they had accepted the greatest part of their religion—never exceeded in their festivals the number of one hundred, and in these, again, a distinct line was drawn between civil and religious ones.

Some of the principal religious festivals were the Sementinæ, on the 25th of January—the rural festival of the seed-time; the Lupercalia, in honor of Pan; the Cerealia; the night festival of the Bona Dea; Matronalia; Minervalia; &c. To the purely civil ones belong the Janualia, the 1st of January and the new-year's day, when the new consuls entered upon their office, and friends used to send presents (*strenæ*) to each other; the Quirinalia, in memory of Romulus, deified under the name of Quirinus; and the Saturnalia, in remembrance of the golden age of Saturn, beginning on the 19th of December. The celebration of these festivals was in all respects imitated from the Greeks, with this difference only, that the games connected with them became, with the pre-eminently bellicose Romans, terribly lifelike images of war. Their sham sea-fights; their pitched battles between horse and foot, between wild beasts and men; their so-called Trojan games, executed by the flower of the nobility; their boxing-matches (with gloves that had lead and iron sewed into them); circus, arena, and amphitheater gave, especially in later times, the greater satisfaction the greater the number of victims.

It is one thing only that monotheism has in common with polytheism with respect to its festivals—namely, that they are with each the religious expression of human joy or human sorrow. But if the former, with a dim misgiving of some awful and supreme power, invited the multifarious governors of the many provinces of nature to partake, as guests, of bodily and intellectual feasts, together with their hosts; monotheism, in binding up all fear and all hope, all gratitude and all awe, which moved the heart of man, in one almighty Creator, Mover, and Maintainer of all things, celebrated its festivals in honor of this omnipresent Spirit with a veneration, a purity, and a lofty elevation, such as the worshippers of star, animal, or image never knew. With the first and strictest monotheists, the Hebrews, whose very existence as a nation was traced to the special and miraculous interference of this highest and only God, the remembrance of that great event, their liberation from Egypt, and the momentous period of preparation in the desert which followed it, mingled with almost all their religious observances, and especially their festivals, and infused into them all a tone of deep and fervent gratitude; while at the same time it held ever before their eyes the cause of their nationality, and their aim and destiny 'to be a kingdom of priests and a holy people.' The Hebrew festivals, too, are of a historical, agricultural, astronomical, and political nature; but they mostly combine all these characteristics, and are always hallowed by the same religious idea, and the same piety and devotion to one and the same holy name. Connected with their festivals were no plays and no representations of a god's deeds, no games and no cruelty, no mystery and no sensuality, but the sacrifice of the day, and a special occupation with the divine law, were the visible signs of the exalted seasons. The influence of the number seven—an influence met with among most eastern nations—is seen in the recurrence of many of the Jewish solemnities. See SEVEN.

The Sabbath, the first and most important of these septenary festivals, is treated of under its own head. Of the service in the temple, and of the way in which this and the other festivals were and are kept after the destruction of the temple, something will be said under HEBREWS and JEWS. The most exalted of new-moon festivals was that of the first day of the seventh month, 'the day of remembrance of the sounding' or 'of trumpets' (Lev. xxiii. 24), to which in later times, when the Seleucidian era was introduced (the Syrian year beginning with the autumnal equinox), the name of Rosh hashana (New Year) was given; notwithstanding that in Exodus (xii. 2) Nisan is spoken of as the first month of the year. After a period of six years of labor, the earth, too, was to celebrate a Sabbath-year; what it produced spontaneously belonged to the poor, the stranger, and to animals. It is remarkable that even Alexander the Great and Cesar remitted the taxes of

Judea in this year of *Shemitta* (abandoning). After a revolution of seven times seven years, the year of Jubilee or *Jobel* was to be celebrated, in which all the Hebrew slaves were set free, and all land which had been sold in the interval was restored to the former owners, in order that the original equilibrium in the families and tribes should be maintained intact. (These two festivals, however, were, according to the Talmud, not kept before the Babylonian captivity.) The pre-eminently agronomical and historical festivals were the three *Chaggim* (whence the Arab. *Hagg*, a pilgrim to Mecca)—viz., Pesach (Passover), Schabnoth (Feast of Weeks), and Succoth (Feast of Tabernacles), on which three every male was obliged to go up to Jerusalem and offer some of the first fruits, besides the prescribed sacrifices (see PASSOVER, &c.).

The postmosaic and exclusively historical festivals, Purim, the feast of Haman, Chanuca, the feast of the Maccabees, will be noticed in the article on JEWS.

Only a cursory glance can be here taken of the Christian festivals, which are treated fully and separately under their various names. They were for the most part grafted, in the course of time, upon the Jewish and Pagan ones, but always with a distinct reference to Christ and other holy personages. The weekly day of rest was transferred from Saturday to Sunday, and called the Day of Joy, or Resurrection, just as the weekly Jewish fasts of Monday and Thursday were changed for Wednesday and Friday. See FASTS. For a long time, both Saturday and Sunday were celebrated, especially in the East. Two separate celebrations took the place of the Jewish Passover: the *Pascha Staurosion* was the festival of the Death, the *Pascha Anastasion* of the Resurrection of our Lord (see EASTER); and the festival of Pentecost, or the law-giving at Sinai, became the festival of the outpouring of the Holy Ghost and of the inauguration of the New Covenant.

In the course of the 4th c., two new festivals were introduced: Epiphany (q. v.), which originated in the East; and that of the Nativity or Christmas (q. v.). Circumcision, Corpus Domini, the festivals of the Cross, of Transfiguration, of the Trinity, and many others, are of still later date. The veneration felt for Mary as the 'Mother of God,' found its expression likewise in the consecration of many days to her special service and worship; such as that of her Presentation, Annunciation (Lady's Day), Assumption, Visitation, Immaculate Conception (q. v.), and many minor festivals, over and above the Saturdays, which in some parts were entirely dedicated to her, in order that the Mother might have her weekly day like the Son. Besides these, there were festivals of Angels, of Apostles, Saints, Martyrs (on the supposed anniversary of their death, called their birthday, *dies natalis*), of Souls, Ordinations, &c.

Celebrated at first with all the primitive simplicity of genuine piety, most of these festivals were ere long invested with such pomp and splendor that they surpassed those of the ancient Greeks and Romans. Burlesque, even coarse and profane representations, processions, mysteries, and night-services, were, in some places, although unauthorized by the general church, connected with them, and voices within the church loudly denounced these 'pagan practices.' Ordinances forbidding mundane music and female singers for divine service were issued, the vigils were transformed into fasts, days of abstinence and penance were instituted, partly as counterpoises, but with little result. Nor did the prodigious increase of these festive occasions, and the rigor with which abstinence from labor was enforced in most cases, fail to produce the natural results of indolence and licentiousness among the large mass of the people. Bitter and frequent were the complaints throughout Christendom; but although even men like Archbishop Simon of Canterbury (1332), Petrus de Alliaco, Nicolaus of Clemangis, did their utmost to obtain a reduction of these festive occasions, which overspread well-nigh the whole year, it was only after the most decided and threatening demands, such as that pronounced by the German Diet of Nürnberg in 1522, that Pope Urban was prevailed upon to reduce the number for Catholic Christianity (1642). Benedict XIV. (1742), Clement XIV. (1773), followed in the same direction. On the change produced both in their number and in the manner of their celebration through the Reformation, we must forbear to enlarge here.

The Christian festivals have been divided variously: into *ferie statuta* (returning annually at fixed times), *indicta* (extraordinary, specially proclaimed), *duplicita* (double reminiscence, or of higher importance), *semiduplicita* (half double), &c. Another division is into weekly and yearly feasts, these latter being subdivided into greater and minor, or into movable and immovable. There is also a distinction made between *integri* (whole days), *intercisi* (half-days), &c.

The only trace of the ancient manner of dating a festival from the eve or vesper of the previous day—a practice discontinued since the 12th c., when the old Roman way of counting the day from midnight to midnight was reintroduced—survives in the 'ringing in' of certain days of special solemnity on the night before, and in the fasts of the vigils.

On some of the principal Mohammedan festivals, partly based upon those of the Jews and Christians, such as the weekly Friday, the Yom Ashoorah (the Jewish Day of Atonement), the Birthday of the Prophet (Molid An-Nebee), that of Hussein, of Mohammed's granddaughter Zeyneb, of the Night of the Prophet's Ascension to Heaven (Leylet Al-Mearag), the Night of the Middle of the month Shaabán, in which the fate of every man is confirmed for the ensuing year; the Eed Al-Shagheer or Ramadan-Beyram, at the end of the Ramadan fasts, and the Eed Al-Kabir, or the great festival of the Sacrifice (Kurban Beyram), see MOHAMMEDANISM. For further information, see Herodotus (ii. 60); Plutarch (vii.); Strabo (vi. and x.); Ovid, *Fasti*; Macrobius, *Sat. i. 7, 11*; Meursius, *Græcia Feriata*; Meiners, *Geschichte d. Relig.*; Fasold, *Ierologia*; Bible, Mishna; Gemara; Shulchan Aruch; Josephus; Philo; Maimonides; Buxtorf, *Lex. Talm.*; *Synag. Jud.*; Bartolucci, *Bibl. Rabb.*; Lightfoot, *Hor. Hebr. and Talm.*; Lund, *Bibl. Hebr.*; Wette, *Archæologie*; Neander, *Hist. of the Ch.*; Blackmore, *Christ. Antiq.*; Baumgarten, *Erläuterung d. chr. Alterth.*; Siegel, *Handb. d. chr. Alterth.*; Mai, *Discorsi di Argomento Religioso*; Koran, &c.

FESTOON, in Architecture, a sculptured wreath of flowers or fruit, frequently used as an ornament in Roman and renaissance buildings. Like many of the other ornaments of classic archi-



Festoon:
St. Mark's Library, Venice.

ecture, it owes its origin to one of the sacrificial emblems, viz., the flowers with which the heads of the animals, the altars, &c., used to be decorated. The festoon occurs along with bulls' heads on the frieze of the temple of Vesta at Tivoli. The fig. is an example of a renaissance festoon, from the library of St. Mark at Venice.

FESTUS, SEXTUS POMPEIUS, a Latin lexicographer, of the third or fourth c. of our era, is one of the most important ancient authorities we have on the Latin language. He made an epitome of the great work of Verrius Flaccus, *De Verborum Significatione*. This compilation, which was arranged alphabetically in 20 books, was still further abridged and spoiled in the end of the 8th c. by Paul, son of Warnefried, commonly called Paulus Diaconus. The great work of Flaccus has unfortunately entirely perished, and of the abridgment made by Festus, only a single MS., and that in a deplorably imperfect condition, has survived. It came from Illyria, and fell into the hands of Pomponius Lætus, a distinguished scholar of the 15th century. It ultimately passed into the library of Cardinal Farnese, at Parma, and is now preserved at Naples. The work, in spite of all its imperfections, is a grand storehouse of knowledge on points of mythology, grammar, and antiquities. All previous editions of F. are of little value compared with that of K. O. Müller (Gött. 1839), in which he has made use of the Farnese MS. and other sources, distinguishing the value of each.

FETICHISM is the worship of a *fetich*. The word *fetich* comes to us from the Portuguese, who were the first Europeans that traded on the west coast of Africa, and who expressed their idea of the religion of the natives by the Portuguese word *feitico*, 'magic.' This word, somewhat modified, passed into the French language, through Brosse's treatise, *Du Culte des Dieux Fétiches* (Dijon, 1760), and from him into German, through the medium of Pistorius (Stralsund, 1785). The term has now received European recognition. A *fetich* is anything in nature or art to which a magical power is ascribed, e. g., stones, carved figures, or certain parts of plants, animals, &c. In this general sense *fetichism* coincides with the belief in charms—a belief which is also to be found among monotheistic nations. The first step out of *fetichism*, is when ignorant tribes cease to be satisfied with believing merely in the magical power inherent in their *fetiches*, and begin to ascribe a certain conscious operation to the objects of their reverence, especially to the *fetiches* in the forms of beasts or men. In this way the *fetich* becomes an idol, and *fetichism* an idolatry. The lowest form of such idolatry is where the savage does not hesitate to throw away, to chastise, or even to destroy his *fetich*, if it does not appear to gratify his desires. The reverence for sacred woods, mountains, streams, &c., which formed part of the religion of the old Greeks, Celts, and Germans, is not *fetichism* proper, but rather belongs to the worship of nature.

FE'TID LI'MESTONE, a variety of limestone which gives out, on being violently rubbed, or struck with a hammer, a smell like

that of sulphuretted hydrogen gas. It has a dark color, produced very probably from the perishable portions of the animals whose hard skeletons compose the rock. This animal matter may perhaps also be the cause of the disagreeable smell. Stinkstone or Swinestone have been likewise employed as characteristic names for this limestone.

FETLOCK, or **FETTERLOCK**. English heraldic writers speak of a horse fetlock or fetterlock, and represent it thus. It seems to have been an instrument fixed on the leg of a horse when put to pasture, for the purpose of preventing him from running off. In Scotch Heraldry, a hoop is usually substituted for the chain, and the fetlock is represented thus, as in the arms of Lokkert (Lockhart) of Barre, given by Sir David Lindsay; Argen, on a bend sable three fetterlocks or. Some branches of this family carry a man's heart within the fetterlock, one of the heads of it having accompanied Good Sir James Douglas with King Robert the Bruce's heart to Jerusalem (Nisbet, i. p. 325).



Fetlocks

FEU AND FEU-DUTY. A feu may be described, in familiar language, as a right to the use and enjoyment of lands, houses, or other heritable subjects, in perpetuity, in consideration of an annual payment in grain or money, called *feu-duty*, and certain other contingent burdens called *casualties* of superiority (see *CASUALTY*). Though a feu was frequently used to express any kind of tenure by which the relation of superior and vassal was constituted, in its narrower meaning, which we have here indicated, and which is that in which it is now almost exclusively used, it was opposed, on the one hand, to those tenures in which the return consisted of military or other personal service (ward and the like), and on the other, to those in which the return was illusory (*blanch*), the only object of which was to preserve the relation of superior and vassal.

A feu, in short, was a perpetual lease—a feu-farm, as it was often called—by which the tenant became bound to pay a substantial consideration, and his rights under which he might forfeit, as the penalty of non-payment. In the present day, the disposal of land in feu is practically a sale for a stipulated annual payment, equivalent to chief rent. It is in this light, accordingly, that feus are generally regarded in Scotland; and though feus resemble English freeholds in substance, their forms agree mostly with copyhold tenure. See Patterson's *Compendium of English and Scotch Law*. The system of feuing property for building purposes seems to have several advantages over that of the long building-leases common in England. From its perpetual character, it gives to the person actually in possession a feeling of greater interest in the property, and usually leads him to erect more enduring structures than he probably would do under a lease. For as time runs on, the feu often increases in value, while the reverse must always be the case with leasehold property. Neither does it in any degree interfere with the letting of property on lease or otherwise. Almost all the houses in Edinburgh and the other towns in Scotland which are let, either on leases or from year to year, are held by those who are spoken of as their proprietors not in absolute property, but as feus. Modern feu-duties are in general paid in money. When the stipulation is for a duty in grain, the quantity is valued by *fiar* prices for the year (see *FIARS*), and paid in money accordingly. The deed transferring the land in feu from the superior to the vassal is called a *feu-charter*—a clumsily conceived and expensive document, which requires renewal in the case of heirs to vassals, or of parties to whom the vassal sells his right; and this repetition of the transaction, designated as 'entering with the superior,' forms the heavy drawback on the acquisition of land in feu, no matter how small in amount. Usually, the feu-charter reserves to the superior all minerals in the ground, and stipulates that the vassal shall build his house either in a particular style or of a certain value. By the Scottish stat. 1597 c. 246, it is declared that all vassals by feu-farm failing to pay their feu-duty for two years together, shall lose their right in the same manner as if an irritant clause had been specially engrossed in their charter. But as the superior must obtain a degree declaring the loss of the vassal's right, before the forfeiture can take effect, if the feu is worth keeping, the duties, as a matter of course, will be paid. In the very rare case of the property having fallen off in value to the extent of rendering the feu a positive burden, it is possible that the irritancy may be voluntarily incurred. For the most part, land proprietors near towns and manufacturing villages are anxious to add to their annual rental by feuing grounds for building purposes. The rate of feu is very various, from as low as £8 to as high as £500 per acre per annum; a common rate is from £20 to £30 per acre. Whatever be the amount, it is payable by the feuar—not the tenant to whom the feuar may have let the property.

When a building consists of several floors forming distinct dwellings, the feu-duty is allocated in certain proportions among the respective proprietors; the feuar to whom the lower floor be-

longs usually paying most. In properties of this kind, each is responsible only for his own share. Occasionally, feu-duties are offered for sale; and as a safe investment, bring from 25 to 30 years' purchase. In such cases, the vassal has an opportunity of extinguishing his feudal tenure, and becoming the superior. There are also instances of vassals sub-feuing. It is customary in feuing building lands for the superior to make the roads and drains. Relieved of this obligation, and getting possession of a site on a mere prospective annual payment of perhaps only a few shillings, the feuar has an undoubted advantage; looking, however, to the cumbersomeness and cost of the feu-charters, and the liability of successors to pay fines at entry, the system is entangled, troublesome, and expensive; and, at least as far as forms are concerned, is allowed to stand in need of reform.

FEUD (Angl.-Sax. *fehgt*) seems to be only another form of the word *fight*, and is allied to *foe*, and probably to *fiend*. It meant a war waged by one family or small tribe on another, to avenge the death or injury of one of its members. In a certain state of society, this is a legitimate mode of obtaining redress. It prevailed extensively among the nations of northern Europe; and it was only by gradual steps that the practice was first restricted and then abolished. The laws of Rudolf I. of Germany recognized the right of waging feuds. At last, partial associations were formed, the members of which bound themselves mutually to settle their differences by courts of arbitration and compensation, without going to war.

FEUDAL SYSTEM. By some, the word feu or feud, of which feudal is the adjective, is derived from the Lat. *fides*, faith, and *ead* or *odh* or *od* a Teutonic word signifying a property, or estate, in land; whilst by others, with perhaps greater probability, the first syllable also is maintained to be Teutonic, equivalent to *eich*, cattle, ultimately from the same root with the Latin *pecus*, which, in the form of pecunia, came to signify property, and its representative, money—because, as Varro remarks, property amongst pastoral nations consisted of cattle (Varr., *De Lingua Latina*, 5, 19, s. 95, ed. Müll.). A feudum, in this sense, would be a piece of land held for a *fee*, or pecuniary consideration, using pecuniary in the wide sense which its etymology suggests. Be this as it may, the feudal system, as a developed institution, belonged neither to the Teutonic nor to the Romanic nations, in their original and unmixed condition. We find it neither in the woods of Germany, nor in the Roman empire previous to the incursions of the Franks and Lombards. Neither the institutions described by Tacitus, nor those with which the Roman jurists have rendered us familiar, exhibit anything that is even analogous to it as a whole. But they each exhibit partial indications of some of the characteristics which must peculiarly distinguish it; and as it arose about the beginning of the 9th c., just when the fusion between the conquering barbarians and the subject populations of the Romanized provinces was everywhere taking place, it seems impossible to doubt that it was a result of the mutual influence of the two races.

The subordination of class to class, and the intimate relations by which all the classes of the community were bound together, taken along with the independence and equality of the individual members of each class within itself, were amongst the most prominent features of the simple society of the Teutonic nations; and these correspond with wonderful accuracy to the relations of superior and vassal, beginning with the sovereign and descending to the smallest feudal proprietor, and also with the equality amongst *peers*, which existed within each of the feudal classes. On the other hand, the incomplete and fiduciary character of the proprietorship implied in a *feu*, as held in trust from a superior on the faith of services to be rendered, or dues to be paid, bore a very close analogy to the Roman emphyteusis (from which indeed the word feu has often been derived), and to the *dominium utile* as opposed to the *dominium directum*. See DOMINIUM and EMPHYTEUSIS.

The nature of this very important social institution, by which the life of every European people of any importance was governed from the beginning of the 9th till the close of the 13th c., and by which many of the forms of our modern life are still affected, will probably be more clearly understood if we commence our description of it from below, by exhibiting the position of the simple land-holder, than by adopting the monarch in whom it culminated, and from whom, in a technical sense, it was supposed to flow (see ALLODIUM), as our point of departure. The latter course has been more strictly adhered to by English writers, from the circumstance that, subsequent to the Conquest, the whole territory of England was regarded as the property of the conqueror, and was by him divided amongst his barons, and by them amongst their dependents, an arrangement which was somewhat peculiar to England (see ALLODIAL), whereas the feudal system, in its essentials, was common to the whole of Europe. A feudal proprietor, then, or feudatory, was a person who held his lands from another, for his own lifetime merely, in the earlier times, on con-

dition of certain services which he was to perform to a superior or suzerain. Apart from the duties to which he was thus bound, he was not only a free man, but his position was that almost of an independent sovereign within his own small dominions. If his holding was at all an extensive one, he lived in a castle, which, notwithstanding the efforts of Charlemagne and his successors to prevent it, was generally fortified, not only for purposes of defence, but to enable him to pursue that life of rapine which in lawless times was not considered inconsistent with honesty or personal worth. For greater security, the castle was generally situated on a height, and under its walls there nestled a village, in which all the dependents of the proprietor, with the exception of his immediate family, and all those who lived by the cultivation of the soil, usually dwelt—isolated farmhouses and cottages being too much exposed to plunder to admit of their being scattered over the country then, as we see them in England now.

A portion of the inhabitants of each feudal domain were usually bound to the soil, and were thus subject to a species of slavery, the conditions of which varied according to the customs of different districts. These were spoken of as *adscripti* or *adscriptitii glebe*, and were called *natiri*, or bondmen, and *villain-soemen*, as opposed to free-soemen on the one hand, and serfs or *theorics* on the other, of whose position we shall speak below. (Stephen's *Com.* i. p. 188). 'He was,' says Sir Francis Palgrave, speaking of the *ceorl*, 'a villain appurtenant; and, notwithstanding the language which was employed to the effect, namely, that he could be bequeathed, bought, and sold, it must be understood that the gift, the bequest, or the sale, was in effect the disposition of the land and of the *ceorl*, and of the services which the *ceorl* performed for the land, a transaction widely differing from the transfer of a slave, whose person is the subject of the purchase.' (*Rise and Progress of the English Commonwealth*, vol. i. p. 18). The *ceorl*, moreover, could purchase his own freedom and that of his wife and offspring (*Ib.*). See VILLEIN. The rest were free tenants, farmers in the modern sense, though personal services to the proprietor probably in almost every case constituted a portion of the rent which was paid. Latterly, when the system of subinfeudation was introduced, many of his wealthier tenants came to stand to the baron, or lord of the domain, very much in the relation which we are about to describe as subsisting between him and his lord paramount. From being tenants-at-will, scarcely less subject to his authority and exposed to his caprices than the thralls, or villeins of the lowest class, they became vassals of their lord, and free citizens of what thus gradually developed itself into a feudal monarchy in miniature. The tenure by which this latter class held their lands was generally known in England as Free Socage (Stephen's *ut sup.* i. 205 *et seq.*). The castles by which the banks of the Rhine are studded along its whole course, from Bonn to Bingen, with their villages and parish churches, for the most part in the condition in which they were erected centuries ago, afford the most numerous and perfect examples of the arrangements of the feudal period which are perhaps anywhere to be met with. The possessors of these castles stood in a magisterial as well as a proprietary relation to their dependents. They exercised jurisdiction, extending even to the infliction of capital punishment, either in person or by means of officers whom they appointed for the purpose; and the castle was in general furnished with dungeons and other appliances for carrying their sentences into execution. Towards each other they stood in the relation of equals, or peers (Lat. *pares*); they were neighbors, simply, and friends or enemies as the case might be—too often the latter. But towards their immediate feudal superior, the count, marquis, duke, or whatever might be his title, to whom the government of the whole district belonged, they all stood in a relation which brought them in contact, and in some degree bound them to each other. Of him they held their lands on conditions somewhat similar to those on which they let them out to their own dependents.

At first, as we have said, they were only tenants for life; but their rights in most countries very early assumed a hereditary character, the dominant proprietor's rights, on the death of a tenant, being confined to the exaction of certain dues from his son and successor, as a consideration for conferring on him, or rather for confirming to him, the feu which his father had held. Where the feu, fief or feoff, as it was sometimes called from the mode of admission—feoffment, or as it is said in Scotland, infeftment (q. v.)—descended to a female, the dominant proprietor was entitled to control her marriage, for the purpose of procuring himself a sufficient and trustworthy vassal; a privilege which, like all those of the lord, was latterly converted into a mere pecuniary claim. When the lord paramount, or suzerain, as he was called, held his court of justice, his vassal barons were the judges, being all on a footing of equality, or *pares curie*, as it was called. When he made war, either on his own account, or as furnishing a contingent to the army of the state, in such cases as in the national wars between France and England in the 12th and 13th centuries—which were the earliest instances of really national wars—his vassals were bound to attend him in person, and to

furnish each the contribution of men, horses, arms, and other materials of war for which he was liable by the tenure on which he held his lands. In addition to these services, he was bound to watch and ward his castle, a duty which the minor barons almost invariably imposed on their vassals when the system of granting fiefs extended downwards to the class of persons who had formerly been mere tenants-at-will. Then there were certain dues which were almost always exigible from the vassal, such, e. g., as contributions towards providing a ransom for his lord when in captivity, for enabling him to celebrate the marriage of his eldest son with due pomp, or to provide a suitable dowry for his daughter. If these dues were not paid, the land reverted to the dominant proprietor, in relation to whom the vassal all along was a mere usufructuary. So far were the conditions of feudal holdings from being always the same, that no less than eighty different tenures have been enumerated; the onerous character of which varied from what was merely nominal, e. g., the payment of a white rose or a pair of spurs, 'if asked merely,' up to what was a rent in some degree equivalent to the value of the land.

For an account of the manner in which the feudal system affected the constitution of land rights and the conveyance of landed property, and still affects them, see CONVEYANCING.

Inferior to all the classes of society in feudal Europe of which we have hitherto spoken, there is reason to fear that there existed almost everywhere, in the earlier times, a class of the positively unfree. The lot of those who were in absolute slavery excluded them from the influences of feudality as a legal and social institution—'they were not reckoned,' says Palgrave, 'amongst the people'—but their existence is by no means to be left out of account in forming to ourselves a picture of European society in feudal times.

Of the condition of this class, as forming the substratum of feudal society, we shall have a pretty accurate conception from the following passage, in which Lappenberg describes them in Anglo-Saxon times, if we bear in mind, on the one hand, that subsequently to the Conquest their ranks were probably swelled by such of the Anglo-Saxon population as was in absolute poverty; and on the other, that their position, in all the countries of Europe, was gradually ameliorated by the influences of Christianity, the spirit if not the letter of which has everywhere proved hostile to slavery. 'One class of the Anglo-Saxon population, at the period of the Norman Conquest, consisted of the unfree or servile (*theowas esnas*), whose number, as registered in Domesday-book, was little over 25,000. Of these, the majority were in a state of slavery by birth, whose forefather had been either Roman slaves, British prisoners of war, or other enemies. Others, denominated, *wite-theowas*, or penal slaves, had been freemen, but reduced by the sentence of the law to the servile condition on account of debt or delinquency. (Palgrave *ut sup.* i. 28.) The master had the right of selling the theow in the country, but not beyond the sea, even if he had perpetrated crime. In other respects, the condition of the servile seems to have differed little from that of the indigent free slaves who had a special wergild, half of which fell to the master and half to the kin.' (Thorpe's Lappenberg, ii. p. 320.) It is probable that the vast majority of the servile class in Anglo-Saxon, and even in Norman times, consisted of persons of Celtic blood. (Palgrave *ut sup.* p. 26.) In proof of this fact, Lappenberg remarks that their numbers diminish as we recede from the Welsh border and from Cornwall, the places in which the Celtic or original British population is known to have taken refuge.

The social elements which counteracted and mitigated the influences of feudality in mediæval life, were monarchy, the church, which vigorously promoted the emancipation of the unfree, and above all, the growing wealth, power, and importance of the commons. In order to free himself from the rude and insolent dictation of his feudal vassals, the king, in almost every European state, courted the alliance of the town communities, who had remained more in the condition in which they had been left by the Romans than the inhabitants of the country, and who were consequently all along more or less opposed to the growth and influences of feudality. See MUNICIPIUM. By their aid, even before the formation of standing armies, something approaching to executive power was placed in the hands of the sovereign. He was thus enabled to appoint and enforce the decrees of independent judges of his own, who in the earlier time were generally churchmen, and thus greatly to circumscribe the power and influence of all classes of feudal proprietors over their dependents. Though the period of bloom of the feudal system was, as we have said, from the 9th to the 13th centuries, in most of the countries of Europe, it everywhere, in many of its features, long survived the latter period. Even considered as a social, and not merely as a legal institution, in which latter capacity it still exists, it was in many respects in vigor in Scotland down to the year 1747, when military tenures were abolished by statute, as dangerous to public tranquillity.

FEU DE JOIE, or 'running-fire,' a discharge of musketry into the air, made in honor of a victory or other great occasion. It commences with the right-hand man of the line, who discharges his rifle, and is followed successively, at scarcely perceptible intervals, by the men on his left, until the extreme left of the line is reached. The effect much depends on the regularity with which the slight interval between the discharges is preserved.

FEUERBACH, PAUL JOHANN ANSELM, RITTER VON, one of the most distinguished criminal jurists of Germany, was born at Jena 14th November 1775. Brought up at Frankfurt-on-the-Maine, where his father was an advocate, and educated in the gymnasium there, he went in 1792 to Jena, where he cultivated his mind by the study of philosophy, and then devoted himself to positive law. In 1798 he appeared as criminal jurist in a work *On the Crime of High Treason*, and in the following year he began to deliver lectures in the university of Jena. In his lectures and published writings, he introduced into criminal jurisprudence a new method of treatment, which was systematized in his Compendium of German Penal Law (*Lehrbuch des Gemeinen, in Deutschland geltenden peinlichen Privatrechts*, Giessen, 1801; 14 Aufl. von Mittermaier, 1847). This celebrated work placed F. at the head of a new school of jurists, who maintain that the decision of the judge in every case ought to be determined solely by an express deliverance of the penal law, never by his own discretion, and who on that account obtained the name of Rigorists. In 1801 F. was appointed ordinary professor in Jena, but in 1802 accepted a call to Kiel. In 1804 he was removed to the university of Landshut; but next year, having received a commission to prepare a penal code for Bavaria, he was transferred to Munich as privy referendary for the ministerial, judicial, and police departments; and in 1808 was appointed privy-councillor. The new penal code which he planned for Bavaria (*Strafgesetzbuch für das Königreich Baiern*, München, 1813), received, after a few modifications, the royal approval, and was taken as a basis in the emendation of the criminal law of several other countries. During this period also, he published his Remarkable Cases in Criminal Law (*Merkwürdige Criminalrechtsfälle*, 2 Bde., Giessen, 1808—1811), which first led the way to a deeper psychological treatment of such cases. In 1812, he published a work on Trial by Jury, to which a second volume, on the Judicial Procedure of France, was added in 1825, as the result of a visit to Paris in 1821. In 1817 he became second president of the Court of Appeal in Bamberg, and afterwards first president of the Court of Appeal at Ansbach for the Rezat district. In 1832 he published a work on the unfortunate Kaspar Hauser, whose mysterious fate had strongly attracted his interest. He had just edited a collection of his miscellaneous writings, when he died at Frankfurt-on-the-Maine 25th May 1833. An interesting life of F. has been written by his son, Ludwig (*Leben und Wirken Anselm von Feuerbachs*, 2 Bde., Leip. 1852). F. left, besides three daughters, five sons, who have all distinguished themselves in German literature.

FEUERBACH, LUDWIG ANDREAS, German philosopher, fourth son of the preceding, was born at Ansbach, 28th July 1804. After studying theology for two years at Heidelberg under Paulus and Daub, in 1824 he was attracted to Berlin for the purpose of hearing Hegel, and soon after he abandoned theology, with the view of devoting himself entirely to philosophy. In 1828 he became *privatdozent* in the university of Erlangen, but in a few years quitted the academical chair, and gave his whole time to literary labor. In a small anonymous work (*Gedanken über Tod und Unsterblichkeit*, Nürnberg, 1830), which attracted little attention when it appeared, he indicated that he had already gone beyond the standpoint of his master Hegel, by combating the doctrine of immortality. During the next few years, he published three works on portions of the history of philosophy, treating severally of the period between Bacon and Spinoza, of Leibnitz and of Pierre Bayle. But these historical works only paved the way to a critical investigation into the nature of religion and its relation to philosophy, the results of which have been given to the world in several works well known to speculative theologians. The most celebrated of these is his work on the Nature of Christianity (*Das Wesen des Christenthums*, Leip. 1841; 2 Aufl. 1743), which has been translated into English. Starting from the Hegelian doctrine, that the Absolute comes to consciousness only in humanity, F. denies to it any existence beyond the human consciousness, maintaining it to be merely the projection by man of his own ideal into the objective world, on which he feels his dependence. All authority above man, and consequently all moral obligation, is therefore consistently regarded as a delusion proceeding from man himself, and the highest good is explained as that which is on the whole most pleasurable. Yet even this highest good is further explained as consisting in resemblance to that ideal humanity which man creates for himself, and worships as God. A kind of ideal theism is therefore retained by F.; but when his doctrines were adopted by the mass of German communists, they degenerated, perhaps logically, into an actual atheism, which ignored any

moral or social law imposed on the individual from any other source than himself.—The works of F. have been collected with additions and corrections to bring them into accordance with his later views (*F.'s Sämmtliche Werke*, 10 Bde., Leip. 1846—1866). He died 13th Sept. 1872. See Karl Grün's *Ludwig F.* (1874), and Beyer's *Leben und Geist F.'s* (1873).

FEUILLANS, CONGREGATION OF, a reform of the Cistercian order, remarkable as forming part of the great religious movement in the Roman Catholic Church during the 16th c., contemporary with and probably stimulated by the progress of the Reformation. The author of this reform was Jean de la Barrière, abbot of the Cistercian monastery of Feuillans, who, painfully struck by the relaxation of its discipline, laid down for himself a new and much more austere course of life, in which he soon found many imitators and associates among the brethren of his order.

The rule thus reformed was, after considerable opposition from the advocates of the old rule, approved, with certain modifications, by Pope Sixtus V.; the reformed congregation, however, being still left subject to the authority of the abbot of Cîteaux; and a convent was founded for them by Henry III. in the Rue St. Honoré, Paris. The subjection to the abbot of Cîteaux was removed by Clement VIII. in 1595; and Urban VII., in 1630, separated the congregation into two branches, one for France, and the other for Italy, each under a distinct general. The rules of both these branches were subsequently modified about the middle of the same century.

The celebrated revolutionary club of the Feuillants took its name from this order, the convent of which, in the Rue St. Honoré, was the place of meeting for the members of the club. It was founded in 1790 by Lafayette, Siéyes, Laroche-foucauld, and others holding moderate opinions. The club was at first called the 'Company of 1789,' and was intended to support the constitution against the ultra party. It reckoned among its members individuals of all classes, who took the constitution of England as their model. This opposition served, however, only to accelerate the revolutionary movement. On the 27th January 1791, on Count Clermont-Tonnerre being elected president of the club, a popular insurrection broke out against it; and, on the 28th March, the assembly in the cloister was forcibly dispersed by a raging mob.

FEUILLEA, a genus of plants of the natural order *Cucurbitaceæ*, named in honor of Louis Feuillée, a French botanist and traveler in Chili. The species are generally half-shrubby climbers, natives of the warm parts of America. The seeds, at least of some of them, as *F. cordifolia* and *F. trilobata*, contain a great quantity of a bitter fixed oil, which is obtained by expression, and is used for lamps. It has also a high reputation in the West Indies and Brazil as a cure for serpent-bites, and an antidote to some kinds of vegetable poisons.

FEUILLETON (Fr.), literally a small leaf, signifies that portion of a political newspaper set apart for intelligence of a non-political character, for criticisms on art, literature, &c., and usually separated from the main sheet by a line. The feuilleton is an invention of the *Journal des Débats*, which, since the year 1800, has held an important place in the sphere of literary criticism. By degrees, the belles-lettres element began to pervade it; and the result was a species of light journalistic literature, in which Jules Janin became the acknowledged king. In the years immediately preceding the revolution, Feb. 1848, entire romances were spun out in the feuilleton. The *Constitutionnel*, in particular, made large pecuniary profits by the social romances of Eugene Sue, which it published in this manner. The French system has been imitated in England and Germany, though with less success than in France.

FEVE'DA, an island of British Columbia, is situated in the Gulf of Georgia, between Vancouver Island and the continent. It is in lat. 49° 41' N., and long. 124° W., measuring 32 miles in length by 2 in average breadth. It possesses a snug little harbor, which appears to be all the more valuable on account of the superior quality of the fuel which abounds on the spot. Its formation is understood to be wholly of limestone.

FEVER (Lat. *febris*, from *ferveo*, I grow warm, or perhaps from *feruo*, I cleanse), a form of disease characterized principally by increase of the temperature of the body, which, however, requires to be estimated according to the state of the internal parts, rather than the external; the surface of the body, and particularly of the extremities, being not frequently cold rather than warm. Having regard to the heat of the surface only, fever has commonly been considered as passing through three distinct stages, more or less marked: 1, the cold or shivering stage; 2, the hot stage; 3, the sweating stage. This description is perfectly correct in most cases, but it requires to be qualified by the remark, that even in the cold stage of fevers, it is now well ascertained that the blood and the internal organs have an elevated temperature, as estimated by the thermometer introduced into the cavities of the body. In

the cold stage of fever, accordingly, and even in the most violent ague, when the teeth are chattering with cold, and the whole surface is pale and clammy, the state of the system is well expressed by the aphorism of Virchow (the most ingenious and comprehensive of the modern exponents of the pathology of fever), to the effect that 'the outer parts freeze while the inner burn.' Increased heat of the body, therefore, is the most essential, perhaps the only essential phenomenon of fever. The other symptoms are loss of appetite, thirst, restlessness, and vague general uneasiness, often headache, and diffused pains in the back and limbs; a frequent pulse, which is sometimes also full and hard; a furred tongue, often with red margin; a flushed face and suffused eyes; vitiated secretions, and general derangement of the functions, with great debility of the voluntary movements of the limbs. The disease often commences with a shivering, or rigor, as it is technically called; this leads through the cold stage to the hot, which usually follows pretty rapidly, and is attended by all the febrile phenomena in their highest degree; the skin being often very pungently warm to the hand, dry and harsh; by and by the pores appear to open, moisture begins to bedew the surface, and the pungent heat disappears: the disease is then about to pass into its third or sweating stage, which ushers in the convalescence. For the special symptoms of particular fevers, see **TYPHUS** and **TYPHOID FEVERS**, **SMALL-POX**, **SCARLET FEVER**, **MEASLES**, **AGUE**, **INTERMITTENT** and **REMITTENT FEVER**, **YELLOW FEVER**.

Besides being thus the leading fact in a number of specific diseases, fever is also associated with many other forms of disease as a secondary or subordinate phenomenon, connected with an inflammation or other distinctly local disease. Thus, in Pneumonia (q. v.) or Enteritis (q. v.), fever is as much a part of the symptoms as pain or any other; and even in some chronic or long-standing diseases, as in Consumption (q. v.), a slow and consuming type of fever (see **HECTIC FEVER**) is found to be very generally present. Indeed, there is no condition which rules so large a part of the physician's duty, whether in the way of distinguishing diseases or of curing them, as this constitutional state. Fever is also very generally prevalent after surgical operations and injuries, of which it constitutes one of the leading dangers; and in midwifery practice, it is well known as constituting a large part of the risks of the puerperal state, whether in the slighter form commonly called a *weed*, or in the more dreaded and fatal, often epidemic, form of Puerperal Fever (q. v.).

The family of fevers is thus separated pretty naturally into two large groups, in one of which the fever is the greatly predominating fact, and determines the specific character of the disease: the local disease (if present) being quite subordinate, and usually secondary in point of time; the other, where the opposite order prevails, and the fever is obviously secondary. Hence the distinction embodied in medical language between *idiopathic* (i. e., self-originating, spontaneous) and *symptomatic* or secondary fevers. Fevers are also distinguished, with reference to their mode of diffusion, as Epidemic (q. v.) and Endemic (q. v.); or with reference to their supposed cause, as contagious, infectious, malarious, pneumonic, rheumatic, &c.; or with reference to their incidental symptoms and their peculiarities of course and termination (the presumed specific phenomena attracting, of course, particular attention), as eruptive (see **EXANTHEMATA**) or non-eruptive, bilious, gastric, enteric, mucous, putrid, malignant, typhoid, &c.

Among these distinctions, based upon the course of the fever, one demands particular notice, as involving an important law of febrile diseases generally, and of a large class of fevers of warm climates in particular. Periodic increase and diminution, or paroxysms of longer or shorter duration, with intervals of more or less perfect relief from all the symptoms, are characteristic of most diseases of this kind, but especially of those arising from *malaria*, i. e., emanations from the soil, educed under the influence of solar heat. The duration of the paroxysms and of the intervals, the complete *intermission*, or more partial *remission*, of symptoms, become in such cases the characteristic facts that mark the *type*, as it is called, of the fever, which is accordingly distinguished as intermittent, remittent, or continued; and, according to the length of the periods, Tertian, Quartan, Quotidian, &c. (q. v.).

The true pathology, or ultimate essence of the febrile state, is still a subject open to question; but it is in accordance with modern physiology to regard fever as connected with some complex derangement of the functions on which the animal heat is known to depend—viz., the nutrition of the textures, or the vital changes constantly in operation between the blood, on the one hand, and the ultimate atoms of solid texture, on the other. Recent observations have shown that, in the paroxysm of ague, the waste of the nitrogenous tissues is in excess; and further, the curious result appears to be arrived at, that for almost every grain of excretion representing this excess of waste in a given time, there is a proportional increase of the temperature of the blood, according to accurate thermometric observations. If such observations are corroborated and extended, it will probably appear that the cause

of fever is to be found in an increased destructive decomposition of the atoms of texture through the oxygen absorbed at the lungs and circulated with the blood; perhaps under the influence of a derangement of nervous system. Some investigators have been led by the GERM-THEORY to regard some of the specific fevers as parasitic diseases.

The treatment of fever will be considered under the separate forms already referred to.

FE'VERFEW (*Pyrethrum parthenium* or *Matricaria parthenium*), a perennial plant, found in waste places and near hedges in Britain and many parts of Europe. It is botanically allied to Chamomile (q. v.), and still more nearly to Wild Chamomile (*Matricaria chamomilla*) and much resembles these plants in its properties, but differs in appearance, the segments of its leaves being flat and comparatively broad, and its flowers smaller. Its habit of growth is erect, its stem much branched, and about 1—2 feet high. It has a strong, somewhat aromatic smell. It was once a popular remedy in ague, and from time immemorial has been used as an emmenagogue. It is employed in infusion, and is stimulant and tonic. A double variety is not uncommon in gardens.—Of the same genus with F. is the MAYWEED (*P. inodorum* or *M. inodora*), with leaves more resembling those of chamomile, but almost scentless, and large flowers, with white ray and yellow disc, very common in cornfields and waste places in Britain and throughout Europe.

FE'VERWORT (*Triosteum perfoliatum*), a perennial plant of the natural order *Caprifoliaceæ*, having an erect, round, hairy, fistular stem, from one to four feet high, opposite ovato-lanceolate entire leaves, axillary whorls of flowers, with tubular 5-lobed corolla, and leathery 3-seeded berries. It is a native of North America, where its dried and roasted berries have been occasionally used as a substitute for coffee; but it is chiefly valued for its medicinal properties, its roots acting as an emetic and mild cathartic. It is sometimes called *Tinkar's Root*, from Dr. Tinkar, who first brought it into notice.

FEZ (Ar. *Fas*), the chief and most northerly province of the empire of Morocco, occupies the country between the Atlas Mountains and the Mediterranean. Its population is estimated at about 3,200,000, consisting of Berbers, Moors, Arabs, Negroes, Jews, and a few Europeans. The province is divided into fifteen districts. FEZ, the capital of the province, in lat. 34° 6' N., and long. about 5° 0' W., was founded by Muley Edris II., in the year 808 A.D., and was reckoned during the middle ages—when it was the capital of the kingdom of Morocco—one of the most magnificent and largest cities in the Mohammedan world. It is said to have contained about 90,000 dwelling-houses, and about 700 mosques, and was celebrated for its splendid public buildings, schools, and scientific institutions. On the removal of the court to Morocco, about the middle of the 16th c., F. gradually fell into decay. It is still, however, a place of considerable importance. The situation of F. is singular; it lies in a valley, formed by surrounding hills into a sort of funnel, the higher parts of which are covered with trees, orange groves, and orchards. It is divided into Old and New F. by one of the upper branches of the Sebu, and has a population variously estimated at from 100,000 to 150,000 souls. There are 100 mosques, of which the most important is that built by the Sultan Muley Edris, which contains his monument, and is an inviolable refuge for criminals, however guilty. On account of its numerous mosques and relics, it is regarded as the Holy City of the Western Arabs. It has seven well-attended schools. The old palace of the sultan is large, but is now falling into decay. In other respects, the external aspect of F., with its numerous baths, caravanseras (of which there are about 200), and bazars, resembles that of Mohammedan towns in general; the multitude of hotels and shops alone imparting to it a peculiar and more European character. A considerable trade is still carried on, by means of caravans, with the adjoining countries on the south and east, extending as far as Timbuktú. F. carries on manufactures of woollens, sashes, silk-stuffs, girdles, slippers, fine carpets, &c. Its artisans are also skilful workers in gold and jewelry.

FEZZA'N (more correctly, FESSAN), an extensive oasis in the north of Africa, in 24°—31° N. lat., and 12°—18° E. long. It lies south of the regency of Tripoli, and has a population variously estimated at from 75,000 to 150,000 souls. The north is for the most part hills, but the hills are composed of perfectly bare, black

quartz sandstone, with no rivers or brooks among them, and the south is mainly a level waste of dry sand. Not more than a tenth of the soil is cultivable.

In the neighborhood of the villages, which are situated mainly in the wadies, wheat, barley, &c., are cultivated. Camels and horses are reared in considerable numbers. Lions, leopards, hyænas, jackals, wild-eats, porcupines, vultures, ostriches, buzzards, &c., are found in abundance. The inhabitants are a mixed race, of a brown color, in many respects resembling the negroes, but are generally well formed. The original inhabitants belonged to the Berber family, but since the invasion of the country by the Arabs in the 15th c., the traces of this native North African element have gradually become very faint. The language spoken is a corrupt mixture of Berber and Arabic. The people are far behind in civilization, and occupy themselves with gardening and the manufacture of the most indispensable necessities of life. Considerable trade is carried on by means of caravans between the interior of Africa and the coast. F. is the Phazania of the ancients, against which the Romans, under Cornelius Balbus, undertook a campaign about 20 B.C. During the classic period, as well as in the middle ages, it was governed by its own princes who were at first independent, but afterwards became tributary to the pashas of Tripoli. In the year 1842, F. was conquered by the Turks, and is now attached to the government of Tripoli. Murzuk, the capital of F., is a well-built town, with broad streets and a population of 3000. Merchandise valued more than £21,000 annually changes hands here, and of that amount the slave-trade forms seven-eighths. Murzuk is now the great starting-point from the north for the interior of Negroland. Compare Barth's *Travels in Central Africa* (Lond. 1857), and also the descriptions given of Fezzan by Denham, Clapperton, Oudney, Richardson, Dr. Vogel, &c.

FIAR. See FEE AND LIFERENT.

FIARS (a word said by Jamieson to be of Gothic origin, and to exist in the same form in Icelandic). The *fiars* prices in Scotland are the prices of the different kinds of grain of the growth of each county for the preceding crop, as fixed by the sentence of the sheriff, proceeding on the report of a jury summoned for the purpose, before whom the evidence of farmers and corn-dealers is produced. The values thus officially ascertained serve as a rule for ascertaining the prices of grain in all contracts where they are not fixed by the parties; and in many sales it is agreed to accept the rates fixed by the fiars. Ministers' stipends, in so far as they consist of grain, and crown dues, are also paid by the fiars prices of the country for each year. With a view to the latter, fiars, in former times, were struck in exchequer. An error in striking the fiars will not afford a ground of suspension.

The form of procedure in 'striking the fiars,' as it is called, is regulated by Act of Sederunt, 21st Dec. 1723, renewed 29th February 1728. The time fixed by this act for summoning the jury is between the 4th and 20th of February, and the verdict must be returned before 1st March, old style; which is generally considered too early, as before that time not much grain of the previous crop has been brought into the market. Mr. Barelay, sheriff-substitute of Perthshire, in his Digest, gives the following account of this difficult and delicate process as practised in his county. 'In Perthshire, the fiars court is held on the last Friday of February, or the first Friday of March. The jury consists of eight heritors, a few farmers, and some neutral parties, especially one or two able to check the calculations.

'An experienced accountant is sworn, and acts as such, but is not on the jury, and is paid a fee from the county rates. The list of the jury is shifted every alternate year, thereby giving sufficient release from duty, and yet securing persons skilled in the practice. Some years ago, it was arranged to take no juror who either paid or received rents according to the fiars; but this greatly limited the choice, and was complained of, and abandoned. All considerable dealers in Perthshire victual, whether resident in Perthshire or elsewhere, are uniformly summoned, and in addition every person whose name is given in by whatever person interested.' As grain is commonly sold according to weight, one shilling being generally allowed on wheat for every additional pound-weight on every bushel; on an application by the farmers, it was agreed to determine the classification by taking a certain weight as the point of division. The first thing which the jury do is consequently to determine the point of weight. The witnesses are then sworn to the schedules, which they receive after harvest, and in which they insert every separate quantity of grain sold, with the dates and prices divided into first and second classes, according as the judgment of each witness dictates, and the weight of each parcel. The results of the separate schedules are inserted by the accountant in a general schedule, which is summed up by the accountant, such members of the jury as are capable assisting him. The result constitutes the fiars prices for the year. The same mode is not adopted in England; but weekly averages of all grain sold at public markets are ascertained and published



Common Feverfew (*Matricaria parthenium*):

a, floret of the ray; b, floret of the disc; c, fruit, showing the toothed membranous pappus.

in the *Gazette*, and this is without respect to the produce of particular counties. 9. Geo. IV. c. 60; 5 and 6 Vict. c. 14; 9 and 10 Vict. c. 22. See *Historical account of the Striking of the Fairs in Scotland*, by George Paterson, Esq., Advocate, 1852.

FIASCO, a term borrowed from the Italian theater, and now naturalized in France and Germany, besides being occasionally used by English writers. It signifies a failure to please on the part of an actor or singer, and is thus the opposite of *furor*, although why the word, which simply means a bottle, should come to be thus applied, is more than anybody knows. In Italy, it is not uncommon to hear an audience cry out, '*Olà, olà, fiasco*,' even when the singer has only made a single false note.

FIAT, in English Law, a short order or warrant of some judge for making out or allowing certain processes.

FIBER. See **MUSQUASH**.

FIBRE (Lat. *fibra*), a term of very common use as applied to objects of a stringy or thread-like character, whether of the animal, vegetable, or mineral kingdom. Minerals are often described as of a fibrous structure or appearance, in which there is, however, no possibility of detaching the apparent fibres from the general mass, or in which they are inflexible and brittle if detached; but a more perfect example of mineral fibre is found in *Amianthus*, a variety of **ASBESTUS** (q. v.).

For the scientific use of fibre with regard to the animal kingdom, we refer to the article **MUSCLE**; for its scientific use with regard to the vegetable kingdom, to **VEGETABLE TISSUE** and to **WOOD AND WOODY FIBRE**. In its most popular, but perfectly accurate use, it includes the hair or wool of quadrupeds, the silken threads of the cocoons of silk-worms and other insects, the fibres of the leaves and of the inner bark of plants, and the elongated cells or hairs connected with the seeds of plants, the ordinary materials of cordage and of textile fabrics.

Of mineral substances, amianthus alone has been used for textile fabrics, and that only to a very limited extent. Animal and vegetable fibres have, from the earliest ages, supplied man with cordage and with cloth. How the invention took place, can only be matter of conjecture.

The animal fibres used for textile purposes are chiefly of the two classes already mentioned—(1) the wool or hair of quadrupeds, and (2) the silk of the cocoons of insects. To these may be added (3) the Byssus (q. v.) of molluscs, but this class contains only the Byssus of the *PINNA* (q. v.) of the Mediterranean, an article of ancient and high reputation, but more of curiosity than of use. The skins and intestines of animals, although sometimes twisted or plaited for various uses, can scarcely be reckoned among the fibrous materials afforded by the animal kingdom. For information regarding the fibres obtained from the cocoons of insects, see **SILK** and **SILKWORM**. It is to the first class that the greater number of different kinds of animal fibre used for textile purposes belong; and the wool of the sheep far exceeds all the rest in importance. See **SHEEP** and **WOOL**. But the wool or hair of other quadrupeds is also to some extent used, as of the Goat (see **GOAT** and **ANGORA**), the Alpaca (q. v.), the Camel (q. v.), the Bison (q. v.), the Musk Ox (q. v.), the Yak (q. v.), and the Chinchilla (q. v.); all of which, except the last—and it has but a doubtful claim to be mentioned—are, like the sheep, ruminants. The hair of comparatively few animals is sufficiently long for textile purposes, or can be procured in sufficient abundance to make it of economic importance. The warmth of clothing depends much on the fineness of the hair, and on other characters in which wool particularly excels.

The useful vegetable fibres are far more numerous and various than the animal. They are obtained from plants of natural orders very different from each other; none of them, however, belonging to the class of acrogenous or cryptogamous plants. They are obtained also from different parts of plants. Those which are derived from exogenous plants are either the fibres of the inner bark (or **BAST**, q. v.), as flax, hemp, &c., or hairs of the fruit, as cotton. The useful fibres of endogenous plants sometimes also belong to the fruit, as coir or cocoa-nut fibre, and the unimportant fibre of cotton-grass. The spathe of some of the palms is sometimes also sufficiently fibrous and strong to be used for bags, &c., without separation of its fibres; the fibres of the interior of the stem of old cocoa-nut palms are sometimes used for coarse purposes; the fibrous character of the stems of the slender palms called rattans, of bulrushes, &c., fits them for wicker-work, for plaiting into chair-bottoms, and the like; the roots of the *Agaves* (q. v.) yield fibres useful for various purposes; but generally, the more valuable fibres obtained from endogenous plants are those of their leaves, either of the leaf-stalks—as Piassaba fibre and Gomuto or Ejoo fibre, both produced by palms—or of the blade of the leaf, as Pine-apple fibre, Pita Flax, New Zealand Flax, Bowstring Hemp, &c.

The fibres of the leaves of endogens being parallel to each other, are easily obtained of sufficient length for economical purposes; whilst the reticulated fibres of the leaves of exogens, even

if long enough, which is comparatively seldom the case, cannot be separated for use. The *bast* fibres of exogens, however, are often of sufficient length, and easily separable. Their separation is generally accomplished by steeping in water, or by frequent bedewing with water, so as to cause a partial rotting of the other parts of the bast and of the bark which covers it. But the fibres of endogens being in general discolored and injured by this process to a much greater degree than those of exogens, mere mechanical means are usually preferred for their separation, such as beating, passing between rollers, and scraping. The fibres of many leaves are separated by scraping alone. The fibres of *fruits*, as cotton, exist in nature in a separate state, like the wool or hair of animals, and require merely to be collected and cleaned.

A complete enumeration of the kinds of vegetable fibre applied to economical purposes would not be easy. Flax, Hemp, and Cotton have long had the pre-eminence. To these have recently been added New Zealand Flax, Jute, Sunn or Sunn Hemp, Coir, Pita Flax, Abaca or Manilla Hemp, Bow-string Hemp, China Grass, Piassaba, and many others. New kinds are continually being brought under notice, and to this industrial exhibitions and industrial museums have most beneficially contributed. New kinds, however, do not immediately command the attention they deserve. 'If a new product is sent into the market,' says Dr. Royle, 'few of the regular customers will buy it, as they want that to which their machinery and manufactures are suited.' But for the judgment and enterprise of Mr. Salt, it might have been long ere alpaca wool had obtained its present place among the materials of our manufactures; and there is much reason to think that many vegetable fibres, now little regarded, may yet in like manner be exalted to importance.

For the use of vegetable fibres in the manufacture of paper, see **PAPER**.

FIBROUS PLANTS. Without attempting a complete enumeration of plants which yield fibres employed for economical purposes, we give the following as a list which may be useful. Many of the subjects will be found treated in separate articles, or more fully noticed under the natural orders. The most important are indicated by capitals.

I. EXOGENOUS PLANTS.

1. *Fibres of the Fruit.*

Nat. Ord. *Malvaceæ*. **COTTON**, produced by species of *Gossypium*.

——— *Sterculiaceæ*. Silk-cotton, or vegetable silk, the produce of *Bombar villosum*, &c.

——— *Asclepiadaceæ*. The silk-like down of the seeds of Virginian Silk (*Asclepias Syriaca*).

2. *Fibres of the Inner Bark or Bast.*

Nat. Ord. *Malvaceæ*. **DECKANEE HEMP** (*Hibiscus cannabinus*).—Other species of *Hibiscus* *Althæa cannabina*, *Sida abutilon*, &c.

——— *Sterculiaceæ*. A great number of different genera; some of them cultivated to a small extent.

——— *Tiliaceæ*. **JUTE** (*Corchorus olitorius*, *C. capsularis*, &c.)—The bast of some trees of this family, as the Linden or Lime (*Tilia Europæa*, &c.) is used for mats, ropes, &c. See **BAST**.

——— *Linaceæ*. **FLAX**, the produce of *Linum usitatissimum*.

——— *Leguminosæ*.—**SUNN**, Jubbulpore Hemp, &c., the produce of species of *Crotalaria*.

Spanish Broom (*Spartium junceum*).

Bokhara Clover (*Melilotus arborea*).

Dunchee (*Sesbania aculeata*).

Species of *Cytisus* (as Common Broom), *Butea*, *Parkinsonia*, *Bauhinia*, &c.

——— *Asclepiadaceæ*. Jetea (*Marsdenia tenacissima*).

Yerum or Mudar (species of *Calotropis*).

Virginian Silk (*Asclepias Syriaca*, *A. debilis*).

Other species of several genera.

——— *Apocynaceæ*. Canadian Hemp (*Apocynum cannabinum*).

Nat. Ord. *Urticæ*. Common Nettle (*Urtica dioica*) and other species of *Urtica*.

Species of *Bœhmeria*, one of them yielding **CHINA GRASS** Fibre.

——— *Cannabaceæ*. **HEMP** (*Cannabis sativa*).

Hop (*Humulus lupulus*).

——— *Moraceæ*. The bark of some species of Fig.

——— *Conifereæ*. Inner bark and roots of some species of Pine and Fir.

——— Unknown. **Braze**.

II. ENDOGENOUS PLANTS.

Nat. Ord. *Liliaceæ*.

NEW ZEALAND FLAX, fibre of leaves of *Phormium tenax*.

Bowstring Hemp, fibre of leaves of species of *Sansevieria*.

Fibre of leaves of species of *Aloe* and of *Yucca*.

- Nst. Or. *Amaryllidææ*. Pita Flax, fibre of leaves of *Agave Americana*.
 — Fibre of leaves of species of *Fourcroya*.
 — *Musacææ*. Abaca or Manilla Hemp, and Plantain Fibre, obtained from leaves of species of *Musa*.
 — *Bromeliacææ*. Pine-apple Fibre, Curraw, &c., fibres of leaves of species of *Bromelia*, &c.
 — *Pandanacææ*. Fibres of leaves of Screw-pines.
 — *Palmacææ*. COIR or cocoa-nut fibre, from husk of cocoa-nut. Fibre of cocoa-nut stem. Gomuto or Ejoo fibre, from leaf-stalks of Gomuto Palm (*Arenga saccharifera*).
 — Piassaba, from *Attalea funifera* and *Leopoldinia Piassaba* (the Chiquichiqui Palm).
 — Other fibres from leaf-stalks, &c., of many palms.
 — *Cyperacææ*. Fibre from leaves of *Eriophorum canabinum* (see COTTON GRASS). Mats, chair-bottoms, &c., made of different *Cyperacææ*.
 — *Graminææ* or Grasses. Esparto (*Stipa tenacissima*). Moonja (*Saccharum munja*).

FIBRINE is an organic compound, occurring both in animals and plants. In its chemical composition it closely resembles albumen and caseine, and it was until recently believed that these three substances possessed a common radical, to which the name *protéine* was given, the *protéine* being regarded as the primary basis of all the tissues of the body. Hence we frequently find fibrine described as one of the *protéine* bodies.

Fibrine is distinguished from the allied substances, albumen and caseine, by its separation in a solid state, in the form of extremely delicate filaments or lamellæ, from any fluid in which it is dissolved, very shortly after the fluid is taken from the organism. Animal fibrine, which is of great physiological importance, occurs principally in the blood, the lymph, and the chyle. It results from the union of two albuminoids, fibrinogen and fibrinoplastic substances, which exist separately in the blood. To obtain F., beat or stir the blood with a bundle of twigs, to which the fibrine adheres in strings. The impure fibrine thus obtained is then rinsed with water, boiled with alcohol and ether, to remove fatty matters—and dried. In healthy venous blood, it scarcely ever amounts to 3 in 1000 parts, its average quantity being 2.3. Small, however, as its amount is, it varies more than any other constituent of the blood, and in acute inflammatory diseases sometimes exceeds its average by five or six times. Moreover, arterial blood contains more fibrine than venous blood. In the lymph and chyle, it occurs in considerably less quantity than in the blood. In inflammatory exudations, we find fibrine in the contents of the serous cavities—as, for example, of the pleura and peritoneum—and on the mucous membrane (as in croup); in these cases, it usually occurs in a state of spontaneous coagulation.

There are good physiological reasons for believing that fibrine is formed from albumen, and not directly from the food; and as fibrine contains a little more oxygen than albumen, it has been inferred that it is formed from the latter by a process of oxidation. As, however, more fibrine is found in the blood in pneumonia—when a considerable portion of the lungs is rendered impervious to air—than in almost any other disease, we are inclined to adopt the opposite hypothesis, that the augmentation of the fibrine in inflammatory blood is caused by an insufficient supply of oxygen. When oxygen is abundantly introduced into the blood, the fibrine rapidly undergoes further transformations: on the other hand, when, in consequence of impeded respiration, the quantity of oxygen conveyed to the blood is not sufficient to effect the further normal oxidation or transformation of the fibrine, we have an accumulation of that constituent in the circulating fluid.

It has, however, been a disputed question, whether fibrine is produced in the elaboration or in the disintegration of the tissues. For the discussion of this subject, and of other points connected with fibrine, we must refer to any standard work on Physiological Chemistry.

The substance forming the mass of flesh or muscular tissue was formerly regarded as identical with coagulated blood-fibrine. The two substances are, however, chemically distinct, and the muscle-fibrine will be described under its new chemical name SYNTONIN (from *sunteinein*, to contract or render tense).

FIBROUS TISSUE. See TISSUES.

FICHTE, JOHANN GOTTLIEB, an illustrious German philosopher, was born at Rammenau, in Upper Lusatia, 19th May 1762. His earliest years were marked by a love of solitary musing and meditation. When a mere child he was wont to wander forth to upland fields, that he might enjoy the pleasure of gazing into the illimitable distance. In 1775, he was placed at the gymnasium of Pforta, near Naumburg; and in 1780 he entered the university of Jena, where he devoted himself at first to theology, but afterwards to philosophy. During the years 1784—1788, he supported himself in a precarious way as tutor in various Saxon families. Subsequently he went to Zurich in a similar capacity, where he made

the acquaintance of the excellent lady who afterwards became his wife, Johanna Maria Rahm. In 1791, F. obtained a tutorship at Warsaw, in the house of a Polish nobleman. The situation, however, proved disagreeable, and was thrown up by the fastidious philosopher, who next proceeded to Königsberg, where he had an interview with Kant, of whom he had become an ardent disciple. Here he wrote, in 1792, his *Kritik aller Offenbarung* (Critique of all Revelation), which he showed to that philosopher, who praised it highly, but still maintained a certain air of reserve towards the enthusiastically earnest author, which pained the latter greatly. At Königsberg, F. was reduced to such straits for want of the means of subsistence, that he was forced to ask the loan of a small sum of money from Kant, which the latter was stoical enough to refuse. Things were now at the worst with F., and of course—according to the old adage—they began to mend. He entered the delightful family of the Count of Krokow, near Danzig, as tutor; was enabled to marry; and in 1794 was appointed to the chair of Philosophy at Jena, where he commenced to expound with extraordinary zeal his system of transcendental idealism. F., in fact, preached his philosophy as if he believed its reception essential to the salvation of his hearers. In 1795, he published his *Wissenschaftslehre* (Doctrine of Science), in which he clearly broke away from Kant, whose speculations did not seem to him sufficiently thorough, or, as Englishmen would say, *idealistic*. Indeed, as early as 1793, writing to Niethammer, he says: 'My conviction is, that Kant has only indicated the truth, but neither unfolded nor proved it.' An accusation of atheism, which F. fervidly but fruitlessly refuted, cost him his chair in 1799. In the previous year, he published his *System der Sittenlehre* (System of Ethics, Jena, 1798), considered by many to be his most mature work. He now removed to Berlin, where he delivered lectures on philosophy to a select auditory.

In 1800, appeared his *Ueber die Bestimmung des Menschen* (On the Destiny of Man). In 1805, he obtained the chair of Philosophy at Erlangen, with the privilege of residing at Berlin in the winter. Here he delivered his celebrated lectures, *Ueber das Wesen des Gelehrten* (On the Nature of the Scholar, Berlin, 1805—1806). In the same year, appeared his *Grundzüge des gegenwärtigen Zeitalters* (Characteristics of the Present Age); and in 1806, his *Anweisung zum seligen Leben oder die Religionslehre* (The Way to the Blessed Life, or the Doctrine of Religion). But F. was a patriot as well as a philosopher. The victories of Napoleon at Auerstadt and Jena drew forth the famous *Reden an die Deutschen* (Addresses to the Germans). These addresses were full of the most exalted enthusiasm. F. laments that his age has denied him the privilege accorded to Æschylus and Cervantes, to make good his words by manly deeds. The Prussian king appreciated the zeal of the eloquent metaphysician, and, on the restoration of peace, requested him to draw up a new constitution for the Berlin University. In 1810, the university was opened, with a host of brilliant names, F., Wolff, Müller, Humboldt, De Wette, Schleiermacher, Neander, Klaproth, and Savigny. By the votes of his colleagues, F. was unanimously elected rector. Here, as at Jena, he labored with unremitting energy for the suppression of all those customs which he deemed barbarous in themselves, and incompatible with the true idea of a scholar. In 1813, the war of independence broke out, and the hospitals of the Prussian capital were soon crowded with patients. F.'s wife was one of the first to offer her services as a nurse. For five months, she tended the sick with all the patient tenderness and devotion of her nature. At last she was seized with fever, 3d January 1814. After a fearful struggle, she recovered; but her husband caught the infection, and in spite of all remedies, sank under its influence, and died 27th January 1814. It is difficult to speak calmly of Fichte. His life stirs one like a trumpet. He combines the penetration of a philosopher with the fire of a prophet, and the thunder of an orator; and over all his life lies the beauty of a stainless purity. See *Fichte's Leben und literarischer Briefwechsel* (published by I. H. Fichte, 2 vols. Sulzb. 1830—1831); and W. Smith's *Memoir*, published by Chapman and Hall (Lond. 1848). The fundamental notion of the idealism set forth in F.'s writings, at least in the earlier of them, is the sole reality of the *Ego* or *I*, which posits both itself and the *Non-ego*, or *Not-I*. (The phrase 'to posit,' it ought to be observed here, signifies in German metaphysics, to present to the consciousness. Hence, when it is said that the *ego* posits itself, the meaning is, that the *ego* becomes a fact of consciousness, which it can only become through the antithesis of the *non-ego*.)

Under this *ego*, however, must not be understood, according to the usual misapprehension, the human and finite, but the 'absolute subject-objectivity' (*absolute subject-objectivität*), the eternal, universal reason. The *ego* is the absolutely productive, which, however, would not attain to consciousness of itself—i. e., of its infinite spontaneous activity, did it not at the same time place in contrast to itself, and as an impediment (*anstoß*) and limit to its activity, the *non-ego*—i. e., the objective world, or nature. The *ego*, in so far as it is determined by the *non-ego*, is the intelligent

ego, and, as such, the subject of theoretical science; the ego, on the other hand, as determining the non-ego, is the subject of practical science. Freedom, absolute, spontaneous activity, for its own sake, is not with F., as with Kant, the condition and pre-supposition of moral action, but is itself the highest expression of the problem of the moral law. To realize this self-activity, however, the ego requires an external world of objects, in order that in them as limits it may become conscious of its own activity. To this idealistic system of ethics it has been plausibly—some think unanswerably—objected that it makes the non-ego be required as the condition of morality, and at the same time represents the removal of this condition as the aim of moral effort. With respect to the idea of right, F.'s theory of freedom, in its fundamental principles, attached itself to the Kantian theory of freedom as the innate and primitive principle of right. Generally speaking, F. makes that which, from the stand-point of ordinary consciousness, we call the world, merely a product of the ego; it exists only through the ego, for the ego, and in the ego. F. himself afterwards modified or extended his system, so as to bring out more prominently the *theistic* character of his metaphysics. The transition to this later stage of F.'s philosophy is seen in his *Bestimmung des Menschen* (Destination of Man). It arose from the intense religiosity of his nature. F. was essentially a worshipping nature, and though he never ceased to be a philosopher, the untiring aspiration of his later years was to realize in his own way the belief of the great Jewish law-giver: 'The eternal God is thy refuge, and around thee are the everlasting arms.' A popular exposition of his philosophy is given in his *Anweisung zum Seligen Leben*. It is set forth in a strictly scientific manner in the lectures published in the *Nachgelassene Werke*, edited by I. G. Fichte (3 vols. Bonn, 1834–1835), in which his *Speculative Logik* and his revised theory of right and morals are particularly deserving of attention. Although F. never, strictly speaking, formed a school, and though his system has only been adopted by a few, such as J. B. Schlad, Mehmel, Cramer, Schmidt, Michaelis, his influence upon the subsequent development of German philosophy has been very important. F.'s collective works have likewise been published by his son, I. H. Fichte. His popular works have been translated into English by W. Smith, and published by J. Chapman of London in his 'Catholic Series.' Their titles are—*The Destination of Man*, *The Vocation of the Scholar*, *The Nature of the Scholar*, *The Way to the Blessed Life*, and *The Characteristics of the Present Age*.

FICHTE, IMMANUEL HERMANN, son of the former, and professor of philosophy in the university of Tübingen, was born in 1797, and early devoted himself to philosophical studies, being attracted by the later views of his father, which he considers were essentially *theistic*. He also attended the lectures of Hegel, but felt averse to his pantheistic tendencies, and leaned more to Schleiermacher and Schelling. Occupied at first as a teacher, F. was appointed professor of philosophy in Bonn in 1836, and from 1842 to 1863 he held a chair in the university of Tübingen. His chief works are—*Beiträge zur Charakteristik der neuern Philosophie* (1841), *Grundzüge zum Systeme der Philosophie* (1839–1847); *System der Ethik* (1850); *Anthropologie* (1856); *Psychologie* (1864); *Vermischte Schriften* (1869), &c. He suggested meetings of philosophers similar to those held by physicists; and at the one held at Gotha, 1847, he delivered an address *On the Philosophy of the Future* (Stuttgart, 1847). The great aim of his speculations has been to find a philosophic basis for the personality of God, and for his theory on this subject he has proposed the term *Concrete Theism*, to distinguish it alike from the abstract theism which makes God almost an unreality—a barren aggregate of lifeless attributes; and on the other hand, from the all-absorbing pantheism of Hegel, which swallows up the human and the divine in its own inapprehensible totality. F.'s *Zur Seelenfrage* was translated by J. D. Morell (*Contributions to Mental Philosophy*, 1860). Later works were *Die Theistische Weltansicht*, 1873; *Fragen und Bedenken* (1876). During the movements of 1848, he issued several political tracts. From 1863 onwards he lived in retirement at Stuttgart, where he died 8th August 1879. The principle of F.'s politics is not unlike Dr. Arnold's maxim. He holds that there is only one kind of real conservatism, that of constant well-planned reform; and that all revolution consists either in attempts to precipitate prematurely the future, or to go back to ideas that are effete, the last being only the chrysalis form of the first. The state, 'according to the idea of benevolence,' belongs to the future. The regeneration of Christianity would consist in its becoming the vital and organizing power in the state, instead of being occupied solely, as heretofore, with the salvation of individuals. To this recent school of philosophy belong Weisse, Chalybæus, Wirth, and others.

FICINO, MARSILIO, an illustrious philosopher of the Italian Platonic school, was born at Florence 1433. He was the son of the principal physician of Cosmo de' Medici; and to the liberality of this prince he owed the classical culture which inspired his fu-

ture career. At the suggestion of Cosmo, F. undertook the translation of Plotinus, Iamblichus, Proclus, and Porphyry, besides a Latin but by no means literal version of Plato. In 1463, he was appointed by Cosmo president of a classical society or academy, founded in 1440, having for its aim the diffusion of the Platonic doctrines, which F. held to be the basis and confirmation of the Christian system.

On the death of Cosmo, F. found a no less munificent patron in this prince's grandson, Lorenzo de' Medici; and having, at the mature age of 40, decided on entering the church, he was endowed by Lorenzo with the rectorship of two churches in Florence, and a canonry in the cathedral. His theological doctrine, while undoubtedly sincere, presents a strange medley of incongruous views, the natural result of his attempt to fuse the philosophy of Plato with the Christian creed. He died in 1499, and was interred in the cathedral of Florence, where a monument commemorates his upright and manly qualities no less than his learning and philosophy. F.'s collected works were published at Basel (2 vols. f. 1491), and consist of translations from the Greek philosophers, and original metaphysical and theological compositions, of which we may mention the *Theologica Platonica*, *De Religione Christiana*, the Latin epistles, and a Commentary on the Epistles of St. Paul.

FICTION. See NOVELS.

FICTION OF LAW has been defined to be 'a supposition of law that a thing is true, which is either certainly not true, or at least is as probably false as true.'—Erskine, *Inst.* iv. 2, 38. Fictions have existed in all legal systems. They must be regarded as a species of legal fraud, which has been tolerated as enabling individuals who, by the strict letter of the law, would have been excluded from obtaining redress of evils, to procure that remedy by a pious fraud. There are two general maxims which regulate the application of fictions—viz., that no fiction shall be allowed to operate a wrong, and that no fiction shall be admitted which in the nature of things is impossible. The Roman form of judicial procedure abounded with fictions, by which alone, in many cases, a party aggrieved could enforce his right. Thus, an heir, unjustly disinherited, by the *querela inofficiosi testamenti*, feigned that his father had been mad. A stranger in Rome, who had been robbed, could not obtain restitution without the *fiction civitatis*, whereby he feigned himself a citizen. Many of the fictions existing in Rome have found a counterpart in modern systems; thus, the *fiction longa manus*, whereby lands at a distance were feigned to be delivered, resembles an English feoffment at law. In like manner, the *fiction traditionis symbolice* of keys of a warehouse to give possession of the articles contained therein, and of a deed in confirmation of the covenants contained therein. The *fiction unitatis personarum* was the original of the Scottish fiction, that the heir is *eadem persona cum defuncto*. But in no system of laws have fictions been so liberally adopted as in that of England. It is by means of fictions alone that the original limited jurisdiction of the courts of Queen's Bench and Exchequer has been extended to ordinary suits. In the latter court, every plaintiff assumed that he was a debtor to the crown, and was debarred from discharging his obligation by the failure of the defendant to satisfy his demand; in the former, it was assumed that the defendant had been arrested for some supposed trespass which he had never in fact committed.

The fictitious characters of John Doe and Richard Roe long contributed to make the action of ejectment famous. And though these fictions have disappeared before the ruthless hand of modern legislation, yet to this day, in an action at the instance of a father for the seduction of his daughter, damages can only be awarded on the assumption that she was his servant, and that he has suffered pecuniary loss by deprivation of her services. In Chancery, again, the whole doctrine of uses and trusts is based upon a fiction. Perhaps the best explanation of the introduction of fictions into legal systems is to be found in Dr. Colquhoun's *Summary of the Roman Civil Law*, 207. It involves, he says, 'less difficulty to adhere to known and admitted forms, and gradually to accommodate them to the changed state of society, than to upset all the incidents connected with them by a sudden change, which must ever tend to unsettle the law and practice of the courts. All nations have therefore found it more desirable to let the one glide into the other, than to adopt any abrupt measure which might disturb the practice and effect of former decisions.'

In the law of Scotland, fictions of law are not of frequent occurrence. For the benefit of creditors, the principle that the heir is *eadem persona cum defuncto* is admitted; and in an action of 'Reduction-improbation' of a deed, it is assumed that the document was false, whether the fact be so or not. But in general the legal system of Scotland has shown a facility of adapting itself to the circumstances of the case, and that without producing the alarming results which presented themselves to the imagination of Dr. Colquhoun.

FICUS. See FIG.

FID (from the Lat. *findere fidē*, to divide), for splicing ropes, is a large pointed pin, with an eye at the thick end, of iron or lignum

vitre, used by sailors in separating and interlacing the strands of which the rope is composed.

A *mast-fid* is a bolt inserted through the bottom of a ship's top-mast or top-gallant-mast, which ends resting on the trestle-trees sustained by the head of the lower mast or topmast. Unless the mast-fid be withdrawn, the supported mast cannot be lowered.

FIDDEMIN, one of the handsomest villages of the Fayûm, inhabited by a Mussulman and Coptic population. It is surrounded by fruit trees, and is remarkable for a large olive, supposed to be the original one planted in Egypt, and yielding annually 268 pounds of olives.—Clot Bey, *Aperçu générale sur l'Egypte* (Svo, Paris, 1840), vol. i. p. 213.

FIDDLE. See VIOLIN.

FIDEICOMMISSUM, in the Civil Law, was a conveyance of property in trust to be transferred to a third person named by the trustor. *Fideicommissa*, when first introduced, were not supported by the law. The performance of them depended, therefore, on the conscience of the party intrusted, and they were consequently frequently not carried out. They were originally adopted for the purpose of conveying property either where a party, from the circumstances of the case, as inability to procure the proper number of witnesses, was prevented from executing a will; or where he desired to benefit those who, by law, were precluded from taking the property. To effect this purpose, an actual conveyance was made to a friend, coupled with a request that the property should be transferred to another. *Fideicommissa* having thus been introduced for a special purpose, were by degrees extended to conveyances of the whole inheritance, and finally were used for the purpose of settling estates in a particular order of succession, forming the earliest instance of Entails (q. v.). *Fideicommissa* first received the sanction of positive law in the reign of Augustus, by whom authority was given to the prætor to enforce the performance of these fiduciary obligations.—*Institutes*, ii. 23, s. 1. The Emperor Claudius subsequently extended this authority to the consuls and presidents of provinces. *Fideicommissa* were either *particular* or *universal*, the former being a bequest of a particular subject, or a part only of the inheritance; the latter comprehended the whole estate.

In *Holland*, the principles of the civil law as to *fideicommissa* form an important branch of the law in regard to landed estates. An heir may be required to transfer either the whole or a portion of his inheritance. The provisions of the *Senatus-Consultum Trebellianum* also have been adopted; but if an heir resist the intentions of the testator, and is compelled by law to execute the trust, he is not allowed to take the benefit of these provisions. The benefit also may be excluded by express direction in the will. Children who have received their legal portions, and are required to transfer to a stranger the rest of the inheritance, are entitled to retain a fourth part for themselves. Grotius, *Dutch Jurisprudence*, by Herbert, b. ii. c. 20.

FIDICULA, a small musical instrument in the shape of a lyre.

FIEF. See FEUDAL SYSTEM.

FIELD. In Heraldry, the field is the whole surface or continent of the escutcheon or shield. It is so called, according to some, because it represents the field of battle on which the achievements or charges represented on it are supposed to have been gained. In blazoning, the tincture or metal of the field must be the first thing mentioned.

FIELD CYRUS WEST, an American merchant, one of a family distinguished for ability, was born at Stockbridge, Massachusetts, November 30, 1819. At the age of 15, he went to New York, and entered upon a commercial career, which he pursued with such energy and success that he was enabled in 1853 to partly retire from business, to spend some time in South American travel, and then to engage with great enthusiasm in the promotion of the Atlantic telegraph, for which he secured a charter from the colonial government of Newfoundland for fifty years. Being joined by Peter Cooper, Moses Taylor, and other American capitalists, he organized, in 1854, the New York, Newfoundland, and London Telegraph Company; and in 1856, the Atlantic Telegraph Company. Devoting himself entirely to the work of uniting the Old and New Worlds, he crossed the ocean nearly thirty times in its prosecution; and on the laying of the first cable, 1858, was received by his countrymen with enthusiastic plaudits. He continued his exertions; and on the success of the cable of 1865, received a gold medal at Liverpool, and a vote of thanks from the American Congress. In 1871, F. was one of the originators of the company which undertook to lay a cable across the Pacific Ocean *via* the Sandwich Islands to China and Japan. See ATLANTIC TELEGRAPH.

FIELD-ALLOWANCE, a daily allowance granted to officers of the British army in consideration of extra expense entailed upon them in consequence of military operations. *Ordinary* field-allowance, ranging from £1, 10s. for a general officer to 1s. for a

subaltern, is applicable when troops are encamped at home or in the colonies. *Extraordinary* field-allowance is sanctioned when and wherever troops are engaged in actual warfare: it ranges for the above ranks from £2, 10s. to 1s. 6d. Strict rules are laid down that no officer shall receive this allowance unless positively present with the army.

FIELD-GLASS is the lens usually interposed between the object-glass and eye-glass of a microscope, which, receiving the diverging rays from the former before they form an image, contracts the dimensions of the image, and increases its brightness, so as to render it of a proper size and degree of distinctness for being viewed by means of the eye-glass. See FIELD OF VIEW, and MICROSCOPE.

FIELD-MARSHAL, the highest rank of general officers in the British and some foreign armies. In the former, it is a special honor enjoyed by very few officers, and only conferred by selection, either on the ground of distinguished service or of royal birth. When unemployed, the field-marshal has no higher pay than any other general, but if commanding an army, he receives £16, 8s. 9d. a day for staff-pay, while a general has but £9, 9s. 6d. The equivalent rank in the navy is that of admiral of the fleet. Formerly, a captain-general was occasionally appointed, who had rank higher even than a field-marshal.

FIELD-MOUSE, a name popularly given to certain species both of MOUSE and of VOLE. See these articles.

FIELD-OFFICERS, in the Army, are such as are competent to command whole battalions—viz., majors, lieutenant-colonels, colonels—in contradistinction to those merely intrusted with company duties, as captains, lieutenants, and sub-lieutenants.

FIELD OF VIEW is the whole space within which objects can be seen through an optical instrument; more strictly, it is the space within which the image of an object may be seen by whole pencils. That part of the image which is seen by partial pencils of the light from the object speculum or lens is called the *ragged edge*, and usually a diaphragm is employed to cut it off from the view of the observer altogether.

FIELD-TRAIN, a department of the Royal Artillery, consisting of commissaries and conductors of stores, responsible for the safe custody of the ammunition, for the formation of proper depôts of shot, &c., between the front and the base of operations, and that a due proportion shall be constantly at the service of each gun during an engagement.

FIELD-WORKS are intrenchments and other temporary fortifications thrown up by an army in the field, either as a protection from the onslaught of a hostile force, or to cover an attack upon some stronghold. Field-works will be more particularly described under the article FORTIFICATION (q. v.).

FIELDFARE (*Turdus pilaris*), a species of Thrush (q. v.), in size about equal to the blackbird, but with greater length of wing; the general color gray, the feathers tipped with a brownish black



Fieldfare (*Turdus pilaris*).

elongated spot; the throat and breast reddish yellow, streaked and spotted with black; the forepart of the back and wings of a rich brown color; the tail slightly forked and nearly black; the under parts white. The F. is a very common winter visitant of Britain, although it rarely breeds even in the northern parts of the island. It arrives from more northern regions when the winter has fully come, and departs again towards the end of spring. It is well known to youthful sportsmen, and affords much employment for their guns during the Christmas holidays, when it may generally be found in small flocks—often along with its smaller congener, the redwing—in fields, if the weather is mild, feeding on worms, snails, &c., or, in severe weather, about hedges, thickets, and woods, wherever haws and other such fruits or seeds are abundant. Its winter migrations extend southward as far at least as the islands of the Mediterranean. It is one of the summer songsters of the north of Europe and of Siberia; its song is soft and melodious, but is much less familiar to us in Britain than its call-

note, which is harsh. It is extremely plentiful in Norway, where its nests are very generally built in spruce firs, and, contrary to the ordinary habits of thrushes, in society; numerous nests being often to be found in the same tree, and 'two hundred nests or more being frequently seen within a very small space.' The F. is easily tamed, and sings well in captivity.

FIELDING, HENRY, born April 22, 1707, was the son of General Edmund Fielding, connected with the Earls of Donbigh. He was sent to Eton, and was afterwards transferred to the university of Leyden, to prosecute legal studies. Returning to London, he began to write for the stage, and worked with so much industry that between 1727 and 1736 he produced nearly a score of comedies and farces, which were forgotten with nearly as much speed as they were produced. He married in 1736, and falling heir to a small estate, he, with his young wife, retired from London. But his was not a Fortunatus's purse, and his hand was continually in it; and in three years after his marriage, he was back in London a student at the Temple. He was called to the bar at the usual time, but gout intervening, steady practice was rendered impossible. Happily, a way of escape was at hand. Richardson published *Pamela*; the town was ringing with it; and F., whose strong, healthy, unconventional nature revolted from the moral priggishness of 'Virtue Rewarded,' resolved to write a counterpart, purporting to be the adventures of Pamela's brother, *Joseph Andrews*. This work, begun in a satirical mood, and intended merely to quiz Richardson, deepened as it proceeded, and flowered out into humorous adventure. The exquisite character of Parson Adams took the world by surprise, and remains one of the permanent glories of English fiction. The next important work undertaken by him was *Jonathan Wild*, a master-piece of irony, which has never been sufficiently appreciated, and which doubtless suggested to Mr. Thackeray the scope and conduct of *Barry Lyndon*. The rebellion of 1745 induced F. to undertake the direction of the *Jacobite Journal*, in support of the Hanoverian succession; and shortly after, as a reward for his loyalty, he was, through the influence of Lord Lyttelton, promoted to a pension, and to the place of justice of the peace of Middlesex and Westminster. While engaged in magisterial duties, he produced *Tom Jones*, his most famous fiction, which the world has never ceased to read, nor critics to admire. His next work was *Amelia*—less striking and masterly than its predecessor, but quieter in style, and enriched with scenes of domestic tenderness. Shortly after its publication, he was attacked by dropsy, jaundice, and asthma, a complication of disorders which baffled the skill of the physicians. Seeking relief, he left England for Lisbon on the 26th June 1754, and died there on the 8th October of the same year, at the early age of forty-seven.

F. was the first great English novelist, and he remains to this day one of the greatest. *Tom Jones* is a miracle of invention, character, and wit. It contains the most amusing scenes and adventures, the most sparkling delineations of life, high and low, the most abundant satire. Everywhere, the author's manliness, shrewd sense, and scorn of meanness and hypocrisy, are apparent. If defects may be hinted, it may be said that F.'s nature was more robust than delicate; that it was deficient in the sentimental and poetic side; and, as a consequence, that his ideal of woman is not high, and his descriptions of the tender passion either commonplace or extravagantly rapturous. The love scenes between Tom and Sophia, and the episode of the 'Man of the Hill,' which is meant to be passionate and poetic, are perhaps the only portions of the great novel which readers skip. It is to be regretted that all F.'s works are disfigured by coarseness of circumstance and expression; but that was the fault of the time as much as of the man. He was coarse, as he wore ruffles, drank claret, and hated the Pretender. He set himself to paint society as he saw it, and we must forgive the coarseness for the truthfulness of the picture.

FIELDING, COBLEY VANDYKE, an English painter in water-colors, was born about 1788, and began to exhibit in 1810. For many years he held the office of President of the Society of Painters in Water-colors, and was generally recognized as the representative of that branch of art in England. He died at Worthing, in Sussex, March 3, 1855, in his 68th year, and after a career of steady prosperity. Possessing remarkable mechanical dexterity and knowledge of effect, F. painted with what severe critics would call fatal facility. He contributed about a score of pictures annually to the exhibition of the Water-color Society. But, to do him justice, he always exhibited a certain easy finish of treatment, which was perhaps of itself a kind of secondary talent. Although his range of subjects was but limited, yet within it he was almost unrivalled. As a painter of marine effects, and of the landscapes of down and glade, it is thought by many that he has had as yet no equal.

FIERDING COURT (Fierding Thing), a district court in use among the early Gothic nations. This court was established for the purpose of rendering speedy justice in small matters. There were four of these courts in every hundred, each presided over by a separate judge, whose jurisdiction extended to all causes where

the matter in dispute did not exceed the sum of three marks. *Stiernhook, De Jure Goth. lib. i. c. 2.*

FIERI FA'CIAS, WRIT OF, and English writ for enforcing the judgment of a court of law against the goods of a debtor. It may be sued out as soon as final judgment has been signed, or, in case of a trial out of term, in fourteen days after verdict, unless, on special cause shown, a judge order speedy execution. But a writ of fieri facias cannot be enforced after a *Capias ad satisfaciendum* (q. v.) has been issued. The sheriff, in executing this writ, may not break open doors; but having obtained peaceable entrance, he may break open inner doors, cupboards, and trunks. The officer in execution having taken possession, may leave an assistant in charge, by whom an inventory of the goods is made. He is entitled to remain on the premises a reasonable time, in order to remove the goods; but if he continue longer without permission of the owner, he is liable to an action for trespass. By 8 Anne, c. 14, if goods are removed from land or premises let on lease, the party removing them must pay the rent and taxes. A creditor may not take, in execution, manure, hay, &c., where, by the covenants of the lease, the tenant is prohibited from removing them (56 Geo. III. c. 50). Growing crops, if seized in execution, and sold, are liable for rent accruing after the date of the seizure, as long as they remain on the ground (14 and 15 Vict. c. 25). By 1 and 2 Vict. c. 110, money, bank-notes, bills of exchange, and other securities, may be taken under a writ of fieri facias.

By 8 and 9 Vict. c. 127, a creditor is not entitled to take wearing-apparel and bedding or tools where the value of the whole does not exceed £5. Such fixtures as belong to the heir, and not to the executor, cannot be taken under this writ. The goods of the party only who is named in the writ may be seized; and if the officer take goods belonging to a stranger, he is liable to an action for damages. By 1 and 2 Vict. c. 110, decrees in Chancery have the effect of a judgment in a court of law. In Scotland, the corresponding process for seizing and selling a debtor's goods is a warrant to poind the movables. See **POINDING**.

Fieri facias de bonis ecclesiasticis is a writ directed to the bishop of the diocese, requiring him to attach the ecclesiastical goods of a clergyman within his diocese, in satisfaction of the judgment of a court of law.

FIE'SCHI, COUNT GIOVANNI LUIGI, a member of one of the most illustrious Houses of Genoa, was born about the year 1523. In addition to the lustre of ancestral fame, his name has attained a tragic historical celebrity in connection with a remarkable conspiracy of which he was the chief. Andrea Doria, a famous admiral, sprung from a race hereditarily at feud with that of F., having expelled the forces of Francis I. from the state, had restored the republican form of government, but at the same time, by his vigorous administration, effectually held in check the ambition of the nobles. Count F. organized a plot, having for its object the death of Doria, and his nephew Gianettino, the object of F.'s special hatred, and the establishment of an oligarchic form of government. Instigated by the approval of France and Rome, and supported by an alliance with the Duke of Parma, F. speedily enrolled a formidable array of accomplices, his three brothers among the foremost. Crowds of his own feudal retainers were secretly armed and assembled from the various hereditary lands of the House; three galleys, purchased with the connivance of the pope, were fully equipped, and all being in readiness, the attempt was fixed for the 2d January 1547. Doria, in spite of repeated warnings, refused to ascribe treacherous or subversive designs to F., whom he regarded as a fast friend and partisan. Complete success seemed at first to crown the conspirators; the gates of the city were forced, the fleet captured, Gianettino assassinated, Doria in flight. F. had but to appear and dictate, but he was nowhere to be found; and the strangest episode of this wild drama is the sudden disappearance of its hero. In stepping from one galley to the other in the darkness of night, F. stumbled, and falling overboard, was borne down by his ponderous armor, and miserably drowned in the harbor, or, according to some, stifled in the slime.

FIESCHI, JOSEPH MARCO, known by his attempt on the life of King Louis Philippe, was born in Corsica in the year 1790. His early life contains nothing of note. A profligate career appears to have reduced him to great poverty about the year 1835, when he conceived the idea of assassinating the king. The immediate cause of his diabolical design was the suppression of a situation which he held, by order of the prefect of the Seine. Disguising his crime under the cloak of political enthusiasm, he leagued with himself one or two obscure persons, of pothouse politics, who hated the government of the Citizen King. These were Pierre Morey, a saddler; Pepin, a grocer; and Victor Boirean, a maker of lamps. F. sketched the plan of an infernal machine with twenty barrels, that could be simultaneously discharged; got one made, and placed it in a house of the Boulevard-du-Temple. The review of the National Guard held there, 28th

July 1835, afforded F. the opportunity he desired. On the approach of the king and queen, he fired his machine. Eighteen people were killed, among whom was Marshal Mortier, who fell dead beside his sovereign. Louis Philippe, however, himself, escaped with a mere scratch, and was able to continue the review. F. was immediately seized, and along with his accomplices, was tried, condemned, and executed, 16th February 1836.

FIE'SOLE (anciently, *Fesula*), one of the most ancient Etruscan cities, is situated on the crest of a hill, at about three miles' distance from Florence, of which it may be said to be the parent city. From the heights of F., the view presented by Florence and the neighboring valleys is gorgeous in the extreme. We find F. first mentioned in 225 B.C. during the great Gaulish war. Hannibal encamped here after crossing the Apennines. The city was next destroyed by Sulla in the Social War (90—89 B.C.), who afterwards despatched thither a military colony. At the invasion of Tuscany by the Goths, F. also fell under their dominion, and being by nature and art a formidable stronghold, was numerously garrisoned by the barbarians. The growth of Florence during the middle ages gradually reduced it to insignificance. It is now a place of about 2500 inhabitants. The only vestige of Etruscan structures still remaining is the cyclopean city wall, constructed of huge blocks of stone, many portions of which are wonderfully perfect. The site of the Etruscan fortress is now occupied by a convent, and interesting fragments of the foundations are often brought to light. The amphitheater and other remains belong to the Roman age. The very ancient church of St. Alexander, supposed to have originally served as a pagan temple, contains an altar dedicated to Bacchus, the inscription of which is, however, illegible, owing to a fissure in the middle. Coins and other relics have been repeatedly dug up.

FIESOLE, FRA GIOVANNI DA, one of the most eminent regenerators of Italian art, also known by the title of *Il beato Angelico*, was born at Mugello in 1387. In 1407, he entered the Dominican order, and, together with his brother, consecrated his artistic abilities exclusively to sacred aims, illustrating various works of devotion with beautiful miniature designs. These early artistic efforts are remarkable for their rich effects of coloring, gorgeous illumination, and exquisite elaboration of the most minute ornamental details. Having achieved a high reputation as fresco-painter by some noble compositions with which he endowed his own and other convents, he was commissioned by Cosmo de' Medici, with the decoration of the church of Santa Annunziata and the convent San Marco. Each cell of the convent was adorned with a fine fresco of large dimensions, and amidst other paintings, one can still distinguish F.'s 'Annunciation.' The fame of this work induced Pope Nicholas V. to summon him to Rome, and intrust him with the execution of a series of illustrations taken from the life of St. Laurence, destined to embellish the private chapel of St. Laurence in the Vatican. See Giangiacoio Romano, *Le Pitture della Cappella di Nicolò V.*, &c. (Rome, 1810). So rigid a disciplinarian was F., that no private or public work was ever undertaken without the formal consent of his superiors being obtained, and to them all pecuniary remuneration was transferred. The archbishopric of Florence, spontaneously offered him by the pope, was humbly declined. He died in Rome in 1454. The gallery of Florence possesses several pictures of F., still undimmed in brilliancy of coloring. One of these, the 'Birth of John the Baptist,' is a conception full of simple and winning grace. Some of the largest easel-compositions of this artist at present adorn the gallery of the Louvre; among those in the antechamber are the 'Coronation of the Virgin,' and the 'Miracles of St. Dominico.' One supreme aim pervades all the creations of F.—that of arousing lofty devotional feeling through the contemplation of the beautiful in art.

FIFE, an ancient wind-instrument of military music, in which the melody is produced by blowing through a hole in a reed or tube, while the escape of air is regulated by the fingers stopping or opening a number of other holes in different parts of the pipe. It has a compass of two octaves, from D on the fourth line of the treble clef to D above in altissimo. The fife figures in the sculptured memorials of the Argonautic expedition, and from that time to this has maintained its place as a simple yet effective instrument for martial purposes. It was common with English troops till the reign of James I., but was then discontinued; to be re-introduced by the Duke of Cumberland at the siege of Maestricht in 1747. It is a universal favorite in the navy, and many a stirring air on drums and fifes has cheered the British sailor to deeds of daring.

In the infantry, there is a *fifer* to each company, and a fife-major to each battalion, the former receiving the daily pay of 1s. 1d., the latter, who is a non-commissioned officer, 1s. 11d.

FIFE-NESS, a promontory of Scotland, the eastmost point of Fifehire, in lat. 56° 17' N., and long. 2° 35' W. On the north, in the sea, are the dangerous Carr Rocks, with an iron beacon 35 feet high, which required six years to construct. F. is in view of the

Isle of May and Bell Rock lights. In the Ness, trap rocks jut through the carboniferous strata, and the rocks contain small caves.

FIFESHIRE, a maritime, almost peninsular county of the east of Scotland, between the Firth of Forth on the south and the Firth of Tay on the north. It is 44 miles in extreme length from north-east to south-west, and 18 at its greatest breadth; area, 503 square miles; coast-line, 85 miles, mostly rocky, and having many small ports. The surface is a succession of cultivated vales and hills. The hills rise in the West Lomond, 1713 feet, and Largo Law, 948. The chief rivers are the Tay, Forth, Eden (20 miles long), and Leven (12). F. rests on old red sandstone, with trap rocks in the north, and carboniferous strata, with trap, in the south. There are many coal and iron mines, and lime quarries. The climate is dry, healthy, and mild on the Forth; but the valleys in the north are much exposed to the full sweep of the east and north-east gales. The soil is a rich loam, or wet clay on till. The Howe of Fife, on the Eden, is mostly sandy and gravelly, and not very productive. In 1880 the total acreage under all kinds of crops, bare fallow, and grass, was 246,480 acres; under corn crops, 86,584; under green crops, 47,179; clover, sanfoin, and grasses under rotation, 62,033. The total number of cattle reported the same year was 39,674; sheep, 72,873; pigs, 5229; horses used for agriculture, &c., 10,202. F. has a greater number of proprietors, gentlemen's seats, and plantations, in proportion to its size, than any other Scotch county, and its coasts are thickly studded with towns and villages. The chief manufactures are linen, floor-cloth, and malt liquors. F. has 61 parishes. Pop. (1871) 160,735; (1881) 171,960. It returns one member to parliament. The chief towns are Cupar (the county town), Dunfermline, St. Andrews, Kirkcaldy, East and West Anstruther, Burntisland, Crail, and Dysart. The ancient 'Kingdom of Fife' was the most cultivated, as well as the most warlike, of Scotch counties. It contains striking monastic, feudal, and palatial ruins at St. Andrews, Dunfermline, Falkland, and Lindores; many Celtic and Roman remains. Many of the events connected with the Scottish Reformation took place in this county, especially at St. Andrews.

FIFTEENTH, a stop in English organs tuned two octaves above the diapasons, the lowest C pipe of which is two feet long.

FIFTH MONARCHY MEN. Among the strange and whimsical forms of opinion which the religious and political fermentation of the 17th c. brought to the surface of society, and embodied in the shape of religious sects, were those of the Fifth Monarchy Men. The date which has been assigned to their first appearance is 1654.

Notwithstanding the ridicule with which they have often been overwhelmed, there seems nothing in their tenets more objectionable than we find in those of many of the other sects of the period, and there is no reason to believe that the practices of their leaders exceeded in absurdity, or equalled in impiety, those of Robbins, Reeve, Muggleton, and other apostles of the Ranters. In common with most persons who hold the literal interpretation of prophecy, they believed in the four great monarchies of Antichrist marked out by the prophet Daniel; and quite consistently with Christian orthodoxy, they added to them a *fifth*—viz., the kingdom of Christ on earth. So far, there was nothing peculiar in their views. But their error was twofold. 1st. They believed in the immediate, or at least in the proximate, advent of Christ (a tenet which was common to them with the early church); and 2d. They held that the fulfilment of God's promise to this effect must be realized by the forcible destruction of the kingdom of Antichrist. Every obstacle which opposed itself to the setting up the Messiah's throne was to be thrown down, and what these obstacles were was a question for the solution of which the only criterion which presented itself was their own fanatical prejudices and hatreds. It is obvious that such doctrines in such times must have given rise to practical as well as speculative disorder. The Fifth Monarchy Men became extinct as a sect shortly after the Restoration; a fact which, by depriving them of exponents of their own body, may have exposed them to misrepresentation (Marsden's *History of the Later Puritans*, p. 387). In politics, the Fifth Monarchy Men were republicans of the extremest section; and when their conspiracy to murder the Protector, and revolutionize the government, was discovered in 1657, their leaders, Vennar, Grey, Hopkins, &c., were imprisoned in the Gate House till after the Protector's death. Amongst their arms and ammunition which was seized, was found a standard exhibiting a lion couchant, supposed to represent the lion of the tribe of Judah, with the motto, 'Who will rouse him up?'—Neal's *Puritans*, vol. iv. p. 186. See also Carlyle's *Cromwell's Letters and Speeches*, vol. iii. p. 31.

FIG (*Ficus*), a genus of trees and shrubs belonging to the natural order *Moraceæ*, and distinguished by having the flowers—male and female mixed—within an almost closed top-shaped fleshy receptacle, which enlarges to form the fruit, and encloses numerous one-seeded carpels, imbedded in its pulp. There are more than 100 species, some of them very large trees. Almost all belong to

tropical and sub-tropical countries, of the vegetation of which they often form a most important feature. They abound in India, in every jungle and hilly situation, to the most northern Himalaya, and some of them are cultivated about every village. Both *F. religiosa* (the Peepul) and *F. Rumphii* are held in veneration by the Hindus. The most notable species are the Common Fig (see below); the Banyan (q. v.); the Peepul (q. v.); Bo Tree or Sacred Fig of India; the Sycamore (q. v.); and the East Indian Caoutchouc (q. v.) Tree. The leaves of some species are entire, those of others are lobed.

Several species of fig exhibit the character for which the banyan in particular has become celebrated, of sending roots straight down to the ground from their spreading branches, and thus multiplying the apparent stems, by which a vast canopy of branches and foliage is supported. The East Indian Caoutchouc or India Rubber Tree is remarkable for the exposure of its roots, which appear in masses above ground, extending on all sides from the base like great writhing snakes. Some figs are creeping or trailing shrubs, with slender stems, covering heaps of stones, or ascending trees like ivy.—Beside the Common Fig, many species yield edible fruits, although none of them are nearly equal to it in value. Amongst them are the Peepul (*F. religiosa*), *F. Benjamina*, *F. pumila*, *F. auriculata*, *F. Rumphii*, *F. Bengalensis*, *F. aspera*, *F. racemosa*, and *F. granatum*, all East Indian, also the Sycamore of Egypt.—The milky juice of some species is bland and abundant, as of *F. Saussureana*, which has therefore been ranked among Cow-trees. In other species, the milky juice is very acid. That of the Common Fig produces a burning sensation on the tongue. That of *F. toxicaria*, a native of the Malayan islands, is used for poisoning arrows.—LAC (q. v.) is gathered from some species.—The leaves of *F. politoria* are so rough that they are used for polishing wood and ivory in India. The juice of the fruit of *F. tinctoria* is used in Tahiti to dye cloth; the color is at first green, but being acted on by the juice of a *Cordia*, it becomes bright red. The bark supplies cordage, of which fishing-nets are made.

The COMMON FIG (*Ficus Carica*) is a native of the East, as the

specific name *Carica* (from *Caria*) imports; but it is now cultivated throughout the whole of the south of Europe, and is even found naturalized there. Its cultivation has also extended to many warm countries. In North America, it is seldom to be seen further north than Philadelphia; and it is not sufficiently hardy to be a common fruit tree in Britain, although even in Scotland figs may occasionally be seen ripened on a wall; and in the south of England fig-trees are sometimes grown as standards, and a few small fig orchards exist. Protection is always given in some way during winter. Near Paris, and in some other parts of the continent of



Common Fig (*Ficus Carica*):

a, male flower, magnified; b, male flower, natural size; c, female flower, magnified; d, female flower, natural size.

Europe, fig-trees are so trained that the branches can be tied in bundles and laid along the ground, when they are covered with litter and earth. The fig is a low deciduous tree or shrub, with large deeply lobed leaves, which are rough above, and downy beneath. The branches are clothed with short hairs, and the bark is greenish. The fruit is produced singly in the axils of the leaves, is pear-shaped, and has a very short stalk; the color in some varieties is bluish-black; in others, red, purple, yellow, green, or white. The varieties in cultivation are numerous.

In warm climates, the fig yields two crops in the year—one from the older wood (midsummer shoots of the preceding year), and a second from the young wood (spring shoots of the same year); but in colder regions the latter never comes to perfection. Fig-trees are propagated by seed, by suckers, &c.; very frequently by layers or by cuttings. In Britain, they are often to be seen in hot-houses, and grow well in pots. Dried figs form an important article of food in the Levant; in more northern regions, they are used for desert, or for medicinal purposes, being applied to gum-boils and other sores, and also administered in pulmonary and nephritic affections, and to relieve habitual constipation. The pulp contains about 62 per cent. of a kind of sugar called *Sugar of Figs*. Figs are either dried in the sun or in ovens built for the purpose. Great quantities are annually imported into Britain

from the Mediterranean. The best are mostly brought from Smyrna, and are known as *Turkey figs*, of which those called *Eleme* or *Elemi* are most highly esteemed. Figs of inferior quality are imported in considerable quantities in the form of *fig-cake*, pressed along with almonds into cakes somewhat like small cheeses. In the Levant, Portugal, and the Canaries, a spirit is distilled from fermented figs.

FIGARO, a dramatic character introduced on the Parisian stage in 1785 by Beaumarchais (q. v.) in his *Barbier de Seville* and his *Mariage de Figaro*. These plays, in which F., who coolly outwits every one, is first a barber and then a valet-de-chambre, secured for their author a brilliant reputation not only in France, but also in Germany, where many translations and adaptations of the piece appeared. Mozart, Paisiello, and Rossini also made them the basis of classic operas. Since their publication, the character of F. has stood as a type of cunning, intrigue, and dexterity. After the restoration of the Bourbons, a literary periodical, distinguished for its satirical talent, assumed the name.

FIGEAC, a town of France, in the department of Lot, is situated in a valley surrounded by finely wooded hills on the right bank of the Selle, 32 miles east-north-east of Cahors. It is irregular, its streets are narrow, and badly planned, and its houses in general not well built, but the antiquity and quaintness of many of its buildings give it a picturesque and interesting appearance. It has two beautiful Gothic churches, one of them, that of St. Sauveur, has a choir of the 11th, a general super-structure of the 15th, and a modern front of the 19th century. F. owes its origin to a Benedictine monastery, founded by Pepin in 755 A.D. It has some cotton manufactures, and a trade in wine and cattle. Pop. (1876) 5660.

FIGHTING FISH (*Macropodus pugnax* or *Otenops pugnax*), a small fresh-water fish, of the family *Anabasidæ* (q. v.), a native of the south-east of Asia, and particularly of Siam, where it is very commonly kept as goldfishes are in Britain, but on account of its pugnacity. Two of these creatures when brought together, often rush immediately to combat, or it is even enough to introduce a looking-glass into the water, and the fish hastens to attack its own image. Fish-fights are a favorite amusement of the Siamese; the license to exhibit them yields a considerable annual revenue; and an extraordinary amount of gambling takes place in connection with them; not merely money and property, but children and liberty being sometimes staked.

The F. F. has the anal and dorsal fins prolonged into tapering points. When the fish is quiet, its colors are dull; but when it is excited, they glow with metallic splendor, and the projected gill-membrane, waving like a black frill around the throat, adds something of grotesqueness to the general appearance.

FIGLI'NÈ, or FIGHINE, a town of Central Italy, in the province of Florence, and 15 miles south-east from Florence, on the left bank of the Arno. It is surrounded by a rectangular wall, and is traversed by a fine street, through which passes the great road from Florence up the valley of the Arno. The silk of F. is the best in Tuscany. Pop. (1872) 5673.

FIGUEIRA, a town of Portugal, in the province of Beira, at the mouth of the Mondego, 23 miles west by south from Coimbra. Its harbor is a small bay or estuary of the Mondego, and is safe, but difficult of access, particularly for large vessels. It carries on, however, a considerable trade. The chief exports are salt, wine, vinegar, oil, dried fruits, and oranges. The wine shipped from F. is known in England by the names of *Figueira* and *Bairrada Wine*. It is quite different both from port and from sherry. It is best when new, and does not bear keeping long. F. is much resorted to as a bathing-place. Pop. 6000.

FIGUERAS, a town in the north-east of Spain, is situated near the French frontier, in the province of Gerona, in a fruitful district, 20 miles north-north-east of the town of Gerona. Its streets are gloomy, but it has beautiful promenades. On a height near the town is the citadel of S. Fernando, the strongest fortress of Spain, and the key of the Pyrenees on their south side, with accommodation for 20,000 men. This fortress has been so frequently taken by the French, as to give rise to the remark, common enough among the Spaniards, that the citadel of S. Fernando, in time of peace, belongs to Spain, but in time of war to France. Pop. 7400.

FIGULINE. See POTTER'S CLAY.

FIGURANTES is the term applied in the ballet to those dancers that do not come forward alone, but dance in troops, and also serve to fill up the scene and form a background for the solo dancers.

FIGURATE NUMBERS. The nature of figurate numbers will be understood from the following table :

	1.	2.	3.	4.	5.	6.	7.	&c.
I.	1,	3,	6,	10,	15,	21,	28,	&c.
II.	1,	4,	10,	20,	35,	56,	84,	&c.
III.	1,	5,	15,	35,	70,	126,	210,	&c.
	&c.							&c.

The natural numbers are here taken as the basis, and the first order of figurate numbers is formed from the series by successive additions; thus, the fifth number of the first order is the sum of the first five natural numbers. The second order is then formed from the first in the same way; and so on.

If instead of the series of natural numbers, whose difference is 1, we take series whose differences are 2, 3, 4, &c., we may form as many different sets of figurate numbers. Thus :

	1.	3.	5.	7.	9.	&c.
I.	1,	4,	9,	16,	25,	&c.
II.	1,	5,	14,	30,	55,	&c.
III.	1,	6,	20,	50,	105,	&c.
	&c.					&c.

Or—

	1.	4.	7.	10.	13.	&c.
I.	1,	5,	12,	22,	35,	&c.
II.	1,	6,	18,	40,	75,	&c.
III.	1,	7,	25,	65,	140,	&c.
	&c.					&c.

The name *figurate* is derived from the circumstance, that the simpler of them may be represented by arrangements of equally distant points, forming geometrical figures. The numbers belonging to the first orders receive the general name of *polygonal*, and the special names of *triangular*, *square*, *pentagonal*, &c., according as the difference of the basis is 1, 2, 3, &c. Those of the second orders are called *pyramidal* numbers, and according to the difference of the basis, are *triangularly*, *quadrangularly*, or *pentagonally* pyramidal. The polygonal numbers may be represented by points on a surface; the pyramidal by piles of balls.

The general formula for polygonal numbers, from which any particular one may be found by substituting the proper values for n and r is,

$$\frac{(r-2)n^2 - (r-4)n}{2}$$

where n = number of the term required, r = the denomination (3 if triangular, 5 if pentagonal, &c.).

FIGURED BASS, in Music, is a bass part with figures placed over the notes, which indicate the harmony to be played to each note, and serves as a guide to the accompanist. Ludovico Viadana invented figure bass in the 17th century.

FIGURE-STONE. See SOAP-STONE.

FIIJI, FEEJEE, or VITI ISLANDS, since 1874, a dependency of the British Empire, form an archipelago of about 250 islands in the Southern Pacific Ocean, and are situated in lat. $15^{\circ} 30' - 20^{\circ} 30' S.$, and long. $177^{\circ} E. - 178^{\circ} W.$ The group, which has a total area of 8034 sq. m., almost equal to that of Wales, was discovered in 1646 by the Dutch navigator Tasman. The largest of the group, Viti-levu, or Big Viti, has an area of 4479 sq. m.; Vanna-levu, of 2486 sq. m.; and all the other islands together, of 1069 sq. m. The islands are of volcanic origin, and although there are no longer any active volcanoes, yet hot springs, numerous earthquakes, and other signs testify that the subterranean forces are not quite extinct. They are all coral-girt; and to the approaching navigator appear clothed to their very summits with a dense and luxuriant vegetation. The surface is generally hilly, and the soil, owing to the abundant rain, is very productive. The windward sides of the islands are covered with thick forests, while to the leeward we see a grassy country dotted here and there with screw-pines.

The natural production of Fiji or Viti are of the most varied description, and the vegetation is, on the whole, of a tropical nature. The mountain districts are well adapted to the growth of coffee; rice can be grown in marshy land; the soil is well adapted for the sugar-cane, while cotton, tobacco, sweet potatoes, yams, arrow-root, maize, bread-fruit, plantain, the sago and cocoa palm, with other tropical productions, all thrive well. These islands only require to be well worked by the capitalists to yield a golden harvest, as the coffee, cotton, and sugar industries are capable of extensive development. In 1880 there were at least seven sugar-mills at work, the product ranking well in the market. Of the plants yielding oil and fat, the most valuable is the cocoa-nut palm; the oil, copra, or dried nuts of which always command a good price. Each tree produces about 100 nuts, and is worth from four to six shillings a year to its proprietor. Edible roots are abundant, bread being made from them; but the yam is the staple article of food, by the ripening season of which the natives regulate their calendar. Timber suitable for house and ship

building abounds. Copper, antimony, plumbago, and gold in small quantities have been found. Pearl fish exist in innumerable quantities near its coral-reefs, and fish and turtle are plentiful. There seem to be no indigenous animals; such live-stock as pigs, dogs, cattle, sheep, and fowls have been imported. Since its annexation to Britain, the prospects of F. have begun to improve, and commerce has been quickened. The value of the exports in 1864 was £19,800; in 1867, £39,960; and in 1887, £140,893. The united imports and exports in 1878 were £329,573, while the revenue for the same year was about £61,000. The exports of cotton shortly after its introduction in 1864 was 650 cwt.; 5880 cwt. in 1866; and in 1873, about 14,000 cwt. Of copra, the exports in 1878 amounted to £122,000; of sugar, £18,000. Cotton, cocoa-nut oil, copra, tortoise-shell, and wool are the chief exports; while the imports embrace Manchester goods, ironmongery, cutlery, wine, beer, spirits, groceries, &c. There are excellent harbors, among which that of Levuka, the largest town, situated on Ovalau, lately provided with a lighthouse, is the most important. The capital is Suva, in the south of Viti-levu.

The native inhabitants are for the most part Melanesians, with dark complexions and long frizzly hair; but considerable intermixture has taken place with the Polynesians of Tonga and Samoa, who have to some extent modified both the customs and the language of the Fijians. They are tall, muscular, and well built, with regular features. They are very cleanly in their habits, and love the water. When first known by Europeans, they were in many respects a civilized people; but till lately human life was recklessly wasted, and nowhere was cannibalism so important an institution as here. The Fijians had priests, temples, a complex theology, and a firm belief in a future state. Human sacrifices were very common; and not merely enemies and strangers were slain in order to be eaten, but even wives, children, and friends were ruthlessly murdered and cooked. This state of things was in full force till about 1854. In 1855 the first Wesleyan missionaries landed on one of the Fiji Islands. Now, marvellous to relate, the bulk of the inhabitants are professing Christians, the only heathens being a few thousands in the interior of Viti-levu. Sir Arthur Gordon has declared that the Fijians are a Christian people.

More than 102,000 are regular attendants at Wesleyan chapels; several thousands are Roman Catholics; and other Christian churches have agencies here. The converts are said to be peaceable, well-living people. Cannibalism has disappeared since 1878; polygamy has also ceased; and peace seems everywhere to prevail. More than 800 churches have been built; and education is being zealously promoted. Several interesting works on F. have lately been published, of which the more notable are *At Home in Fiji*, by Miss Gordon Cumming (1881); *A Year in Fiji*, by J. Horne (1881); and *Coral Lands*, by H. S. Cooper (1880).

The population was estimated in 1871 at 146,000, but a deadly epidemic of measles in 1875, introduced by a British man-of-war, reduced that number by at least one-third. The census of 1881 showed a white population of 2293; Fijians, 115,635; Polynesians from other islands, recently introduced as laborers, 6318; besides the 2500 inhabitants of Rotumah.

The later history of Viti has been very tumultuous. In 1855, Thakombau, chief of Bau, was made responsible for a debt due from the natives to the Americans; and this resulted in his election to the dignity of 'Tui Viti,' or king of Viti. In 1857 he offered to cede Viti to Great Britain, in consideration of the payment of his debt to America, stipulating only for the retention of his title and authority over the natives. This offer was refused by the British government in 1862, after sending out a deputation. A 'Polynesian Company' was then started, which undertook to clear off the debt, in return for certain valuable privileges, but ultimately it collapsed. In 1869 the President of the United States refused the protectorate of the islands. From that date till 1873, the government sanctioned three or four unsuccessful constitutions. The cession of the islands to Britain was renewed in 1873, and accepted, and on Sept. 30, 1874, they were annexed as a crown colony. The small island of Rotumah (q. v.), annexed by Britain in 1880, is now attached to the F. group.

FILADEL'FIA, a town of South Italy, in the province of Catanzaro, 18 miles west-south-west from Catanzaro, on the western side of the Apennines, and on a branch of the Angistola. Pop. 5700.

FILARIA. See GUINEA-WORM and THREAD-WORM.

FILBERT. See HAZEL.

FILE, FILING. A file is a steel tool, having its surface covered with teeth or serratures, and used for cutting down and shaping metals and other hard substances. There is little doubt that in the earliest stages of metal-working, when bronze implements first superseded those of stone, rough stones were used for the purposes to which files are now applied; nevertheless, the use of files dates from high antiquity. They are mentioned in

the Old Testament in the first book of Samuel, xiii. 21, also in the *Odyssey*.

Files are made of almost every conceivable shape, to suit the very varied purposes to which they are applied—flat, square, round or *rat-tail*, triangular, half-round, feather-edged, &c., besides being variously bent, in order to get at intricate work. Nearly all these files are made thicker in the middle, or 'bellied,' the object of which will be explained under *FILING*.

Files require to be made of the very best steel, which is first forged into the required shape, and is then called a 'blank.' The blanks are then finished more accurately to the required form by grinding, planing, or filing.

The blanks thus prepared and well softened (see *TEMPERING*) are next handed to the cutter, who sits astride on a low bench or stool, and has before him a stone anvil, with a flat piece of pewter laid upon it. The blank is held upon the anvil, with its tang towards the cutter, by means of a long loop of leather-strap, into which the cutter places his foot. He then cuts the teeth by striking with a hammer a short stout chisel, held obliquely at an angle of about 12° or 14° from the perpendicular. The object of this will be easily understood; for, if the chisel were perpendicular, a furrow like the letter V would be indented, and an equal burr struck up on each side; but, instead of this, a cutting tooth like that of a saw, but with less obliquity, is required; this is effected by the obliquity of the chisel, and a burr is thrown up on one side only—viz., towards the tang.

The astonishing regularity observable in the distance between the teeth is secured in this way: The cutting is commenced at the point of the file; the chisel is then drawn backwards, laid upon the blank, and slid forwards till it reaches the burr raised by the last cut; the blow is now struck, and another tooth and burr produced, which serves as a guide for the next cut; and so on. The distance between the teeth thus depends on the force of the blow and the obliquity of the cut; for the heavier the blow, the greater the ridge or burr, and the obliquity determines the distance of the cut from the burr; the skill of the workman consists, therefore, in the precise regulation of the blows.

Most files are double cut—that is, they have two series of *courses* of chisel-cuts, which are oppositely inclined at an angle of about 55° to the central line of the file. The second course is made in the same manner as the first, but with lighter blows, and is usually somewhat finer than the first. This angular crossing converts the ridges into pointed teeth. Files used for soft metals which are liable to clog the teeth, are single cut—that is, they have but one course of cuts. Taper files have the teeth finer towards the point. Rasps for wood are cut with pointed chisels; each tooth being an angular pit with a strong burr, instead of a long furrow. The newly cut teeth in the soft steel are preserved from injury by being laid upon the softer pewter block before referred to. The rapidity with which the blows are struck varies with the fineness of the file; 60 or 80 cuts are commonly made per minute.

Files have to be very carefully hardened and tempered. If heated too strongly, or made too hard, the steel is so brittle that the teeth tear off; if too soft, they wear down rapidly, and the file soon becomes useless. Great care is also required in keeping them straight, as the sudden cooling necessary for hardening is very apt to warp the steel.

At first sight, it would appear, from the simplicity and continual repetition of the movements required in file-cutting, and the precision and regularity of the work, that it is an operation specially adapted for machinery. Many attempts have been made to cut files by machinery, but with only partial success; the chief difficulty arises from the necessity of modifying the force of the blow to suit the hardness of the steel. It is practically impossible to supply a large number of blanks all of exactly the same hardness; and if the machine be adjusted to suit the hardness of one blank, it may strike too heavy or too light a blow for the next; whereas the workman *feels* at once the hardness of the steel he is working upon, and adjusts his blows accordingly.

FILING.—To the uninitiated, this may seem a simple operation of rubbing one piece of metal upon another, and requiring only muscular strength and no skill. This is far from being the case, for a skilful workman will, in a given time, with a given amount of muscular work, cut away a far greater quantity of metal with a file than one who is unskilful, for he makes every tooth *cut into* the work, instead of *rubbing over* it. To do this, he must adopt the pressure and velocity of motion of the file to the coarseness of its teeth, and the hardness, brittleness, and toughness of the material he is working upon.

To *file flat*, that is, to avoid rounding the sharp edges of a narrow piece of work, is very difficult, and some years of continual practice is required before an apprentice can do this well, especially in 'smoothing up' or finishing work before polishing, and there are some who never succeed in filing, smoothing, and polishing without rounding the edges of fine work. The power of doing this constitutes the main test of skill among mathematical instrument makers and other metal-workers. The flattest surface can

be obtained by laying the work, where its form admits, upon a piece of cork held in the vice, and filing it with *one hand*, the pressure on the file being communicated by the forefinger.

It is mainly to aid the workman in filing flat that the rounded or bellied form is given to files; this partially compensates the tendency of the hands to move in a curved line with its convexity upwards when they move forward and apply pressure, as in the act of filing.

FILE (Fr. *file*, a row, Lat. *filum*, Ital. *fila*, *filo*), in a military sense, is used to signify any line of men standing directly behind each other, as *rank* refers to men standing beside one another. In ordinary formations of the present day, a battalion stands two deep, or in two ranks—front and rear—wherefore a file consists of two men. Sometimes, however, the battalion may be formed much more solidly, as in a square.

FILEY, a watering-place on the Yorkshire coast, eight miles south-east of Scarborough. A promontory shelters the bay from north winds; and F. has been recommended as a good place for a great harbor of refuge. Pop. about 3000.

FILIA'TION, in the law of Scotland, is the process by which its paternity is determined. The general rule that the father is he whom the marriage points out (*pater est quem nuptie demonstrant*), is a presumption which may be overcome by showing its impossibility in point of fact—as, for example, where the husband is impotent, or where he has been absent from his wife during the period between the eleventh solar and sixth lunar month preceding the birth. As regards natural children, a *copula* more than ten months before birth does not filiate, but it forms an important admissible of proof, which, till the passing of the 16 Vict. c. 20, it was held might be completed by the oath of the mother. As to the effect of that statute on the previously existing law, see *EVIDENCE*, and *SEMIPLENA PROBATIO*.

FILICAJA, VINCENZO, a lyrical poet of Italy, was born at Florence, of an ancient but impoverished family, in 1642. Deeply wounded, while yet a youth, in his affections, he resolved to dedicate his undivided genius to heroic, martial, and sacred themes, forswearing all amatory compositions for the future, and perversely consigning his exquisite love inspirations to the flames. In six sublime odes, F. celebrated the deliverance of Vienna in 1683 from the besieging forces of the Turks, chiefly effected by the heroism of John Sobieski, king of Poland, and of Charles Duke of Lorraine. On the publication of the odes in Florence in 1684, F. became, almost in spite of himself, famous, and attracted the notice of Queen Christina of Sweden, an ardent admirer and munificent protectress of Italian letters and genius. Relieved from harassing pecuniary embarrassments by the liberal patronage of Christina, F. was enabled, with undisturbed powers, to devote himself to composition, some of his most touching verses being addressed to his royal benefactress. Patriotic sonnets, the grandest of which is a lament over the internal weakness of Italy—*Italia, Italia, O tu cui feo la sorte*—and heroic odes, severely classic in form, are the chief works of Filicaja. His career as patriot, citizen, and man, won him reverence and love as universal as was the admiration accorded to his works. In advanced age, he was appointed judge and senator, and in 1702 was called to one of the highest magisterial offices in Florence, where he died in honored peace, September 24, 1707. His works, under the title of *Poesie Toscane di Vincenzo da Filicaja, Senatore Fiorentino e Accademico della Crusca*, were published after his death. The best edition is that of Venice (2 vols. 1762), containing both the Italian and Latin verses of the author.

FILICES. See *FERNS*.

FILIGREE, from the Italian *filigrana* (*filo*, a thread or wire, and *grano*, a grain or bead), the old filigree-work being ornamented with small beads. The name is now applied to delicate wire-work ornaments, usually made of gold or silver wire, which is twisted into spirals and other convoluted forms; and these spirals, &c., are combined to form a sort of metallic lace-work, which is shaped into brooches, earrings, crosses, head ornaments, and others of a very light and elegant character. This work is chiefly done in Malta, India, Genoa, the Ionian Islands, and some parts of Turkey. It sometimes receives the general name of *Maltese work*.

FILIPPO-D'ARGIRO, SAN, a town of Sicily, in the province of Catania, and about 30 miles west-north-west of the town of that name, stands on the right bank of the Traina, in an exceedingly fertile district. It contains a ruined Saracenic castle, and several religious edifices. Saffron of good quality, and in considerable quantity, is grown in the vicinity. Pop. (1872) 11,876. San F. stands on the site of the ancient Sikelian city of Agryrium, the birthplace of Diodorus Siculus, and which, about 400 B.C., is said to have had 20,000 citizens.

FILLAN, ST. Two Scots-Irish saints of the name of Fillan appear in the church calendars, and have left their mark on the topography of Scotland and Ireland. (1.) *ST. FILLAN*, or *Fao-*

lan, surnamed the Leper, had his yearly festival on the 20th of June. His chief church in Scotland was at the east end of Loch Erne, in Perthshire, where 'St. Fillan's Well' was long believed to have supernatural powers of healing. A seat in the rock of Dunfillan still keeps the name of 'St. Fillan's Chair'; and two cavities beside it are said to have been hollowed by St. F.'s knees in prayer. His Irish church is at Ballyheyland (anciently called Killielan or Kill Faelain), in the barony of Cullenagh, in Queen's County. (2.) ST. FILLAN, the abbot, the son of St. Kentigerna of Inchealeach, in Loch Lomond, lived in the 8th c., and had his yearly festival on the 7th or 9th of January. He joined the monastery of St. Mund on the Holy Loch, and after that saint's death succeeded him as abbot. His chief church in Scotland was in Perthshire, in the upper part of Glendochart, which takes from him the name of Strathfillan. Here, a well-endowed priory, dedicated in his honor, was repaired or rebuilt in the beginning of the 14th century. King Robert Bruce made a grant of money to the work of gratitude, probably, for the miraculous encouragement which he was said to have received on the eve of Bannockburn from a relic of the saint—one of his arm-bones enclosed in a silver case. Another relic of St. F.—the silver head of his crozier, or pastoral staff—has been preserved to our time. It is called the 'Coygerach' or 'Quigrich,' and appears in record as early as the year 1428, when it was in the hereditary keeping of a family named Jore or Dewar, who were believed to have been its keepers from the time of King Robert Bruce. They had half a boll of meal yearly from every parishioner of Glendochart who held a merk land, and smaller quantities from smaller tenants; and they were bound, in return, to follow the stolen cattle of the parishioners wherever their traces could be found within the realm of Scotland. The Quigrich, besides its virtues in the detection of theft, was venerated also for its miraculous power of healing. In 1487, the right of keeping it was confirmed to Malice Doire or Dewar by King James III. in a charter, which was presented for registration among the public records of Scotland so lately as the year 1734.

Sixty years later, the Quigrich still commanded reverence; but its healing virtues were now only tried on cattle, and its once opulent keepers had fallen to the rank of farm-laborers. It was publicly exhibited in Edinburgh in the year 1818, before being carried to Canada, by its hereditary keeper Archibald Dewar. His son, Alexander Dewar, desirous that it should be restored to Scotland, came to an arrangement whereby, partly by purchase and partly by gift, it became the property of the Society of Antiquaries of Scotland. It was described by Dr. Daniel Wilson in a paper in the *Canadian Journal*, No. xxiv., reprinted as *The Quigrich, or Crozier of St. Fillan* (Toronto, 1859); see also *Historical Notices of St. Fillan's Crozier* by Dr. Stuart, reprinted from the *Proceedings of the Society of Antiquaries of Scotland*, vol. xii. (1877). A limn in the river Fillan or Dochart, in Strathfillan, was long believed to work wonderful cures on insane persons, who were immersed in the stream at sunset, and left bound hand and foot till sunrise in the ruins of the neighboring church of St. Fillan. A hand-bell, which bore the name of St. Fillan, was also believed to work miracles.

FILLET, in Architecture, a small space or band like a narrow ribbon used along with mouldings. *a, a, a* (see fig.) are examples of fillets, both in classic and Gothic architecture.

FILLET, in Heraldry, is an ordinary which, according to Guillim, contains the fourth part of the chief.

FILLIBUSTERS, another name for the piratical adventurers whose origin and history are treated of under **BUCANEERS** (q. v.). Recently it has become familiar to English ears as the designation of certain lawless adventurers belonging to the United States, who have attempted violently to possess themselves of various countries in North America. The plea urged by these persons has generally been, that such countries were a prey to anarchy and oppression, and could only attain to prosperity by annexation to the United States, and the introduction of 'democratic' institutions—amongst which, strange to say, slavery stands prominent. The most notorious of these fillibusters was the late William Walker, whose expedition against Nicaragua in 1855 was so far successful that he kept his ground in that country for nearly two years. At last, he was driven out by a combination of the various states of Central America. He was subsequently captured and shot, September 12, 1860, at Truxillo, in Central America, in the course of another piratical expedition.

FILLMORE, MILLARD, an American statesman, ex-president of the United States, was born on 7th January 1800, at Summer Hill, in the state of New York. Born of English parents, in rather straitened circumstances, all the education he received was the very imperfect instruction furnished by the village school.

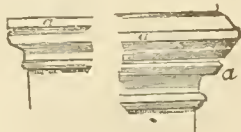
At the age of fifteen he was sent to the county of Livingston, there to learn the drapery trade, and soon afterwards was bound apprentice to a wool-carder in his native village.

During the four years he labored at this occupation, he used every means at his disposal to cultivate his mind, devoting his evenings to reading and study. In his nineteenth year he made the acquaintance of a lawyer named Wood, who discovering in the young man talents worthy of a loftier sphere, took an interest in him, and offered him a situation in his office, at the same time supplying him with funds for the prosecution of his studies for the legal profession. The attention bestowed upon him by his benefactor was not thrown away. He entered with ardor upon the course marked out for him, and in order that he might not be too great a burden upon his friend, devoted a part of his time to conducting a school. He removed to Buffalo in 1821 in order to complete his studies, and in 1823 was admitted a member of the bar. A brilliant career was thus opened up for him, and he delayed not to pursue it. He gradually acquired both means and reputation. In 1829, he began his political career, being in that year chosen as a representative of the county of Erie in the Legislature of New York, where he entered the ranks of the Whig party, at that time in opposition. Here his probity and modesty soon gained him universal esteem. He was mainly instrumental in procuring the abolition of imprisonment for debt in the state of New York. In 1832, F. was elected a member of Congress, and such were the statesman-like qualities displayed by him, that he was several times re-elected; but in 1844 he resumed his profession of advocate. In 1847, however, he again returned to public life, being elected by a large majority to the post of comptroller of New York; and in the following year he was made vice-president of the United States. The unexpected death of General Taylor in July 1850, leaving the office of president vacant, F. was raised to that high office, which he held till 1853. His presidency was marked by the passing of some very salutary measures, notwithstanding that his party were in the minority. He promoted as far as he could the progress of exploration and discovery, at home and abroad. In 1855, F. visited Europe, and on his return in 1856, he was again nominated for the presidency, but was not returned. F. took no active part in the civil war; though nominally he sided with the Union. After the expiry of his term of office, he retired to Buffalo, where he died in 1874.

FILTER, FILTRATION. When solid matter is suspended in a liquid in which it is insoluble, it may be separated by various means. Under the article **FIXING**, various methods of causing such suspended matter to collect together and sink to the bottom or float on the surface, and thereby clearing the liquid, are described. The process of filtration consists in passing the liquid through some porous substance, the interstices of which are too small to admit of the passage of the solid particles, the principle of the action being the same as that of a sieve; but as the particles of fluids are immeasurably small, the pores must be extremely minute.

One of the simplest forms of filter is that commonly used in chemical laboratories for separating precipitates, &c. A square or circular piece of blotting-paper is folded in four, the corner where the four folds meet is placed downwards in a funnel, and one side is partly opened, so that the paper forms a lining to the funnel. The liquid passes through the pores of the paper, and the solid matter rests upon it. The chief advantages of this filter are its simplicity, and the ease with which the solid matter may be removed and examined.

A simple water-filter for domestic purposes is sometimes made by stuffing a piece of sponge in the bottom of a funnel or the hole of a flower-pot, and then placing above this a layer of pebbles, then a layer of coarse sand, and above this a layer of pounded charcoal three or four inches in depth. Another layer of pebbles should be placed above the charcoal, to prevent it from being stirred up when the water is poured in. It is obvious that such a filter will require occasional cleaning, as the suspended impurities are left behind on the charcoal, &c. This is best done by renewing the charcoal, &c., and taking out the sponge and washing it. By a small addition to this, a cottage-filter may be made, which, for practical use, is quite equal to the most expensive filters of corresponding size. It consists of two flower-pots, one above the other; the lower one is fitted with the sponge and filtering layers above described, and the upper one with a sponge only. The upper pot should be the largest, and if the lower one is strong, the upper one may stand in it, or a piece of wood with a hole to receive the upper pot may rest upon the rim of the lower one. The two pots thus arranged are placed upon a three-legged stool with a hole in it, through which the projecting part of the lower sponge passes, and the water drops into a jug placed below. The upper pot serves as a reservoir, and its sponge stops the coarser impurities, and thus the filtering layers of the lower one may be used for two or three years without being renewed, if the upper sponge be occasionally cleaned. Care must be taken to

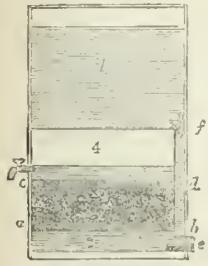


Fillets.

wedge the upper sponge tightly enough, to prevent the water passing from the upper pot more rapidly than it can filter through the lower one.

A great variety of filters are made on a similar principle to the above, but constructed of ornamental earthenware or porcelain vessels of suitable shape. It would occupy too much space to enter upon the merits of the filters of different makers, especially as there is really very little difference between them in point of efficiency, and nearly all the domestic filters that are offered for sale are well adapted for their required purpose. In purchasing a filter, the buyer must not be satisfied with merely seeing that the water which has passed through it is rendered perfectly transparent—this is so easily done by a new and clean filter—but he should see that the filter is so constructed as to admit of being readily cleansed, for the residual matter must lodge somewhere, and must be somehow removed.

When large quantities of water have to be filtered, this becomes a serious difficulty, and many ingenious modes of overcoming it have been devised. In most of these, water is made to ascend



Leloge's Filter :

- 1, 2, 3, 4, the four compartments; *ab*, the first porous stone of third or filtering compartment; *cd*, the exit filtering stone of *d*; *e*, the plug to remove for clearing out second compartment; *f*, a loose sponge at entrance of communicating tube.

through the filtering medium, in order that the impurities collected on it may fall back into the impure water. Leloge's ascending filter consists of four compartments, one above the other; the upper part, containing the impure water, is equal in capacity to the other three. This communicates by a tube with the lower one, which is of small height. The top of this is formed by a piece of porous filtering-stone, through which alone the water can pass into the third compartment, which is filled with charcoal, and covered with another plate of porous stone. The fourth compartment immediately above the third, receives the filtered water, which has been forced through the lower stone, the charcoal, and the upper stone. A tap is affixed to this, to draw off the filtered water, and a plug to the second or lower compartment, to remove the sediment.

In the diagram showing this filter in section, the figures 1, 2, 3, and 4 indicate the corresponding compartments. At *f*, the top of the tube by which the first and second compartments communicate, a sponge may be placed to stop some of the grosser impurities.

Since 1831, when this filter was contrived, a number of ascending filters have been patented, many of them being merely trifling modifications of this. Bird's Siphon Filter is a cylindrical pewter vessel containing the filtering media, and to it is attached a long coil of flexible pewter pipe. When used, the cylinder is immersed in the water-butt or cistern, and the pipe uncoiled and bent over the edge of the cistern, and brought down considerably below the level of the water. It is then started by applying the mouth to the lower end, and sucking it till the water begins to flow, after which it continues to do so, and keeps up a large supply of clear water. This, of course, is an ascending filter, and the upward pressure is proportionate to the difference between the height of the water in the cistern and that of the lower end of the exit tube. See SIPHON. Sterling's filtering tanks are slate cisterns divided into compartments, the water entering the first, then passing through a coarse filter to a second, and from there through a finer filter to the main receptacle, where the filtered water is stored and drawn off for use.

A common water-butt or cistern may be made to filter the water it receives by the following means: Divide the cistern or butt into two compartments, an upper and a lower, by means of a water-tight partition or false bottom; then take a wooden box or small barrel, and perforate it closely with holes; fit a tube into it, reaching to about the middle of the inside, and projecting outside a little distance; fill the box or barrel with powdered charcoal, tightly rammed, and cover it with a bag of felt; then fit the projecting part of the tube into the middle of the false bottom.

It is evident that the water can only pass from the upper to the lower compartment by going through the felt, the charcoal, and the tube, and thus, if the upper part receives the supply, and the water for use is drawn from the lower part, the whole will be filtered. It is easily cleaned by removing the felt and washing it.

Various means of compressing carbon into solid porous masses have been patented, and filters are made in which the water passes through blocks of this compressed carbon. Most of these are well adapted for the purpose, but their asserted superiority over filters composed of layers of sand and charcoal is doubtful. A very elegant and convenient portable filter for soldiers, travelers, and others who may require to drink from turbid ponds and rivers, was constructed of Ransom's filtering stone, and is also made of

the compressed carbon. A small cylinder of the stone or carbon is connected with a flexible India-rubber tube in such a manner that the cylinder may be immersed in a river, the mouth applied to a mouth-piece at the other end of the tube, and the water drawn through the filtering cylinder.

The filtration of water on a large scale will be treated of under WATER-SUPPLY.

Some very interesting experiments were made by Mr. H. M. Witt, to ascertain whether soluble matter, such as common salt, is in any degree removed from water by filtration. Theoretically, it has been assumed that this is impossible, since the filter only acts mechanically in stopping suspended particles; but the results of Mr. Witt's experiments show that from five to fifteen per cent. of the soluble salts were separated by sand-filters such as above described. This is a curious and interesting subject, well worthy of further investigation. Another most important matter, on which a series of accurate experiments is required, is to ascertain to what extent soluble organic matter may be decomposed by filtration, especially by charcoal filters, and to ascertain how long charcoal and other porous matter retains its property of acting on organic matter in watery solution. The power of dry charcoal in decomposing organic matter in a gaseous state is well established (see below), and it is also well known that fresh charcoal acts powerfully upon organic matter in solutions, but the extent to which this power is retained in the charcoal of a filter in continuous action has not been satisfactorily ascertained. This is of the highest importance, as it sometimes happens that water of brilliant transparency, and most pleasant to drink, on account of the carbonic acid it contains, is charged with such an amount of poisonous organic matter as to render its use as a daily beverage very dangerous. Charcoal obtained from burning bones is still more efficacious than charcoal from wood. A filter of animal charcoal will render London porter colorless. Loam and clay have similar properties. Professor Way found that putrid urine and sewer-water, when passed through clay, dropped from the filter colorless and inoffensive.

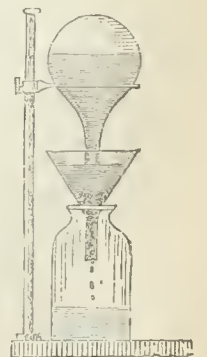
When a liquid contains mucilaginous or other matter having viscous properties, there is considerable difficulty in filtering it, as the pores of the medium become filled up and made water-tight. Special filters are therefore required for syrups, oils, &c. Such liquids as ale, beer, &c., would be exceedingly difficult to filter, and therefore they are clarified by the processes described under FINING. Oil is usually passed through long bags made of twilled cotton cloth (Canton flannel). These are commonly 4 to 8 feet long, and 12 to 15 inches in diameter, and are enclosed in coarse canvas bags, 8 or 10 inches in diameter, and thus the inner filtering-bag is corrugated or creased, and a large surface in proportion to its size is thus presented. Syrups are filtered on a small scale by confectioners, &c., by passing them through conical flannel bags, and on a large scale in the *creased bag-filter* just described. Thick syrups have to be diluted or clarified with white of egg, to collect the sediment into masses, and then they may be filtered through a coarse cloth strainer. Vegetable juices generally require to be treated in this manner.

The simple laboratory filter has to be modified when strong acid or alkaline solutions, or substances which are decomposed by organic matter, require filtration. Pure silicious sand, a plug of asbestos, pounded glass, or clean charcoal, are used for this purpose. Böttger recommends gun-cotton as a filter for such purposes. He has used it for concentrated nitric acid, fuming sulphuric acid, chromic acid, permanganate of potash, and concentrated solutions of potash and aqua regia. He says that properly prepared gun-cotton is only attacked at ordinary temperatures by acetic ether.

Filtering paper for laboratory purposes requires to be freed from inorganic impurities that are soluble in acids, &c.; this is effected by washing the paper with hydrochloric acid, or, when thick, with nitric and hydrochloric acid, and removing the acid by washing thoroughly with distilled water.

When a considerable quantity of liquid has to pass through a filter, it is sometimes desirable that it should be made to feed itself. In the laboratory, this is done by inverting a flask filled with the liquid over the filtering funnel, the mouth of the flask just touching the surface of the liquid when at the desired height in the funnel. As soon as it sinks below this, air enters the flask, and some liquid falls into the funnel. On a large scale, self-acting filters are fed by the common contrivance of a ball-cock and supply-pipe.

Air-Filters.—The extraordinary powers of charcoal in disinfecting the gaseous products evolved from decomposing animal and vegetable matter, have been made available by Dr. Stenhouse in constructing an apparatus for purifying air that is made to pass



through it. A suitable cage, containing charcoal in small fragments, is fitted to the opening from which the deleterious gases issue, and is found to render them perfectly inodorous, and probably innocuous. The first application of this was made in 1854, when a charcoal air-filter was fitted up in the justice-room of the Mansion House, London, the window of which opens above a large urinal, the smell of which was very offensive in the room.

The filter at once destroyed the nuisance, and the charcoal has been found to last many years without the need of renewal. 103 of such filters have been applied to the outlets of the sewers of one district of the city of London, and no bad smell is observable where they are placed, and no obstruction offered to the ventilation of the sewers. They have been applied with like results in two or three county towns. The subject is fully treated by Dr. Stenhouse in a letter to the lord mayor, published by Churchill (London). Charcoal respirators are small air-filters of the same kind applied to the mouth. See RESPIRATOR.

FIMBRIATED (Lat. *fimbria*, a border or hem), is said, in Heraldry, of an ordinary having a narrow border or edging of another tincture.

FINAL JUDGMENT. The meaning of this term in the law of Scotland having led to some dispute, an Act of Sederunt (q. v.) was passed on the 11th July 1828, declaring it to be applicable to a case in which 'the whole merits of the cause have been disposed of, although no decision has been given as to expenses, or, if expenses have been found due, although they have not been modified or decerned for.' The importance of the definition arises from the fact, that only final judgments can be carried by advocacy from the inferior to the superior courts. 'The whole merits of the cause' has been held to mean, not only the merits of the action to which the advocate is a party, but also those of any other conjoined with it. If the parties in the conjoined action will not proceed to have it determined, the advocate ought to apply to the inferior judge, stating his intention to advocate, and praying him to call on the parties to proceed with the conjoined process; and, failing their doing so, to disjoin the causes, which disjunction will render an advocacy competent. Shand's *Practice*, i. p. 454. In Advocations (q. v.) and Suspensions (q. v.), if the record be closed, and the proof concluded in the inferior court, the case may be taken at once to the Inner House without a judgment of the Lord Ordinary, 13 and 14 Vict. c. 36. In order to warrant an appeal to the circuit court in a civil cause (where otherwise competent) not only the merits must have been disposed of, but the expenses modified and decerned for.

FINALE, the name given to that part of a musical composition which finishes the act of an opera; also to the last movement of an instrumental composition, as in the symphony, quartet, quintet, sonata, &c. The character of the finale, in purely instrumental works, is always lively. In the opera, it depends on the subject, while in some operas the finale consists of an aria alone, as in Mozart's *Figaro*, instead of the usual full concerted music for soli and chorus.

FINALE, a town of North Italy, in the province of Modena, on the Panaro, 22 miles north-east from Modena. It is surrounded by walls, has manufactures of linen and silk, and an active general trade. Pop. 4500.

FINANCE, a French word incorporated with our language, means the art of managing money matters, the person who professes this art being called a financier. Finance, in the plural, is often used for money itself, but still with a reference to the purpose to which it is to be applied, as where the finances of a country are said to have improved or fallen off—that is to say, have become abundant or scanty according to the expenditure of the country. Sometimes the word is applied to private wealth, but it is properly applicable to public funds. We use it in this country rather in a political and economic sense than officially, but in France, there have been, from time to time, comptrollers-general of finance, councils of finance, bureaux of finance, &c. Many statesmen have been spoken of as great financiers, from the talent which they have shown for adjusting national revenue and expenditure, as Colbert, Turgot, and Necker in France, and Godolphin and Peel in Britain. As a branch of statesmanship, finance is intimately connected with other branches. In questions of national policy—such as, whether a state can go to war or not—the financier is the person who is expected to count the cost, and say how the necessary funds are to be obtained. In the question, whether an unpopular or oppressive tax is to be abolished, the financier is an authority on the question, whether the government can do without it. Hence, there is a special connection between finance and taxation, which has become closer and stronger since the progress of political economy has shown that the taxes which are the most productive, and even the most easily collected, are not always the best, looking at the gain or loss of a nation, in the long-run. Turgot said that finance was the art of

plucking the fowl without making it cry. On this notion, the principle of indirect taxation achieved its popularity. For instance, customs duties seem to fall on no one. The importer and the retailer add them to the price of the article, and the ultimate purchaser only knows that the article is dear without experiencing the sense of hardship felt by one who pays out money directly in the shape of a tax. But many indirect taxes have, on the other hand, been found to affect the trade and the wealth of communities to an extent which has made them very deleterious in comparison with direct taxes. See further on matters connected with finance the heads CUSTOMS; DEBT, NATIONAL; CORN LAWS; EXCISE; FREE TRADE; TAXATION; REVENUE.

FINCH (Ger. *Fink*; for the origin of the word see CHAFFINCH), the popular name of a great number of species of little birds of the order *Insectores*, and tribe *Corvirostræ*. Many of them have great powers of song, and are called *Hard-billed Song-birds*, in contradistinction to the Warblers (*Sylviæ*) or *Soft-billed Song-birds*. The name F. is sometimes used as equivalent to *Fringillidæ* (q. v.), either in its more extensive or more restricted application; but the limits of its popular use are very indeterminate, and some birds are equally known as finches and as linnets, or as grosbeaks, &c. The word F. often forms part of the popular name of birds of this family, as bullfinch, chaffinch, hawk-finch, pine-finch, &c.

FINDER OF GOODS. The finder acquires a special property in goods, which is available to him against all the world except the true owner; but before appropriating them to his own use, he must use every reasonable means to discover the owner. It has been decided that if the property had not been designedly abandoned, and the finder knew who the owner was, or knew that he could have discovered him, he was guilty of larceny in keeping and appropriating the articles to his own use. *R. v. Thurborn*, 1 Denison c.c. 393; *Merry v. Green*, 7 M. and W. 623. In the latter case, in which a person purchased, at a public auction, a bureau, in which he afterwards discovered, in a secret drawer, a purse containing money, which he appropriated to his own use, Mr. Baron Parke thus laid down the law. 'The old rule, that "if one lose his goods, and another find them, though he convert them *animo furandi* to his own use, it is no larceny," has undergone in more recent times some limitations. One is, that if the finder knows who the owner of the lost chattel is, or if, from any mark upon it, or the circumstances under which it is found, the owner could be reasonably ascertained, then the fraudulent conversion, *animo furandi*, constitutes a larceny.' This law, however, although in most cases clear, is, in others, extremely difficult in application, and judges and juries often go wrong. The question for the jury is not whether they think the finder could have discovered the owner, but whether he believed that he could; and if not satisfied as to this, they cannot convict him of larceny. It is a mistake to suppose that the finder is bound to advertise, or use extraordinary means to discover the owner; indeed he cannot claim such expenses from the real owner, if he appear.

FINDHORN, a river rising on the west side of the Monadh Liadh Mountains, in the east of Inverness-shire. It runs north-east through the counties of Inverness, Nairn, and Elgin, in the valley of Strathdearn, passes Forres, and enters the Moray Firth at the village of Findhorn by a lagoon three by one and a half miles in extent, after a course of about 90 miles. Its waters abound in salmon and trout. Its basin consists of gneiss in the upper part, and of old red sandstone in the lower. At one place, it rose nearly 50 feet in the great floods of August 1829, known as the 'Moray Floods,' and did much damage. West of the mouth of the F. are the Culbin Sands, in one part 118 feet high, and covering 9500 acres of a formerly fertile tract.

FINE OF LANDS, in England, fictitious proceedings formerly in common use in order to transfer or secure real property by a mode more efficacious than an ordinary conveyance. A fine is defined by Coke, quoting from Glanville, an amicable composition and final agreement by leave and license of the king or his justiciaries; and such indeed it was in its original effect; and it was called a fine because it put a termination (*finis*) to all litigation between the parties, and those claiming through them, in regard to all matters touching the suit.

The proceedings in a fine were shortly as follow: The party to whom the land was to be conveyed commenced a fictitious suit against the vendor. But the case was no sooner in court than the plaintiff asked leave to agree or settle with the defendant. This leave having been obtained, a covenant was entered into whereby the vendor or defendant, called the *cognizor*, recognized the right of the plaintiff, called the *cognizee*, to the lands, of which he admitted that the plaintiff was wrongfully kept from the possession. These proceedings, which at first were real, were afterwards adopted universally without having a shadow of foundation in fact. This solemn farce having been completed, a *note of the fine*, being an abstract of the covenant, the names of the parties, and the parcels of the land, was entered on the rolls of the court; and the business was concluded by what was called the *foot of the*

fine, setting forth the parties, the time and place of agreement and before whom the fine was levied. The whole was embodied in indentures commencing *hæc est finalis concordia*. It was necessary that a fine should be levied openly in the Court of Common Pleas, or before the chief-justice of that court, or before two or more commissioners appointed in the country. Fines were of four kinds, which need not be specified here. In order that a fine should have full effect, it required to be levied with *proclamations*, i. e., open proclamation of the transaction in court. A fine so levied cut off the right even of strangers who failed to assert their claim during the period allowed by law; hence an estate was said to be barred by fine and non-claim. A fine levied by a married woman had the effect of cutting off all right she might have in the lands, and was the only mode by which a married woman could convey lands; and in order to protect her from undue influence, she was privately examined as to the voluntary nature of the transaction. A fine levied by tenant in tail cut off the estate tail, but did not affect remainders; hence, though a fine was sometimes used to bar an entail, the usual method was by common Recovery (q. v.). But while a recovery was the most effectual method of barring an entail, it required the consent of the tenant in possession. Where, then, that consent could not be obtained, or where the tenant in tail was at the same time tenant in fee in remainder, a fine was a convenient mode of barring the entail. The statute *De Donis* prohibited fines as a means of barring entails, but this restriction was removed by 32 Hen. VIII. c. 36.

The old law as to fines has been abolished by the *Fines and Recoveries Act*, 3 and 4 Will. IV. c. 74. This act was passed for the purpose of abolishing the cumbrous machinery used in the transfer of land according to the ancient forms and fictions. The act abolishes all the fictions formerly in use. In regard to fines and recoveries by heirs of entail, it permits every tenant in tail of freehold land whether in possession, in remainder, or contingency, to dispose of the lands for an estate of fee-simple absolute, or any less estate, by any of the ordinary conveyances, except a will, at common law, or under the statute of Uses (q. v.).

The conveyance must be registered in the Court of Chancery within six months after its execution. But where there is an estate of freehold prior to the estate tail, the act requires that the consent of the tenant of the freehold shall be necessary in order to give full effect to the conveyance. This person is called the *protector of the settlement*. Where a conveyance is made without consent of the protector, it has the effect of barring those only who would succeed under the heir by whom it is executed. This is precisely the effect which under the old law belonged to a recovery without the consent of the tenant to the *precipe*, and of a fine levied by a tenant in tail; so that the statute, while it abolishes the fictions, sustains entails as family settlements to the limited effect which they formerly possessed. In regard to fines by married women, the act provides that a Feme Coverte (q. v.) may dispose by deed of any lands, or of money subject to be invested in the purchase of lands. It is necessary, unless specially dispensed with by the court, that her husband should concur in the conveyance and that she should acknowledge it before a judge of one of the superior courts at Westminster or a Master in Chancery, or two of the commissioners appointed for that purpose under the act.

FINGAL'S CAVE. See STAFFA.

FINGER-BOARD, that part of a stringed musical instrument, as in the violin, violoncello, guitar, &c., which is made of ebony-wood, and glued on the neck of the instrument, and shaped on the top somewhat round, to suit the position in which the strings lie on the nut and the bridge. At the lower end, the finger-board projects over the sounding-board of all those instruments played with the bow, while in the guitar species the finger-board is glued down on both neck and sounding-board. The strings are stretched along the finger-board from the nut at the top to the bridge at the lower end, and are pressed down by the fingers of the left hand, to make the different notes in music; while the right hand produces the sound either by a bow or the points of the fingers.

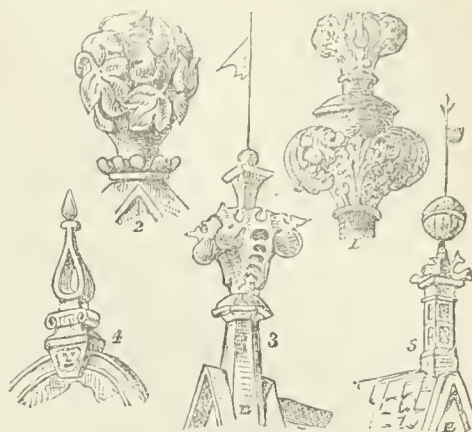
FINGERS. See HAND.

FINGERS-AND-TOES, the popular name of a disease in turnips, called also ANBURY (q. v.)

FINIAL, an ornament, generally carved to resemble foliage, which forms the termination of pinnacles, gables, spires, and other portions of Gothic architecture. There are traces of foliated terminations, both in stone and metal, on the pediments of classic buildings (see ACROTERION), but it was not till the 12th c. that the finial proper was introduced. During the latter part of that century and the whole of the 13th c., finials of the most perfect form and of infinite variety were used as the crowning ornaments of every salient point in the buildings of the period (see fig. 1). The architects of the 14th c., in finials, as in other ornaments, imitated more closely the forms of natural foliage; but their

finials had neither the variety of design nor the vigor of outline of those of the preceding century (see fig. 2).

In the 15th and 16th centuries, the finials became more and more meagre in form, and are frequently only four crockets set upon a bare pyramidal terminal. Some variety of effect is often obtained during this period by surmounting the finial with a gilded vane. This is common in Tudor and domestic architecture (fig. 3). Finials were carved both in stone and wood, and in the latter



Finials:

1, from Bishop Bridport's Monument, Salisbury Cathedral; 2, York Minster; 3, Maulbronn, Germany; 4, Crew Hall, Cheshire; 5, Augsburg.

material with great delicacy and minuteness. In connection with metal-work, finials of metal were used, and whatever the material adopted, its natural capabilities were made a source of special beauty.

The finial is one of the most effective ornaments of Gothic architecture, and when that style was succeeded by the revival of classic, in the reign of Queen Elizabeth, our forefathers could not persuade themselves to part with the finials to their buildings. We thus find in Elizabethan architecture a great variety of finials; they are, however, almost entirely of a geometric form, and without foliage (fig. 4), and are frequently, especially when terminating wooden gables, combinations of finial and vane partly wood and partly iron (fig. 5). In the stricter classic which succeeded the Elizabethan, some traces of the favorite finial still remain in the balls, obelisks, &c., used as terminations, and also in the shields and supporters (themselves a remnant of feudalism) which form the crowning ornament of gate-piers, pedestals, &c.

FINING, the process of clearing turbid liquors, such as beer, wine, &c. The simplest mode of fining is by passing the liquor through a porous substance that retains the solids and allows the clear liquid to pass through (see FILTER); but this method is only applicable to particles mechanically suspended in a limpid liquid. When the liquid contains mucilaginous or other matter, that readily clogs the filter, some other means of fining must be used. Such is the case with all malt liquors and most wines when turbid. When in good condition, these do not usually require fining, as the suspended matter agglomerates, and sinks to the bottom shortly after fermentation is completed. When this does not take place, some means of promoting such action are usually adopted. One of the simplest is to add soluble albumen, such as white of egg, to a portion of the liquid, and after beating it well in this, to add the mixture, and stir it into the whole of the liquid. Upon the application of heat, the albumen coagulates and contracts from its diffusion into a scum, enveloping and drawing together the suspended matter. The scum is then easily removed.

This method is adopted for syrups and other liquids that may be heated without mischief. In making clear soups, the albumen of the meat performs this function. As alcohol coagulates albumen, it may be used for fining wines and cordials without the application of heat. It is generally used for red wines. Malt liquors are usually fined by means of gelatine, either isinglass or cheaper substitutes being used. One pound of isinglass is soaked in three or four pints of water, or sour beer, then more sour liquor added as the isinglass swells, until it amounts to about a gallon. The jelly thus formed is next dissolved in seven or eight gallons of the liquor to be fined. This solution, having the consistence of a syrup, is called 'brewers' finings,' and about a pint to a pint and a half is added to a barrel of ale or porter, or to a hogshead of cider or wine. The action of this depends upon the combination of the gelatine with the astringent matter (tannic acid) of the liquor, forming thereby an insoluble solid, which sinks to the bottom, and carries with it, like the coagulating albumen, the suspended matter; but as the flavor of malt liquors partly depends

upon the astringents they contain, the fining affects the flavor; the astringents also help to preserve the liquor, and hence their removal is in this respect disadvantageous. Malt liquors thus fined do not 'stand well on draught.' The use of gelatine for fining red wines is objectionable, as in most of these the astringent flavor is an esteemed quality, and therefore albumen is preferred.

Other methods of fining are adopted. Sugar of lead is sometimes added, and afterwards one-half its weight of sulphate of potash dissolved in water. By this means, an insoluble sulphate of lead is precipitated, which in subsiding carries down other matters with it. This is a dangerous process, the salts of lead being poisonous. If properly conducted, the whole of the lead may be precipitated, but a casual mistake in the quantities might cause the death of many people. Ox-blood is used in the same manner as albumen and isinglass. Lime, alum, alcohol, and acids act by coagulating albumen, &c., contained in the liquor. Plaster of Paris, clay, and even sand, are sometimes used to carry down the suspended matters. A strip of isinglass or a piece of dried sole-skin is often used for fining coffee, and it acts in the manner above described. Liquors that are unusually difficult to fine are called 'stubborn' by coopers and cellar-men.

FINISTÈRE, or **FINISTERRE** (Lat. *Finis terræ*, 'Land's End'), a department at the western extremity of France, comprehending a part of the former duchy of Bretagne, has an area of 2648 square miles, and a pop. (1881) of 672,310. It is traversed from east to west by two low but picturesque chains of hills. Its coast is very rugged and broken, its shores bristling with dangerous granite rocks, and fringed with many islands. The soil, one-third of which is occupied by sandy tracts and marshes, is moderately productive; and, owing to the vicinity of the sea, which washes the northern, western, and southern shores of the department, the climate is mild and humid. Corn, hemp, and flax are grown in considerable quantities. In the valleys, smiling meadows everywhere occur. The silver and lead mines of F. are very valuable; those of Poullaouen and Huelgoet being about the richest in France. Its principal rivers are the Aulne, the Elorn, and the Odet. The first of these is connected by a canal with the Blavet, and forms part of the great line of communication by water from Brest to Nantes. This department is divided into the following five arrondissements: Quimper, Brest, Châteaulin, Morlaix, and Quimperlé. Quimper is the chief town.

FINISTERRE, **CAPE**, or **LAND'S END**, is the name given to a promontory at the north-western extremity of Spain, in lat. 43° 54' N., and long. about 9° 20' W. It is the *Promontorium Nerium* of the ancients.

FINLAND (Fin. *Suomesimaa*, land of lakes and marshes) is a grand duchy of Russia, lying between 59° and 70° N. lat. and between 21° and 33° E. long., is about 750 miles from north to south, and has an average breadth of about 185 miles. It is united with Russia, the Emperor of Russia being Grand-Duke of F.; but is administratively independent. Pop. (1851) 1,636,915; (1880) 2,023,021. The area of F. may be estimated at about 145,000 square miles, of which nearly one-third is occupied by marshes and lakes. The largest of these sheets of water, independently of Lake Ladoga, which belongs partly to the Russian province of Olonetz, are Lakes Puruvesi, Payane, Enara, and Saima; the last of these, which is about 180 miles in length, constitutes a portion of the system of water-communication which has been established between the central parts of the country and the Gulf of Finland. The lakes are especially numerous in the south-west of F., where they are almost all united together by rivers and waterfalls, round the central lake of Pyhäjärvi. The surface is a table-land, from 400 to 600 feet above the level of the sea, with occasional higher elevations. There are, however, no mountain-ranges, and hence the rivers are unimportant; but in the north the country is intersected by a sandy ridge known as the 'Maansekilkae,' which merges, under the name of Lapintunturit Mountains, into the great Lappo-Norwegian Alpine chain. The coast-line is generally low, but to the south it is skirted by numerous rocky islands, separated from the land by narrow channels, difficult of navigation, but well adapted for purposes of defence against hostile attacks from the sea. The principal geological formations are friable granite, hard limestone, and slate. The forests of F. are still very abundant, although they have been recklessly cut down in many parts of the country for the sake of their ashes, which are used to stimulate the soil, whose natural poverty requires to be counteracted by frequent manuring. Pine and fir predominate, but birch, beech, oak, &c., thrive in the south parts of the country, where some good pasture-land is to be met with. Since the incorporation of F. with Russia, agriculture has declined, and fishing and cattle-breeding increased in importance. The annual exports from F. have a value of £4,000,000; the imports much exceed this sum. The most valuable are the products of the forests, as timber, pitch, potash, tar, and rosin; for the supply of grain is scarcely larger than the home demand, although at one time F. was regarded as the granary of Sweden for barley and rye. Few fruits

ripen except hardy berries; and in the extreme north, vegetation is almost limited to mosses and liverworts. F. yields some copper, iron, lime, and slate, but it produces scarcely any salt, which constitutes one of the principle articles of import. Reindeer, wolves, elks, beavers, and various kinds of game abound; while the numerous lakes, and the adjacent gulfs, supply the inhabitants with an abundance of salmon, herring, and other fish.

The climate is rigorous, and winter, which lasts seven or eight months, is succeeded by a brief spring, which passes almost suddenly into a short but hot summer of six or seven weeks, succeeded in its turn by a rainy season, which ushers in the return of cold weather. In the north, the sun is absent during a part of December and January, and almost perpetually above the horizon during the short summer. F. is divided into eight länas or governments—Nyland, Abo-Björneborg, Tavastehus, Wiborg, Kuopio, St. Michel, Wasa, Uleaborg, which are included in the three dioceses of Abo, Borgo, and Kuopio, and contain in all 214 parishes. The predominant form of religion is the Lutheran, but the Greek Church has of late years been gaining ground. The courts of law are held at Abo (the ancient capital), Wasa, and Wiborg; and there is one university, founded in 1640 at Abo, but removed to the present capital, Helsingfors, in 1829. The highest administrative authority is vested in the imperial senate for F., consisting of 18 members, nominated by the emperor, and presided over by the governor-general of F. The estimated revenue of F. in 1882 was £1,453,000; the estimated expenditure was £1,405,250. The army numbers now only 679 men, but has the privilege of serving in distinct corps, without being incorporated in the general forces of the empire. The naval force also forms a distinct squadron, under its own national flag.

The early history of F. is shrouded in obscurity, and little is known of the people before the 12th c., when Eric the Saint, king of Sweden, exasperated by their piratical inroads, undertook a crusade against them, and compelled them, by force of arms, to profess Christianity. The hold which the Swedes then acquired over the country was never wholly lost till 1809, when Sweden secured peace with Russia by the cession of all F. and the island of Åland; before that time, however, the Russians had at various epochs wrested portions of the Finnish territories from the Swedes, while F. had been for centuries the perpetual cause and scene of wars between the two nations. The Swedish language had taken such deep root in F., that the efforts of the Russian government to displace it in favor of the native Finnish have hitherto met with only partial success, and in many parts of the country, the people still openly prefer their old masters. The inhabitants who call themselves *Suomes*, and are denominated *Tschudes* by the Russians, have, however, no affinity of race with the Swedes, and may be regarded as differing from all other European nations, excepting the Lapps and the Finmarkers, to whom they are very probably allied. See **FINNS** and **FINNISH LITERATURE**.—For further information, see Rein, *Finlands Historia* (Helsingf. 1871); Hallsten, *Finlands Historie och Geografi* (1873); Koskinen, *Finnische Geschichte* (Leip. 1873); Armfelt, *La Finlande* (Helsingf. 1874); Ignatius, *Statistiska Anmärkingar om Finland* (1876).

FINLAND, GULF OF, the eastern arm of the Baltic Sea, between 22° and 30° E. long., and between 59° and 61° N. lat. Its coasts are entirely Russian territory. It receives the waters of the great lakes Onega and Ladoga. The water of the gulf is not deep, and only very slightly salt. The topography of the Gulf of F., which has been thoroughly elucidated by Struve, forms an interesting part of the great work of the Russian survey of the Baltic.

FINLAY, George, a distinguished historian, was born in Scotland about the commencement of the present century. Circumstances induced him to take up his residence in Athens, where he patiently and industriously devoted himself to the study of the later Greek history. The fruits of his labor and researches are contained in his *History of Greece under the Romans*, 146 B.C. to 717 A.D. (London, 1843; 2d ed. 1857); *History of Greece from its Conquest by the Crusaders to its Conquest by the Turks, and of the Empire of Trebizond*, 1204—1461 A.D. (London, 1851); *History of the Byzantine and Greek Empires*, 716—1453 A.D. (London, 2 vols., 1853—1854); *History of Greece under the Ottoman and Venetian Dominion* (1854); and *History of the Greek Revolution* (1861). F. is not regarded as a philosophical historian, in the highest sense of the term; but, from his earnest endeavors to obtain an accurate conception of the times about which he wrote, he was enabled to throw a flood of new light on modern Greek history. F. also exhibited a profound knowledge of Greek art, antiquities, and topography. In 1870, he edited Brue's *Journal of Ali Pacha's Campaign in 1715*. He died in 1875.

FINMARK, a province of Norway, and the most northern part of the continent of Europe lying between 68° 30' and 71° N. lat., and 17° and 31° E. long., constitutes Norwegian Lapland (q. v.). Area about 20,000 square miles, of which three-fourths are occupied by the continent, the rest belonging to the numerous islands which skirt its north-west shores, and terminate in the North Cape.

Innumerable fiords and bays indent the coast. The interior is intersected by a snow-covered range of mountains, reaching an elevation of 4000 feet; the line of perpetual snow being here less than 3000 feet above the level of the sea. Agriculture is impracticable above an elevation of 100 feet; a few berries are the only fruits that ripen; and although barley, potatoes, and a few other vegetables thrive in some parts, fish and game constitute almost the sole food of the inhabitants. In the north, where no trees are to be found, the turf of the marshes affords a good supply of fuel. The thin vegetable mould which covers the stony soil yields grass for the sheep and cows, which graze on the declivities of the rocks skirting the fiords and creeks. The principal source of wealth is the reindeer in the north, and the cod-fisheries in the south. The pop., which in 1880 numbered 27,000, consists principally of Lapps (see LAPLAND), a people of Finnish origin. Hammerfest, the capital of F. (70° 40' N. lat.), is the most northern town of Europe.

FINNISH LITERATURE. To Elias Lönnrot of Helsingfors belongs the merit of having rescued from utter oblivion some of the numerous sagas and songs which had for ages been recited by the Finnish *Runolainen*, or singers, to the sound of the *kantele*, or harp, and thus transmitted from one generation to another.

Although his researches were limited to the district of Karelia, in the government of Kupio, he obtained numerous songs and proverbs, and a complete epos, consisting of 32 parts, each of which contained from 200 to 700 verses. This singular monument of the earlier culture of the people was published by him in 1835, under the title of *Kalevala* (the ancient name of Finland), but it met with little notice till the Academy of Dorpat made it the subject of discussion at their meetings in 1840. This publicity soon attracted the attention of foreign philologists, and led to its translation into Russian, Swedish, and German. The learned Finnish scholar, Carsten, the Grimms, and Brockhaus, agree in regarding the *Kalevala* as a pure epic, and characterize it as a composition possessing a thoroughly Oriental appreciation of nature, an almost unparalleled wealth of images and tropes, great flexibility of rhythm, and a copiousness of synonyms not to be met with in any other northern tongue. There is less unanimity in regard to the character of the plot, for while one critic believes that the incidents refer to definite historical epochs, another regards them as purely allegorical. But whatever discrepancy of opinion there may be in this respect, the *Kalevala* is admitted by all who are entitled to form a judgment of its merits to be one of the most curious monuments of the kind possessed by any European people. The date of its composition must be referred to a period anterior to the introduction of Christianity amongst the Finns in the 14th c., while there is even strong internal evidence, from an identity of the names and traditions of the *Kalevala* with many still current in Esthonia, that the poems very probably belong to an epoch anterior to the immigrations of the Karelians into the districts which they now occupy. The publication of the *Kalevala* has given a powerful impetus to the study of the Finnish language, which the Russian government effectively sustains by encouraging the cultivation and use of their native tongue by the Finlanders. The upper classes still cling to the use of Swedish, but the peasantry and small landed proprietors welcome with avidity every addition to the limited stock of their printed literature. Finnish weekly papers circulate freely among them, and political questions are discussed with an enthusiasm which is never met with among similar classes in Scandinavia or Russia Proper, but which affords additional proof of the diversity of character which distinguishes the Finn from either of the neighboring nations with which he has been successively incorporated.

The prose literature of Finland is almost exclusively devoted to religious and moral subjects. The Bible was translated into Finnish in 1642, but a part of the Old Testament had been translated a century earlier. Several Finnish poets have acquired a reputation of late years, but their works breathe the same melancholy tone which so strongly characterizes the more ancient poems of Finland. Lönnrot has made a collection of about 7000 proverbs (*Suomen kansan Sanakirja*, 1842), and about 2000 charades (*Suom. kans. arvoituskia*, 1851). In 1880, about 20 journals or magazines appeared regularly in the Finnish tongue, one of them illustrated.

FINNS, geographically, the name of the inhabitants of Finland; but in ethnology, that of a considerable branch of the Ugrian race, dwelling for the most part in Finland, though with some representatives in Sweden and Norway as well. The Ugrians have been classed among the nations said to have a Mongolian origin. Dr. Latham places them among the 'Turanian Altaic Mongolids,' and divides them into Ugrians of the East, and Ugrians of the West. The Western Ugrians consist of Lapps, Finns, Perimians, and other nations or tribes in the north and north-west of Russia, and of the Magyars in Hungary. The Magyars are the most numerous, and next after these come the

Finns, comprising about 2,000,000 of individuals. All the other tribes of Western Ugrians do not together comprise so many. The F., in common with the other Ugrians, are of the Mongolian type. A recent traveller, Mr. Bayard Taylor, describes them as having 'high cheek-bones, square, strong jaws, full, yet firm lips, low broad foreheads, dark eyes and hair, and a deeper, warmer red on the cheeks than on those of the rosy Swedes. The average height is, perhaps, not quite equal to that of the latter race, but in physical vigor there is no inferiority, and there are among them many men of splendid stature, strength, and proportion.' Other travellers bear similar testimony to the physical appearance of the F. proper, or those of pure Finnish blood; but although these form the majority, there are many, in the towns especially, who pass for F., while, in reality, they are quite as much entitled to be called Swedes, or even Russians, on account of the frequent intermarriages of the F. with individuals of those two nations. The F., from having been originally a nomadic race, have for many centuries been stationary and civilized. Long before the arrival of the German and Slavic nations in the north of Europe, the Ugrians, or *Ogres* (for the name so common in fiction is really of historic origin), possessed it, and were gradually pushed further north and east by the new invaders. Both F. and Lapps, there is good reason to believe, originally extended much further south than they do at present, occupying, perhaps, the whole of Sweden and Norway. 'The Finns,' says Prichard, 'were, in the time of Tacitus, as savage as the Lapps; but the former, during the succeeding ages, became so far civilized as to exchange a nomadic life for one of agricultural pursuits; while the Lapps have ever continued to be barbarous nomades, as well as the Siberian tribes of the same race—namely, the Woguls and Ostiaks. The Finns, as well as their brethren the Beornials, or Finns of the White Sea, had probably undergone this change long before the time when they were visited by Otther, the guest of Alfred. When the Finns were conquered by the Swedes, they had long been a settled people, but one of curious, and singular, and isolated character.'

The Finnish language, like that of the other Ugrian nations, belongs to the Turanian family of languages, and hence offers some striking points of resemblance to the languages and dialects of the Turks, Tartars, Mongols, Mandshurians, Tungusians, and even Magyars or Hungarians. In Finnish, the nouns are not inflected, but an additional word is required to denote the variations of case, number, and sex. The prepositions and pronouns are suffixed to the words they modify. The verbs have only two tenses, past and present; the future being expressed by adding to the present some word indicating a future action or state of being. Rask considers the Finnish to be the most harmonious of tongues. Many Swedish, and a few Russian words have, of course, become incorporated with the language, in consequence of the social and political relations of the F. with those two countries. The F. of our time are doubtless the same race as the *Fenni* of Tacitus, and the *Phinnoi* of Strabo and Ptolemy, though not occupying the same geographical area. 'The nearest approach to a name at once general and native,' says Dr. Latham, 'is *Suomelamen*, meaning swamp, morass, or fen people; the term Finn and Finlander being of foreign origin.' With respect to the social habits, morals, and manners of the F., all travellers are unanimous in praising them. They are of a cheerful disposition, affectionate towards each other, and honest and honorable in their dealings with strangers. They are also cleanly in their persons, being much addicted to the use of the vapor-bath, to which circumstance may be attributed the strongly marked difference in physical appearance between them and the stunted Lapps, to whom, in language as well as many other respects, they stand closely related.

FINS (allied to Lat. *pinna* or *penna*, see letter F), organs adapted for swimming or locomotion in water. The limits of the application of the term are rather vague. It is always applied to the locomotive organs of fishes, when they possess special organs of locomotion, as almost all of them do; and equally to those organs (the pectoral and ventral fins) which are homologous to the limbs of other vertebrate animals, and to those (the vertical fins) which may be said to be superadded to them, and to belong to fishes alone; equally also to those which are furnished with rays, having a membrane stretched on them, as is generally the case in all the fins of fishes, and to those which consist, as in some fishes, of a mere fold of the skin, and which, when they exist in fishes, are in reality not very much organs of locomotion. The name fins is given to the locomotive organs of *Cetacea*, but not to those of any other *Mammalia*, even when, as in the case of the hind feet of seals, they approach very nearly to the character of the fins of fishes. Nor is it ever given to the webbed feet of birds. But it is often given to the swimming organs of invertebrate animals, as to the expansions of the mantle which serve this purpose in the *Cephalopoda*, and which are entirely destitute of rays.

FINSBURY, or **FEN TOWN**, a parliamentary borough of Middlesex, forming the north part of London (q. v.).

FI'NSCALE. See RED-EYE.

FI'NSTERAA'RHORN, the highest peak of the Bernese Alps. See ALPS.

FINSTERWALDE, a small town of Prussia, in the province of Brandenburg, is situated on an affluent of the Black Elster, 40 miles north of Dresden. It has manufactures of cloth and machinery; spinning and weaving are carried on. Pop. (1880) 7300.

FIORENZUOLA (*Florentiola*), a town of Northern Italy, in the province of Piacenza, 22 miles west-north-west from Parma, on the Arda, in a beautiful and fertile plain. It is a station on the railway between Parma and Piacenza, and is also on the ancient Æmilian Way. It is well built, and a place of considerable activity. It formerly had numerous conventual and other ecclesiastical establishments. The principal church is still collegiate, and contains some curious relics of ancient art. There are some interesting relics of mediæval times in Fiorenzuola. It is supposed to occupy the site of the ancient *Fidentia*. Pop. 6500.

FI'ORIN. See BENT GRASS.

FIR, a name often used in a sense co-extensive with the widest sense of the word PINE (q. v.), and therefore so as to include a large portion of the CONIFERÆ (q. v.), or at least the whole of the Linnæan genus *Pinus*. But the name fir is often also used in a more restricted signification, and the trees so designated are those forming the genus *Abies* of some authors. *Abies* and *Picea* of others, which the greater number of botanists have now agreed in separating from *Pinus*. The SCOTCH FIR, however, is a true Pine (*Pinus sylvestris*), and will be described along with its congeners. See PINE.—The genus *Abies* is distinguished from *Pinus*



Common, or Norway Spruce Fir (*Abies excelsa*):
Copied from Selby's *British Forest Trees*.

by the flat rounded apex of the scales of its cones, and by leaves not in clusters of definite number. Some botanists include the species of LARCH (q. v.) and CEDAR (q. v.) in the genus *Abies*; but if these be separated, no species with clustered leaves remain in this genus, which then contains only the different kinds of SPRUCE FIR and of SILVER FIR, or species most nearly allied to those which ordinarily bear these names. All of them are evergreen. The Spruce Firs form the genus *Abies* of some authors, distinguished by short solitary leaves, scattered all round the branchlets, and by the scales of the (pendulous) cones being attenuated at the apex, and remaining fixed to the axis of the cone. The Silver Firs form the genus *Picea* of some, distinguished by the deciduous scales of the (erect) cones. It being supposed, however, that the Linnæan names had been given through mistake, and that the common Silver Fir is the true *Abies* of the ancients, and the Norway Spruce their *Picea*, Link has attempted, but without being followed by many, to restore these names to their ancient use, and to denominate the genera accordingly.—The NORWAY SPRUCE (*Abies excelsa* or *Pinus Abies*) is a noble tree, sometimes attaining the height of 180 feet, with long cylindrical pendulous cones, denticulate scales, and scattered, green, crowded, suddenly pointed, almost quadrangular leaves. It is the *Fichte* of the Germans, called also *Rothtanne* or *Schwarzthanne*.

Like the other kinds both of Spruce and Silver Fir, it exhibits the peculiar character of the *Conifere* more perfectly than many of the true Pines do, in its perfectly erect stem, from which proceed almost whorled horizontal branches. It is a very beautiful pyramidal tree, and when old, its long branches droop towards the

ground. It forms an entire forest in the middle and north of Europe and in Asia, chiefly upon elevated ridges, although it prefers moist places. It loves districts of primitive rock. In some places, it is found even within the Arctic Circle. It is not a native of Britain, but has long been very generally planted, although too often it is merely made a nurse for other trees, and is not allowed to attain a considerable age or size. It is of rapid growth, but is believed to live to the age of 400 years. It yields the same products as the Scotch Fir, resin, turpentine, tar, and lampblack (see these heads); but more resin than turpentine. The true Spruce Resin flows spontaneously from the bark. The purest pieces are whitish or pale yellow, are sold under the name of Common FRANKINCENSE, and used for ointments and plasters, and when melted yield the common Burgundy Pitch (q. v.). The bark of the spruce is a good and cheap non-conductor of heat: the cones are an excellent substitute for tanners' bark. In Sweden and Norway, the inner bark is made into baskets; and the long and slender roots, split and boiled with alkali and sea-salt, are dried and twisted into cordage, which is used both for vessels and by farmers. The wood is used for fuel and for house-building; it also supplies masts and spars for ships. It is the WHITE CHRISTIANA DEAL and DANZIG DEAL of the market, and is very largely imported into Britain from Norway and the Baltic.

It is whiter, lighter, less resinous, and more elastic than the timber of Scotch Fir. The sapwood, whilst still in a gelatinous state, is sweet, and is eaten fresh in Sweden and Lapland; and the inner bark, in times of scarcity, is mixed with a little flour or meal of some kind, and baked into bread. The young shoots, still covered with their bud-scales, are in many parts of Europe used for fumigation. The leaf-buds are also employed medicinally in cases of scurvy, rheumatism, and gout. The pollen is often sold by apothecaries instead of the dust of the Clubmoss or *Lycopodium*.—A very superior variety of this fir is known as the RED NORWAY SPRUCE. Dwarf varieties are cultivated amongst ornamental shrubs.—The BLACK SPRUCE (*Abies nigra*), of which the RED SPRUCE (sometimes called *A. rubra*) is regarded as a mere variety caused by difference of soil, and the WHITE SPRUCE (*A. alba*), form great woods in North America. The Black Spruce is found as far north as lat. 65°. Both species are now common in plantations in Britain. Both have quadrangular leaves; those of the Black Spruce are of a dark glaucous green, those of the White Spruce are of a lighter color. The cones of the Black Spruce are short, ovate-oblong, obtuse, and pendulous, with rounded scales ragged at the edge; those of the White Spruce are oval, and tapering to a point with entire scales. The Black Spruce is a valuable timber tree, supplying yards of ships, &c., but its planks are apt to split. The White Spruce is smaller, and the timber inferior. From the Black Spruce the *Essence of Spruce* is obtained, which is so useful as an antiscorbutic in long voyages, and is used for making spruce-beer. Spruce-beer is also made by adding molasses or maple sugar to a decoction of the young branchlets, and allowing the whole to ferment. From the fibres of the root of the White Spruce, macerated in water, the Canadians prepare the thread with which they sew their birch-bark canoes; and the seams are made water-tight with its resin.—From the twigs of the ORIENTAL FIR (*A. Orientalis*), a native of the Levant, a very fine clear resin exudes, which is known by the name of SAPINDUS' TEARS. This fir has very short quadrangular leaves, densely crowded, and uniformly imbricated.—The HEMLOCK SPRUCE of North America (*A. Canadensis*) forms great part of the forests of Canada and of the Northern States of America, extending northwards as far as Hudson's Bay. Its timber is not much esteemed, as it splits obliquely, and decays rapidly in the atmosphere; but the bark is valued for tanning. The leaves are two-rowed, flat, and obtuse. The cones are scarcely longer than the leaves. The young trees have a very graceful appearance, but the older ones are generally much disfigured by remaining stumps of their lower branches.—*A. dumosa* of Nepal is very much allied to the Hemlock Spruce.—*A. Douglasii* is a noble tree, attaining a height of 250 feet, which forms immense forests in the north-west of America, from lat. 43° to lat. 52°. The bark, when the tree is old, is rugged, and 6–9 inches thick. It abounds in a clear, yellow resin. The timber is heavy, firm, and valuable; the growth very rapid.—*A. Menziesii*, a native of North Carolina, very similar to the *A. Douglasii* in general appearance, also produces timber of excellent quality.—*A. Brunonian*, a Himalayan



Cone of Norway Spruce Fir:

a, branchlet and cone; b, scale, with seeds; c, a seed.

species, forms a stately blunt pyramid of 120—150 feet in height, with branches spreading like the cedar, and drooping gracefully on all sides.

It is found only at considerable elevations. The wood is not durable, but the bark is very useful.—The KHUTROW or HIMALAYAN SPRUCE (*A. Smithiana*, called also *A. Morinda* and *A. Khutrow*) much resembles the Norway Spruce, but has longer and more pendulous branches. The wood is white, and not highly esteemed, although it readily splits into planks.—The MOUNT ENOS FIR (*A. Cephalonica*), a native of Cephalonia, attaining a height of 60 feet, and a diameter of three feet, yields durable and very valuable timber.—All these species have been introduced into Britain, and some of them seem likely soon to be pretty common in our plantations, as well as others from the north-west of America and from the mountains of Asia, as *A. Wittmanniana*, &c., noble trees, and apparently quite suitable to the climate.—The common SILVER FIR (*Picea pectinata*, or *Abies* or *Pinus picea*) has erect cylindrical cones, 5—6 inches long, and two-rowed



Silver Fir (*Picea pectinata*):
Copied from Selby's *British Forest Trees*.

leaves, with two white lines upon the under side. It forms considerable woods upon the mountains of Central Europe and of the north of Asia, and attains a height of 150—180 feet, and an age of 300 years. It is not a native of Britain, but large trees are now to be seen in very many places. The wood is white, contains little resin, is very soft and light, and is employed for the ordinary purposes of coopers, turners, and joiners, and in ship and house carpentry, also for making band-boxes and for many fine purposes, especially for the sounding-boards of musical instruments. The same resinous and oily products are obtained from the Silver Fir as from the Spruce and Scotch Fir, but of superior quality. It yields the beautiful clear turpentine known as Strassburg Turpentine. Very similar to the Silver Fir, but generally of much smaller size, and indeed seldom much above thirty feet in height, is the BALM OF GILEAD FIR (*Picea* or *Abies Balsamea*), a native of North America from Virginia to Canada. The wood is of little value, but the tree yields CANADA BALSAM (q. v.).

Besides these, a number of other species of *Picea* are found in the western parts of North America and in the Himalaya, some of which are trees of great magnitude, and yielding excellent timber,

as *P. grandis*, a Californian tree of 170—200 feet in height—*P. amabilis*, a species much resembling it—*P. nobilis*, a majestic tree, which forms vast forests on the mountains of Northern California.—*P. bracteata*, a Californian species remarkable for its slender stem, which rises to a height of 120 feet, and yet is only about one foot in diameter at the base, and likewise for the manner in which the middle lobe of each bractea of its cones is produced so as to resemble a leaf—*P. Webbiana*, the HIMALAYAN SILVER FIR, which, in its native regions, fills



Cone of Silver Fir:

a, branchlet and cones; b, a scale; c, a seed.

the upper parts of mountain valleys, and crowns summits and ridges at an elevation of upwards of 10,000 feet, a tree of great

size, 35 feet in girth, and with a trunk rising 40 feet before it sends out a branch. Most of these have been introduced into Britain with good prospect of their succeeding well in our climate, and other species, as *P. Pichta*, a native of the Altai Mountains, very nearly resembling the Silver Fir, *P. Nordmanniana*, *P. Fraserii*, &c.—*P. religiosa* is a tall and elegant tree, a native of the mountains of Mexico, with slender branches, which are very much used by the Mexicans for adorning churches, and cones shorter than those of any other Silver Fir. *P. Jezoensis* is a new species introduced from Japan.

FIRBOLGS, the name given in the fabulous early history of Ireland to a tribe said to have descended from the Nemedians, who, under their leader Nemedius, landed in the island about 2260 B.C.; and after 217 years, left it, on account of the oppression to which they were subjected by pirates called the Fomarians. The emigrating Nemedians formed three bands—one went to Thrace, and from them descended the F.; a second to the north of Europe or Lochlan, from whom descended the Tuatha de Danann; and the third to Alban or Scotland, from whom sprung the Britons. The F. returned to Ireland in three tribes, one of which more especially bore the name Firbolg; the others were called Firdomnan, and Firgaillian. The three tribes, however, were under five leaders, by whom Ireland was divided into five provinces. With Slinge, the first Firbolg king, who began to reign 1934 B.C., and reigned only one year, the Irish historians begin their account of the Irish monarchy and list of kings. The F. were driven out, after they had been thirty-six years in Ireland, by their kinsmen, the Tuatha de Danann, from Scotland, they having previously passed over to that country from Lochlan; and these, in their turn, were expelled or conquered by the Milesians. The most recent investigators of the early history of Ireland regard the story of the F. as having some basis of truth, but no chronological accuracy; the different tribes having long subsisted in the country together, and with varying fortunes as to temporary superiority. See IRELAND.

FIRDUSI, FIRDOWSI (TUSI), ABUL-KASIM MANSUR, the greatest epic poet of Persia, was born between 304—328 H., or 916—940 A.D., at Shadab or Rizvan, near Tus in Khorassan. Whether the name Firdusi (from *firdus*, garden, paradise) was given to him because his father (Fakhreddin Ahmad was a gardener, or on account of the 'Paradise of Poetry' which he had created, is matter of controversy. All that is known of his early life is, that when a boy he was very industrious, and also that 'he loved to sit for days alone on the bank of a river.' At the age of between thirty and forty, he went to Gazneh, where Mahmud the Gaznawide, a great admirer and patron of poetry and the arts generally, then resided. Ere long, F. had an opportunity of displaying both his talent and his extraordinary knowledge of ancient Persian history and legendary lore before the sultan himself, who was so pleased with an episode (the story of Sijavush) written by him at his majesty's order, that he at once paid him a gold dirhem for each couplet, and shortly afterwards sent him a great number of fragmentary ancient chronicles and histories of Persia, that he might versify them, and thus carry out the task once attempted by Dakiki—viz., to write a poetical history of the Persian kings from the creation of the world to the end of the Sassanide dynasty (636 A.D.)—the reward to be a dirhem a line. F. spent thirty years over the work, and produced the famous *Book of Kings* (*Shah Nameh*), consisting of 60,000 double lines. Without going so far as many critics have gone, we may fairly rank it among the greatest epics of all nations: the *Iliad*, the *Mahabharata*, the *Nibelungen*. Truth and fiction, history and fairy lore, all the most gorgeous imagery of the East and its quaintest conceits, together with the homeliest and most touching descriptions of human joy and human sorrow, of valor and of love, the poet has formed into one glowing song. Though abounding—in strict adherence to its sources—in impossibilities and anachronisms (such as Alexander the Great being a Christian, Ki-Khosroo holding the Zend Avesta in his hands—some hundred and twenty years before it was brought to light—Abraham being Zerdusht, &c.), it yet contains not a little that is of real historical value, quite apart from its being the most faithful mirror of its own times. See SHAH NAMEH. But while F. was 'weaving his poetical carpet,' his enemies had not been idle. Unable to attack his genius and his honesty, they attacked his religious opinions; and the sultan, influenced by bigotry and avarice, sent the poet, instead of 60,000 dirhems of gold, so many dirhems of silver. F. was at a public bath when the messenger arrived with the money, and on discovering that it was silver, and not gold, Mahmud had sent him, he divided the amount into three portions, and gave one to the attendant at the bath, another to the messenger, and the third to a man who brought him a glass of sherbet. He then burned several thousand verses which he had written in praise of the sultan, as sequel to the *Shah Nameh*, and composed one of the bitterest satires against him, which he handed over, well sealed, to the king's favorite slave, to give it to him when he might be seized

with one of his fits of despondency, as it contained a beautiful panegyric on him.

Dreading the Sultan's rage, he fled precipitately, first to Tus; persecuted here, he next went to Bagdad, where Kadir Billah, the calif, received him with all honor. But the unrelenting anger of Mahmud followed him thither, and he removed to Tabaristan, which again he had to leave, to seek another place of refuge. After eleven years of restless wanderings, he was at last allowed to return to his native place, a broken, wretched old man. Mahmud is said to have repented his cruelty at last, and to have sent a caravan loaded with the costliest goods to F., to entreat his forgiveness, and induce him to become once more the star of his court. But while the king's messengers entered one gate of the city, F.'s bier was carried out to his last abode by the other, 1020 A.D. (411 H.). His only daughter—an only son of his had died long before him at the age of 37 years—refused the sultan's present, and certain buildings were erected instead in honor of the dead poet.

The great popularity which the *Shah Nameh* has always enjoyed in the East, is to a certain amount also the cause of the uncritical state of the texts. Every transcriber shaped and moulded certain passages, or even episodes, according to his own fancy, so that not two out of the innumerable copies are quite alike. Nor are the 60,000 couplets extant in any one instance, the utmost number, including all the most palpable interpolations, never exceeding 56,600. The first complete edition of the text, with a glossary and introduction, was published by Turner Macan (Calcutta, 1829, 4 vols.). Another edition, with a French translation, was published by Mohl (Paris, 1840, &c.). Champion published some English extracts in 1788. F. also wrote another poem, *Yusuf and Zuleikha*, which has been edited by Morley, and a *Divan*, or collection of poems. See Miss Zimmern's translation of the *Epic of Kings* (with introduction, 1882); also the works of Hammer, Wahl, Görres, Morley, Ouseley, Atkinson, &c.

FIRE. For the superstitious connected with fire, see BELTEIN, NEED-FIRE, and SUN AND FIRE WORSHIP.

FIRE, in Armorial Bearings, is used to denote those who, being ambitious of honor, perform brave actions with an ardent courage, their thoughts always aspiring as the fire tends upwards. A flame of fire is more frequently used as a charge in France and Germany than in this country; but we have fire-balls or bombs, fire-beacons, firebrands, fire-buckets, &c., in abundance.

FIRE, ORDEAL BY. See ORDEAL.

FIRE, ST. ANTHONY'S. See ERYSIPELAS.

FIRE AND SWORD. By the law of Scotland, though decree may be given in a civil action against an absent defender, no criminal sentence can be pronounced unless the accused be present. But to resist a criminal citation, is to rebel against the law of the land, and in former times might be treated as treason. In this view, letters of *fire and sword* were occasionally issued by the privy council (Stair, iv. 89). These letters were directed to the sheriff of the county, authorizing him to call in the assistance of the country, and to proceed to the extremities which the terrible words fire and sword indicate, should such proceedings be necessary for apprehending the accused party.

Lord Stair describes this remedy as the 'last legal execution, warranting all manner of force of arms that is competent in war.' The same course might be resorted to where the decree of a court was resisted; and the object with which letters of fire and sword were more frequently issued than any other, was to enable the sheriff to dislodge refractory tenants who retained possession contrary to the order of the judge, or the diligence of the law. By the modern practice, the judge may, of course, always call in the aid of the military to apprehend an accused party, or to enforce a decree where the ordinary means have proved unavailing.

FIRE ANNIHILATOR. An apparatus bearing this name was patented by Mr. Phillips in 1849, and attracted a good deal of public attention, as it was expected at the time that it would supersede the ordinary Fire Engine (q. v.). The object of this invention was to extinguish fires by pouring into the midst of the conflagration streams of carbonic acid, sulphurous acid, and other gases which do not support combustion. A bottle containing sulphuric acid was placed immediately over a mixture of chlorate of potash and sugar, which, again, was surrounded by a mixture of charcoal, nitre, and gypsum. On breaking the bottle, the sulphuric acid drops upon the chlorate of potash and sugar, which, as is well known to chemists, produces immediately an intense combustion of the sugar; the heat from this fires the surrounding mixture, and dense volumes of the above-mentioned gases are evolved. It is found, however, to be practically of little value in ordinary fires, where the air has free access.

FIREARMS may be defined as vessels—of whatever form—used in the propulsion of shot, shell, or bullets, to a greater or less distance, by the action of gunpowder exploded within them. They have played so great a part in the world's story, that their invention, development and science deserve careful analysis. At

a more advanced period, and obvious division of the subject into cannon, mortars, and small-arms presents itself; but in the infancy of the invention, and amid the obscurity enshrouding it, we can only seek to inquire into the origin of firearms generally.

The invention of gunpowder bears so directly upon the gradual introduction of firearms, that it will be well to consider the two discoveries concurrently. The widely prevalent notion that gunpowder was the invention of Friar Bacon, and that cannon were first used by Edward III. of England, must be at once discarded. It is certain that gunpowder differed in no conspicuous degree from the *Greek fire* of the Byzantine emperors, nor from the *terrestrial thunder* of China and India, where it had been known for many centuries before the chivalry of Europe began to fall beneath its levelling power.

'Nitre,' says Sir George Staunton, 'is the natural and daily produce of China and India; and there, accordingly, the knowledge of gunpowder seems to be coeval with that of the most distant historic events.' The earlier Arab historians call saltpeter 'Chinese snow' and 'Chinese salt;' and the most ancient records of China itself show that, when they were written, fireworks were well known, several hundred years before the Christian era.

From these and other circumstances, it is indubitable that gunpowder was used by the Chinese as an explosive compound in pre-historic times; when they first discovered or applied its power as a propellant, is less easily determined. There is an account of a bamboo tube being used, from which the 'impetuous dart' was hurled a distance of 100 feet: this was at a very early period, but it is difficult to say precisely when. It is, alleged however, that in the century before the Christian era a cannon was employed, bearing the inscription: 'I hurl death to the traitor, and extermination to the rebel.' This must almost necessarily have been of metal. We have also curious evidence in regard to the armament of the Great Wall; for Captain Parish, who accompanied Lord Macartney's mission, reported that 'the soles of the embrasures were pierced with small holes, similar to those used in Europe for the reception of the swivels of wall-pieces. The holes appear to be part of the original construction of the wall, and it seems difficult to assign to them any other purpose than that of resistance to the recoil of firearms.' This surmise seemed to carry back the use of gingsals to 200 B.C.; but it is now known that great part of the wall dates from the 15th c. A.D. Stone mortars, throwing missiles of 12 lb. to a distance of 300 paces, are particularly mentioned as having been employed in 757 A.D. by Thang's army; and in 1232 A.D. it is incontestible that the Chinese besieged in Caifongfou used cannon against their Mongol enemies. Thus, the Chinese must be allowed to have established their claim to an early practical knowledge of gunpowder.

It has been asserted on doubtful grounds, that the principles of firearms reached Europe from India, and India has equal claims with China to the first acquaintance with the art. The ancient Sanscrit writings appear to point very plainly to the operation of some primitive sort of cannon, when, in recording the wars of the Egyptian Hercules in India, it is stated that the sages remained unconcerned spectators of the attack on their stronghold, till an assault was attempted, when they repulsed it with whirlwinds and thunders, hurling destruction on the invaders; and a Greek historian of Alexander's campaign testifies that the Hindus had the means of discharging flames and missiles on their enemies from a distance.

These Indian philosophers seem, from the writings of Ctesias and Ælian, to have also possessed an unquenchable fire similar to that employed later by the Greeks. Passing from these very early times, in which there is reason to believe that some sort of great gun was employed, we come to the comparatively recent date, 1200 A.D., when their use is established beyond a doubt, for Chased, the Hindu bard, writes (in stanza 257) that the culivers and cannons made a loud report when they were fired off, and that the noise of the ball was heard at the distance of about ten coss, which is more than three-quarters of a mile. In 1258, the vizir of the king of Delhi went forth to meet the ambassador of Hulaku, the grandson of Genghis Khan, with 3000 carriages of fireworks (in the sense of weapons, probably a sort of rude muskets). In 1365, 300 gun-carriages were captured by Muhammed Shah Bahmani.

The use of cannon had so far advanced in India by 1482, that they were even used for naval purposes; shells having been employed two years earlier by the sovereign of Guzerat. In 1500, the Portuguese had matchlockmen to contend with, as well as heavy ordnance. Pigafetta, in 1511, found the town of Borneo defended by 62 pieces of cannon mounted on the walls. So much for the antiquity, and apparently common use of firearms in China and India, at times long antecedent to any knowledge of them in Europe, and during the period at which they were scarcely developed in an effectual degree. Most of the pieces discovered in India, and supposed to be of early manufacture, are composed of parallel iron bars welded together, and very often they had a movable breech-piece.

The knowledge of gunpowder and firearms may be presumed to have extended in a westerly direction through the Arabs, whom we find using them possibly in 711 A.D., under the name of *manjaniks*, and certainly very early in the 14th century. The Byzantine emperor, Leo, introduced 'fire-tubes' between 890 and 911, for use in connection with Greek fire; and there can be little doubt that these were a species of cannon, probably of small bore. In Spain, both Moors and Christians used artillery as early as the 12th century.

Friar Bacon was conspicuous among his contemporaries for his general learning, and we have no evidence to show whether he discovered the ingredients of gunpowder independently of foreign aid, or whether he derived the knowledge from some ancient manuscripts; the latter, however, seems the more likely conclusion, as Sir F. Palgrave brought to light in the Bodleian Library a letter from a Spanish friar, Brother Ferrarius, who was a contemporary of Bacon, in which the materials of Greek fire are detailed, differing only in proportions, and in these but slightly, from real gunpowder. That the latter was identified of old with Greek fire, is shown by the name 'Crake,' applied to the first cannon used. This word, which still survives in 'cracker,' is pointed out by Sir F. Palgrave to be nothing more than a Norman corruption of 'Grec.' Bacon's announcement dates from 1216; but the powder of his time, as made in the West, was not really explosive, since the materials were but roughly cleared of impurities, and then mixed together on a slab; and probably little use could be made of it as a propellant until the process of granulating had been introduced by Bertholdus Schwartz in 1320. Immediately after this discovery, cannon of small size appeared in the armory of almost every state, as if their use had been known previously, although



Fig. 1.
From the Santini
Manuscripts.

no practical effect had been given to the knowledge, on account of the badness of the powder manufactured. These cannon generally consisted of a smaller barrel or chamber to receive the charge, which fitted into a larger one containing the projectile (see fig. 1). It may be safely assumed that these weapons, if terrifying from their noise, were tolerably harmless—at least to the enemy—in their practice. In 1326, the Florentine republic ordered the making of iron shot and cannon for the defence of its villages. In 1327, Edward III. used 'crakeys of war' against the Scotch; in 1339, ten cannons were employed in the siege of Cambrai.

By 1346, various improvements had been made; and we find in the same year the consuls of Bruges witnessing experiments by one Peter, a tinman who had constructed a cannon with a square bore, to throw a cubical shot of about eleven pounds; his bolt passed both walls of the town, and unfortunately killed a man on the other side. We have the authority of Villani for believing that Edward III. had three cannon at Crécy; but the cannon then made were, from the little knowledge of casting, limited to about the size of modern duck-guns, and, as has been remarked, three very inferior muskets could have had but little to do with putting 50,000 men to flight.

Up to this time, European ordnance had been kept back by the rarity and high prices of sulphur, saltpetre, and iron, the last having been so scarce in England, that it was thought necessary to forbid its exportation by a statute of 28 Edw. III. Still, crude as was their form, and small their number, firearms had established a firm footing in Christendom; their mission of civilization, and, paradoxical as it may appear, of humanity, had begun. With the first killing discharge, the doom of feudalism had gone forth. Plated armor no longer availed against the weapon of the peasant; and the mailed chivalry, the sinews of previous battles, who had trampled with their iron heels upon popular rights, no longer could carry all before them, but, like other soldiers, were now as loath to be slain by unseen foes as the veriest villain in the host. The people discovered their powers of contending with the noblesse; by degrees, they rose for liberty, and suppressed the tyrannies of the petty lords who had long held them as mere bondsmen. In war, again, as artillery became more general, so the slaughter of battles diminished, for an army out-manœuvred was an army at the enemy's mercy, and therefore beaten; whereas, previously in the hand-to-hand-fights where victors and vanquished mixed pell-mell in single combat, a victory could only be really won when there were no foes left to slay. A battle as great as that at Crécy might now be gained with a loss to the vanquished of not more than 1000 men, instead of the 30,000 who are said to have fallen victims to the English sword or bow.

Dating from the reign of Edward III., the employment of cannon and bombards in siege operations became more or less general. Froissart records that the Black Prince took bombards, cannon, and Greek fire to the reduction of the castle of Romo-zantin in 1356, but it does not appear that he availed himself of firearms at the battle of Poitiers in the same year. The bombards seem to have been short, capacious vessels, from which stone balls were shot with small charges to a short distance, and

at considerable elevation; they were essentially the parents of the present bombs or mortars (see fig. 2). The cannon (*canna*, a reed), on the other hand, were, for some time at least, of extremely small bore, scarcely larger than muskets of the 18th c.; they discharged leaden bullets, and would have probably been used as hand-weapons, but for their cumbrous and heavy workmanship, which necessitated small carriages.

Arms of this description are doubtless those referred to as hav-

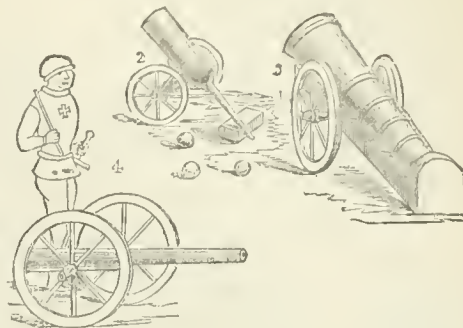


Fig. 2, from the *Chroniques de St. Denis*, Fourteenth Century. Fig. 3, Bombard of the Fifteenth Century, from Froissart. Fig. 4, Cannon of the Fifteenth Century, from *Les Vigiles de Charles VII.*

ing been brought by Richard II. to the siege of St. Malo, to the number of 400 pieces, where they are said to have kept up an incessant fire day and night on the town *without success*.

In the 15th c., armies for siege operations were usually accompanied by great and small guns, the latter being intended to keep down the fire of the besieged while the large bombards were being loaded, an operation requiring no small time. These guns were gradually improved, but it was not until the reign of Henry VIII. that the founders succeeded in casting iron ordnance, to the entire exclusion, until quite the present day, of cannon formed of square or rounded bars welded together. England had even then become famous for the workmanship of its ordnance. The accompanying sketch (fig. 5) of a gun found in the wreck of the *Mary Rose*, which sunk at Spithead in the above king's reign, will show that a degree of excellence had been attained in the manufacture of artillery, little inferior to that which has lasted till our own day, when rifled ordnance are rapidly superseding cannon of smooth bores. Still, so late as Henry's reign, although great guns were found very serviceable in siege and naval operations, where the defences of those days offered but a trifling resistance to their power, they appear to have been looked upon rather as an encumbrance than an advantage with armies in the field. This is attributed partly to the heavy character of the guns themselves, and especially of their carriages, but more particularly to the badness, or rather absence, of the necessary roads for their transport. In 1522, it is recorded in the state papers that the 'kings ordonans [were] unable to pass over Stanes More towards Carlisle.'

As time passed on, the details of the manufacture were improved, the general principles remaining the same; the size of the guns increased, while the proportionate weight of the carriages diminished; limbers (q. v.) were added, and the equipage of a gun gradually perfected and lightened. With increased calibre, to which augmented range was usually added, the number of cannon—at one period enormous—taken with an army was by degrees reduced, until now a certain standard proportion between artillery and infantry is ordinarily maintained.

Three guns to a thousand infantry is the proportion now considered best. Of course, this proportion differs with the opinions of various commanders; but the greatest modern generals have always acted on the maxim, that it is wasteful to send a soldier on any duty of danger which a ball can be made to perform. As a weapon of offence, Vauban doubled the utility of heavy ordnance when he applied the Ricochet (q. v.) system of firing. Napoleon may almost be said to have won his battles by artillery, for he rarely if ever brought his infantry into action except as supports, until a way had been opened for them, or a panic caused, by the massed fire of large batteries of guns. The Duke of Wellington also devoted the greatest attention to his ordnance-train; while, referring to recent events, the campaigns of Lord Clyde in India were remarkable instances of the use of artillery being pushed with abundant success to its greatest limit. During the Franco-German War of 1870—1871, the Prussians made good use of their numerous breech-loading artillery.

Cannon of widely varying bores have at different times been cast, and the various sorts became so numerous in continental armies, as at one time to cause much inconvenience from the large quantities of ammunition which it was necessary to carry. Gustavus Adolphus set the example of reducing his guns to a few standard calibres, and this example was soon followed systemat-

ically by the French and other armies. The introduction of rifled guns of late years has limited the classes in use in the British army to the following: *Muzzle-loaders*—17-inch, 100 tons; 16-inch, 80 tons; 12·5-inch, 38 tons; 12-inch, 35 tons; 13·5-inch, 23 tons; 12-inch, 25 tons ('Woolwich Infants'); 11-inch, 25 tons;



Fig. 5.

10-inch, 18 tons; 9-inch, 12 tons; 8-inch, 9 tons; 7-inch, 7 tons. 6½ tons, and 90 cwt.; 80-pounder of 5 tons; 64-pounder; 40-pounder; 25-pounder; 16-pounder; 9-pounder; 7-pounder (steel) mountain-gun. *Breech-loaders*—7-inch, 64-pounder, 40-pounder, 20-pounder, 12-pounder, 9-pounder, 6-pounder. See CANNON, CARRONADES, GUNNERY, HOWITZER.

The mortar differs from all other guns in its solidity of form, its shortness, and its large bore. The object is the projection of



Fig. 6.

From Leonardo da Vinci.

shells by a more or less vertical fire, with the intention of breaking through and destroying, by weight and explosion together, roofs of magazines, public buildings, and so on, or of sinking a shell deep into earthworks of a fortress, in which it shall explode as a most deadly mine. The different sorts of mortar will be described under MORTAR. The mortar arose naturally out of the old bombard, and doubtless deviated by degrees more and more from

the cannon. Fig. 6 shows a bombard or mortar designed in the 15th century. In very early days, we read in Arabian authors of a cylinder hewn in the rock at Alexandria, and used as a mortar. Such a cylinder, and of large size, is still to be seen at Gibraltar, where it was employed in the last siege against the Spanish, when it was made to discharge volleys of large stones, which spreading at times to a distance of 500 yards, constituted a formidable means of defence. In recent years, nearly all guns fire shells, so that the specific necessity for mortars has greatly diminished.

A gun is a frustrum of a right cone, with a cylinder (bore) removed around the axis; from which it follows that the thickness of metal is greatest at the breech, where it has to withstand the effect of ignited powder in its most condensed, and therefore most powerful state. Guns are first cast in loam or dry sand, then turned to the required shape, and lastly bored with the minutest accuracy. Formerly, they were cast with the bore already formed; but the direction was rarely exactly correct, and the surface scarcely ever strictly even. See GUN-FACTORIES, ROYAL; and the science of artillery will be summarized under GUNNERY. See also ARMSTRONG, LANCASTER GUN, KRUPP'S STEEL.

An article on firearms would be incomplete without some allusion to the progress made in small arms. In the 15th c., the smallest sort of cannon were probably at times mounted and used as hand-guns. From this the step to the arquebus was rapid; that weapon developed as years passed into the clumsy matchlock; that into the firelock and flint-musket; then the percussion-musket; and lastly into the beautiful rifles of our own day, which have culminated in the central-fire breech-loaders. For diminutives, small arquebuses were made to do duty as horse-pistols; genuine pistols succeeded them; these were gradually improved and reduced in size, till they have culminated in the saloon pistol, available for a waistcoat-pocket, and the deadly revolver. See the several heads ARQUEBUS, MATCHLOCK, MUSKET, PISTOL, REVOLVER, RIFLED ARMS, BREECHLOADING ARMS; also LOCK.

Many valuable works have been written on firearms from the days of Leonardo da Vinci and Tartaglia to the present. See Louis Napoleon's *Etudes sur le Passé et l'Avenir de l'Artillerie*; Jervis, *Our Engines of War*; Straith, *Treatise on Artillery*; Chesney *On Firearms*; Greener, *The Gun and its Development* (1880); and the works of Reinaud and Favé.

FIREARMS, PROVING OF (in Law). In consequence of the frequency of accidents from the bursting of insufficient barrels, the legislature had made it imperative that all barrels made or imported should be regularly proved in a public proof-house. A Royal Charter granted in 1637 to the London Gunmakers, gave them powers to search for and prove and mark all manner of hand-guns, great and small daggs, and pistols. The several statutes of 1813, 1819, and 1855 rendering the proving of firearms compulsory, have been superseded by 'The Gun-barrel Proof Act, 1868' (31 and 32 Vict.), regulating the duties and powers of the proof-houses in London and Birmingham (the only two in England). By this statute the forging or counterfeiting of the proof-marks or stamps is treated as a misdemeanor punishable by

imprisonment for not more than two years; and a fine of £20 is imposed on any person selling or exposing for sale barrels not duly proved, or exporting or importing barrels with forged proof-marks. These penalties are to be levied on conviction before two justices or a metropolitan or stipendiary magistrate. The statute does not extend to Scotland or to Ireland, and arms manufactured for Her Majesty are exempted from its operation.

FIREBALLS are projectiles occasionally discharged from guns or mortars, for the purpose either of setting fire to, or of merely illuminating some work, against which hostile operations are directed. The usual ingredients are—mealed powder, 2; saltpetre, 1½; sulphur, 1; rosin, 1; turpentine, 2½; with pitch, tow, naphtha, &c., as circumstances dictate. The use of fireballs, has, however, been in great measure superseded by the introduction of rockets (q. v.), and incendiary shells (q. v.). Akin to the fireball, was the *fire-arrow* of ancient warfare, which consisted of tow steeped in pitch, rosin, or some inflammable mixture, wrapped round the shaft, and fired alight among an enemy's works or troops. Greek fire was also discharged in many cases on large arrows surrounded by tow and shot from *balistæ*.

FIREBOTE, the right of a tenant for life or years, according to English law, to cut wood on the estate for the purpose of fuel. See ESTOVER.

FIREBRICK. See BRICK.

FIRECLAY is the variety of clay which is employed in the construction of gas-retorts, glass pots, firebricks, crucibles, &c., which require to withstand high temperatures. It is found chiefly in the coal measures; and the more famous kind is the Stonebridge, which is found in a bed about four feet thick. It also occurs largely near Glasgow, Newcastle-on-Tyne, and in Belgium and France. The principal constituents of fireclay are silica and alumina, accompanied by small proportions of iron, lime, magnesia, water, and organic matter, as may be observed from the following table:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silica.....	64·10	54·10	48·55	69·25	83·29
Alumina.....	23·15	31·35	30·25	17·90	8·10
Oxide of Iron...	1·85	4·63	4·06	2·97	
Lime.....		1·46	1·66		1·88
Magnesia.....	0·95	1·54	1·91	1·30	
Organic Matter } and Water, }	10·00	10·47	10·67	7·50	3·64

Fireclay is found abundantly, near and at the surface of the ground, and is readily reduced to powder by traveling wheels. When kneaded with water, and fashioned into vessels and other articles, it is dried, and is then generally subjected to a strong heat, which drives off the water and organic matter, causes the silica to unite more firmly with the alumina, &c., and leaves a more porous material, which can withstand very high temperatures. The Passau crucibles are merely dried, and are not fired like Hessian crucibles and other fireclay wares. The larger the percentage of silica (sand) in the clay, the more refractory are the articles fashioned from it; and hence sand is often added to clay to increase its fusing-point and refractory powers; but a certain proportion of alumina, &c., is required to serve as a flux, to cement and hold together the particles of sand. The proportions of sand and clay are determined by the temperature to which the manufactured article is intended to be exposed; and the fireclay of crucibles or bricks, which are serviceable at a comparatively low temperature, as in the lining of limekilns, would become soft, and yield in glass or porcelain furnaces.

FIREDAMP is the miners' term applied to light carburetted hydrogen or coal-gas when it issues from crevices in coal-mines. See GAS.

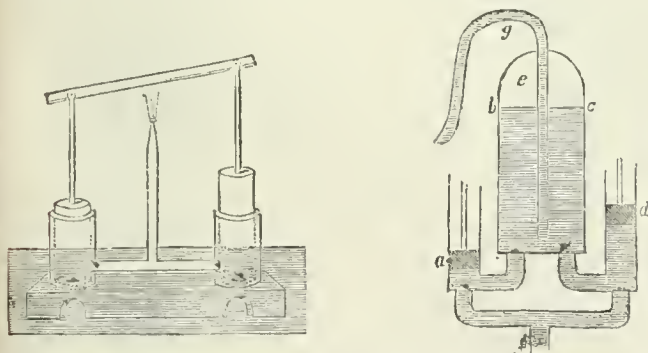
FIRE-EATING, a name usually given to a variety of feats, performed by jugglers with flaming substances, melted lead, red-hot metal, &c. Evelyn, writing under date October 8, 1672, thus describes fire-eating in his day: 'I took leave of my Lady Sunderland. She made me stay dinner at Leicester House, and afterwards sent for Richardson, the famous fire-eater. He devoured brimstone on glowing coals before us, chewing and swallowing them; he melted a beer-glass, and eat it quite up: then taking a live coal on his tongue, he put on it a raw oyster; the coal was blown on with bellows till it flamed and sparkled in his mouth, and so remained till the oyster gaped, and was quite broiled; then he melted pitch and wax with sulphur, which he drank down as it flamed; I saw it flaming in his mouth a good while; he also took up a thick piece of iron, such as laundresses use to put in their smoothing-boxes, when it was fiery hot, held it between his teeth, then in his hand, and threw it about like a stone; then he stood on a small pot, and bending his body, took a glowing iron with his mouth from between his feet, without touching the pot

or ground with his hands; with divers other prodigious feats.' About 1818, Signora Josephine Girardelli, who described herself as the 'original Salamander,' performed astonishing feats of this kind in London and other places in England. According to the accounts of her, 'She commences her performances by passing plates of red-hot iron over her legs; she then stands with her feet naked on a plate of red-hot iron, and afterwards draws the same plate over her hair and across her tongue,' &c. About the same time appeared in Paris M. Chaubert, whose astonishing powers of resisting heat, attracted the attention of the National Institute. Among other things performed by this person, was his going into a common baker's oven with a leg of mutton in his hands, and remaining with the oven closed until the mutton was completely dressed. Another of his performances was standing in a flaming tar-barrel until the whole of it was consumed around him. He subsequently exhibited in London.

Many of the feats of this kind are undoubtedly mere tricks, or illusions, produced by sleight of hand; others are capable of scientific explanation. There is nothing more wonderful in stuffing blazing tow into the mouth—a common form of mountebank fire-eating—than in eating flaming plum-pudding, or in dipping the finger into spirits and letting it burn like a candle. It is also well known that the tongue, or the hand dipped in water, may be rubbed with impunity against a white-hot bar of iron; the layer of vapor developed between the hot metal and the skin prevents contact and produces coolness (see SPHEROIDAL CONDITION OF LIQUIDS). Such performances as those of M. Chaubert are explained by the well-known power of the living body to maintain its normal temperature, for a time, independently of the external temperature (see ANIMAL HEAT).

FIRE-ENGINE, a machine employed for throwing a jet of water for the purpose of extinguishing fires. This name was formerly applied to the steam-engine. Machines for the extinguishing of fires have been used from a very early date. They were employed by the Romans, and are referred to by Pliny; but he gives no account of their construction. Apollodorus, architect to the Emperor Trajan, speaks of leather bags, with pipes attached, from which water was projected by squeezing the bags. Hero of Alexandria, in his *Treatise on Pneumatics*—written probably about 150 years before the Christian era—proposition 27, describes a machine which he calls 'the siphons used in conflagrations.' It consisted of two cylinders and pistons connected by a reciprocating beam, which raises and lowers the pistons alternately, and thus, with the aid of valves opening only towards the jet, projects the water from it, but not in a continuous stream, as the pressure ceases at each alternation of stroke.

The accompanying copy of Hero's diagram explains itself. Little or nothing is known as to the extent to which engines of this kind



were practically used. We have accounts of 'instruments for fires,' and 'water syringes useful for fires,' in the building accounts of the city of Augsburg, 1518; and in 1657, Caspar Schott describes a fire-engine used in Nuremberg, which must have been almost identical in construction with that described by Hero. It had a water-cistern, was drawn by two horses, was worked by 28 men, and threw a jet of water, an inch in diameter, to a height of 80 feet. It was not until late in the 17th c. that the air-chamber and hose were added; the first being mentioned by Perrault in 1684, and the hose and suction-pipe being invented by Van der Heide in 1670. In England, hand-squirts were used up to the close of the 16th century. They were of brass, and contained three or four quarts of water. Two men held the handles at the sides, while a third forced up the piston. The nozzle was dipped in a vessel of water after each discharge, then raised, and the water again forced out. So clumsy an apparatus could have been but of little service in the fearful conflagrations to which our old wood-built towns were so subject.

With the addition of the air-chamber and hose, and some improvement in the details of construction, the 'siphons' of Hero became the modern fire-engine. The principle of the action of the

air-chamber, and of its connection with the pumps, &c., will be easily understood by the aid of the annexed diagram, where *a* represents in section a piston ascending, *d* the other piston descending, *f* the pipe or hose communicating with the water-supply, *g* the hose that conveys the issuing stream to the fire, *bc* the level of the water in the air-chamber, *e* the space above filled with compressed air. The rising piston raises the water from *f* to fill its cylinder; the descending piston forces the water contained in its cylinder into the bottom of the air-chamber, and thereby compresses the air in *e*. The pistons rise and descend alternately.

The compressed air reacts by its elasticity, and pressing upon the surface *bc*, forces the water through the hose *g*. In the space *e*, above *bc*, the whole of the air that formerly filled the chamber is supposed to be compressed. Assuming this to be one-third of its original bulk, its pressure will be about 15 lbs. to the square inch, and this pressure will be continuous and nearly steady, if the pumps act with sufficient force and rapidity to keep the water at that level. As air may be compressed to any extent—and its elasticity is increased in exactly the same proportion—the force that may be stored in the compressed air is only limited by the force put upon the pumps, and the strength of the apparatus.

Under proposition 9 of the same work, in which 'the siphons used in conflagrations' are described, Hero describes and figures the air-chamber as 'a hollow globe or other vessel, into which if any liquid be poured, it will be forced aloft spontaneously and with much violence, so as to empty the vessel, though such upward motion is contrary to nature.' The globe is represented with a single piston attached for compressing the air. Thus, about 1800 years elapsed before proposition 9 and proposition 27 of this work were put together for so obvious and useful a purpose as the fire-engine, although the book was tolerably well known to the mathematicians of the period; and when they were put together, it was probably done by a practical man, who had never heard of the name of Hero.

The more recently constructed fire-engines include contrivances for preventing the entrance of mud and gravel, and for getting readily at the valves in case of their being out of order, while the cistern is dispensed with, a hose being carried directly to the water-supply. They are usually drawn by two or four horses, though smaller engines are made to be drawn by hand or by one horse. The hose is of leather, fastened by metal rivets, instead of the sewing formerly used. In the United States, cotton is woven into a tube by machinery constructed for the purpose. Two such tubes are fitted one within the other, and held together by a solution of India-rubber, which, on consolidating, forms a water-tight layer.

The fire-engines of the London Fire Brigade establishment have usually 6-inch barrels with 7-inch stroke, and throw about 70 gallons of water per minute. Their weight, with implements, firemen, and driver, is about 30 cwt. These are found more convenient for general purposes than larger engines, as they can be drawn at a gallop by two horses for a distance under six miles. Four horses are used for greater distances. When a large engine is required, two of these may be joined together, and throw 180 gallons per minute. The pumps are worked by levers, with long horizontal bars attached, to enable a number of men to work together upon the same pumps. Many larger engines than these have been constructed, and steam has been successfully applied. The first application of the steam fire-engine was made when the Argyle Rooms in London were burned in 1830. Several floating fire-engines for conflagrations near the Thames have been constructed and worked by steam; one of these is capable of throwing 1400 gallons per minute.

A floating engine was used with considerable effect when the Houses of Parliament were burned; but at the fire of the warehouses near London Bridge (1861), the fury of the combustion, when at its maximum height, was so great, that the combined efforts of all the London engines, whether worked by steam or by hand, had no perceptible effect in subduing it. For all ordinary fires, the hand-engines above referred to are the most useful, as they can be brought to the spot and set in action immediately. Nevertheless, so greatly have the steam fire-engines been recently improved, that steam of 100 lb. pressure on the square inch can be raised in seven minutes after making the fire.

It has been questioned whether, in cases of very intense combustion, a comparatively small stream of water has any subduing effect at all—some assert that it may even increase the conflagration. Various chemical liquids have been proposed as flame-extinguishers; but plain water is still the only power used to any extent.

FIRE-BRIGADES.—For working fire-engines, a body of *firemen* are required. The fire insurance companies formerly had separate establishments of fire-engines and firemen; but in 1825 some of them united, and by 1833 all the important companies combined, and the London Fire-brigade was formed, under the management of the late Mr. Braidwood, whose death in the discharge of his duties at the great fire just referred to was justly deplored.

throughout the country as a national loss. In 1865, an act of parliament empowered the Metropolitan Board of Works to purchase the engines and appliances of the London Fire-brigade establishment; to secure the services of the brigade men; to construct additional engines and stations; to map out the metropolis into convenient districts; and to cause the firemen to act in harmony with a salvage corps and a fire-escape corps. The engines now used are very powerful; the manual engines are for 22, 26, 30, 38, and 46 men each; while the steam fire-engines, especially those constructed by Messrs. Shand and Mason, on a principle patented in 1870, will throw a jet to a vertical height of 180 feet, or drive water through half a mile of pipe horizontally. At a fire in the East India Docks in 1866, the steam fire-engines poured in the enormous quantity of 3,000,000 gallons. At the great fire in London, in June 1873—that of the Alexandra Palace—a powerful force of engines was present, but there was insufficient water to render them effective. The establishment comprises about 550 firemen, 60 stations, 115 manual engines, and 40 steam-engines (3 of them floating). As the Metropolitan Board in London pay a fee to the first person who gives notice of a fire at the engine station, there is always a supply of volunteers from among cabmen and people in the streets, besides policemen, to perform this important service; and in like manner the pump-bars of the fire-engines are always fully manned. The men of the brigade wear a uniform, with strong helmets and metal epaulets, to protect them from the blows of falling beams, &c. The courage and skill of the men in making their way through and about burning buildings, for the purposes of directing the stream from the hose, or for saving life and property, and the general efficiency of the whole organization, are worthy of the highest praise. The water-supply in London is not so well managed as the engine-supply, thereby frustrating the exertions of the firemen.

Most of our provincial towns now have a fire brigade upon the same model as that of London. The fact that Paris has several times as many firemen as London, is a tolerable proof of the amount of work the London firemen are called upon to perform. At Paris, as on the continent generally, the fire-engines and firemen are under government control; and the *sapeurs pompiers*, or firemen, are empowered to enforce the assistance of any people they can find in the streets.

In many continental towns, fire-watchmen are stationed in commanding situations, such as church-towers; and their duty is to ring a fire-bell, or otherwise give the alarm, immediately upon observing a conflagration. The fire-companies of the United States are composed of volunteer firemen, who receive no pay, but certain immunities from taxation and militia service. Their annual parade-day is quite a fete. Each company has a special uniform; and in some cities the rivalry among them is so great, that they frequently have desperate fights for the best 'location' for their engines. Prizes are awarded to those whose engines throw a jet of water to the greatest height. An admirable system of electro-telegraphy has been adopted, to give notice from station to station in the event of fire. Nevertheless, American conflagrations are often frightfully destructive: witness those at Chicago in 1871, and at Boston in 1872 and 1873.

In Constantinople, there are two fire-towers, one on each side of the Golden Horn, with watchmen continually stationed there. A large wicker-ball is hauled up to the side of the tower as a signal, and the cry of 'There is a fire at Scutari, Tophané,' or whatever be the quarter of the city in which it occurs, is raised and taken up by the patrol, who strike the pavement with their iron-bound staves as they repeat the cry. In a few minutes, the alarm is thus spread throughout the whole city.

FIRE-ESCAPES. An immense number of contrivances have been at different times proposed for enabling people to escape by windows and house-tops from burning buildings. They are of two distinct kinds—one for affording aid from outside, and the other for enabling those within the house to effect their own escape. Of the latter, the simplest is a cord that should be firmly attached to the window-sill of every sleeping-apartment, and coiled up either in a box on the floor, or under a dressing-table, or other suitable place. A rope one-quarter or three-eighths of an inch thick, and knotted at intervals of about a foot, is well adapted for the purpose. A good quarter-inch sash-cord will support from three to four cwt. or more if new, and will cost from 6d. to 2s., according to the height of the room. A man with tolerable nerve may let himself down by means of such a cord, either by placing his feet against the wall and bringing 'hand over hand' down upon the knots, or by clinging with his feet and knees to the rope as well as with his hands. A man may let down a woman or child by means of a sack at the end of the rope, or simply by fastening them to the end, and letting the rope pass through his hands, aided if necessary by the friction of the window-sill, if it be allowed to bend over it. A rope coiled upon a drum inside a dressing-table, with a winch-handle to uncoil it, is another form. A pulley fixed to the window-sill, over which

runs a rope with a chair or simple board to sit on, is a well-known contrivance.

Some means of escape from every sleeping-room should be provided, and the inmates should be thoroughly prepared by knowing beforehand how to act in case of a fire cutting off communication with the usual means of outlet. In a row of houses with projecting balconies, a board of sufficient length to reach from the balcony of one house to the next may be kept in each room, or even a rope might be thrown across with the aid of a stone or lump of coal, &c., tied to one end. An exit by the roof or from the window on to the parapet affords a ready means of escape from a top-story, and should always be provided in tall houses. In case of emergency, when no provision has been made, the cord holding the sacking of the bedstead may be undone, or the bed-clothes and curtains tied together to form a rope; or, as a last resource, the bedding may be thrown out of window to form a cushion to alight upon in case of the cord or bedclothes being too short to reach the ground; or if there be no time to extemporize such cordage, and it should be necessary to drop directly from the window, in this case, it would be better to hang by the hands from the window-sill and then drop, than to jump direct, as the height of the fall would be somewhat diminished thereby. In all such cases, presence of mind and coolness is of the utmost importance, and may render very simple and slender means of escape more effectual than the most complete and elaborate would be without these qualities; and presence of mind may be to a great extent acquired chiefly by being mentally prepared, and, if possible, by rehearsals of what should be done in case of danger.

Fire-escapes, to be used from without, consist either of simple ladders kept in churches, police-offices, or other convenient stations, or a series of ladders that can be jointed together; of poles with baskets attached; of ropes with weights at one end, that they may be thrown or shot into windows; of combinations of ladders, ropes, bags, baskets, nets, &c. The fire-escape now generally adopted by the Society for the Protection of Life from Fire is a light carriage or framework on wheels, to which a series of ladders, &c., are attached. It is thus described by the society: 'The main ladder reaches from 30 to 35 feet, and can instantly be applied to most second-floor windows by means of the carriage-lever.' This projects on the opposite side to the ladder like the shafts of an ordinary carriage, and works upon the axle of the wheels as a fulcrum. 'The upper ladder folds over the main ladder, and is raised into position by a rope attached to its lever-irons on either side of the main ladder; or, as recently adopted in one or two of the escapes, by an arrangement of pulleys in lieu of the lever-irons. The short ladder for first floors fits in under the carriage, and is of the greatest service. Under the whole length of the main ladder is a canvas trough or bagging made of stout sail-cloth, protected by an outer trough of copper-wire net, leaving sufficient room between for the yielding of the canvas in a person's descent. The addition of the copper-wire is a great improvement, as, although not affording an entire protection against the canvas failing, it in most cases averts, and prevents the possibility of any one falling through. The soaking of the canvas in alum and other solutions is also attended to; but this, while preventing its flaming, cannot remove the risk of accident from the fire charring the canvas. The available height of these escapes is about 45 feet; but some of them carry a short supplementary ladder, which can be readily fixed at the top, and which increases the length to 50 feet.'

This society has upwards of 120 of these fire-escapes stationed in different parts of London. They stand in the roadway, and are each under the charge of a conductor during the night. Almost every house in London is within two or three minutes' run of one of these. Since 1836, when the operations of the society first commenced, they have saved thousands of lives. At one fire, nine lives were saved by one man and fire-escape. Fire-escapes of similar construction are now stationed in some of our provincial towns. When required, they are run to the burning house, the main ladder standing nearly upright all the while. It is then directed to the required window at a considerable inclination, and the attendant ascends the ladder, and helps the inmates either to descend by it, or if they are unable to do this, he lets them down by the canvas trough, which forms an inclined plane, along which they may easily and safely descend with the aid he is enabled to afford them.

FIRELOCK the name applied on its introduction, in 1690, to the old musket, which produced fire by the concussion of flint and steel, to distinguish it from the *matchlock* previously in use, which had been fired by the insertion of a lighted match at the powderpan. Writers of the earlier part of the 18th c. called firelocks 'asnaphans'; a word obviously corrupted from the Dutch *snaaphaan*, and leading to the inference that they were brought to England by William III. and his Dutch auxiliaries. Their first invention is, however, involved in obscurity. The weapon was

superseded before 1830 by the percussion musket; which, in its turn, has now yielded to the rifle (q. v.).

FIREFLY, a name common to all winged luminous insects, at least to all that possess much luminosity. Except the lantern-fly (q. v.), they are all coleopterous, and belong to two nearly allied tribes, *Lampyrides*, to which the glowworm (q. v.) also belongs, and *Elaterides*, to which belong our skipjack beetles, and of which the larvæ are too well-known to farmers as wire-worms. The male glowworm, which alone is winged, has too little luminosity ever to receive the name of F., but the fireflies of the south of Europe (*Lampyris Italica*) and of Canada (*L. cornuta*) are nearly allied to it. See **GLOWWORM**. Fireflies are



Firefly (*Lampyris Italica*).

only seen in the most southern parts of Europe. They abound in almost all the warmer parts of the world, and the brilliancy of the spectacle presented by them when glancing about in numbers amidst the darkness of night, has been often described with enthusiastic admiration. Mr. Gosse says of the Canadian F.: 'The light is of a yellow color, very different from the blue gleam of the English glowworm: from this circumstance I at first took them for candles in the woods, and though told what they were, at every one that appeared, the same idea would come across my mind. . . . They more frequently give out the light while flying, than when crawling or resting, though we may often observe the intermittent gleam as one crawls up a stalk of grass, or rests on the leaf of a tree. They fly slowly, and as they fly, emit and conceal their light with great regularity at intervals of two or three seconds; making interrupted lines of light through the air, gleaming slowly along for about a yard, then suddenly quenched, and appearing again at the same distance ahead. The insect is a pretty beetle, with soft elytra, of a light-brown color, marked with red, and handsomely striped; the light proceeds from the last three segments of the abdomen, which are of a delicate cream color by day. At night, these three segments are bright at all times; but at the regular intervals I have mentioned, they flash out with dazzling splendor. If this part be plucked off and crushed, many patches of brilliance occur for a few moments among the flesh, but they gradually die away.

He further describes these fireflies as appearing in great numbers in summer evenings, over wet and marshy ground, millions of them above a river, or over the surface of a large field, like stars on a clear winter night, but flashing and disappearing, and moving about in mazy evolutions.—But still more brilliant are the fireflies of more tropical regions, belonging to the tribe *Elaterides*, as the F. of the West Indies (*Elater noctilucus*), which gives out its light chiefly from two eye-like tubercles on the thorax. The light is so powerful, that the smallest print may be read by it; and this becomes quite easy if a few of the insects are enclosed in a small glass vessel. They are not unfrequently employed—particularly in St. Domingo—to give light for household purposes of decoration on festival-days by women, who attach them to their dresses or to their hair. One which had been accidentally brought alive to Paris, once astonished and alarmed the Faubourg St. Antoine. These insects are caught in some parts of the West Indies—a torch being used to attract them—and brought into houses to destroy mosquitoes, which they eagerly pursue and devour. See **LUMINOSITY OF ORGANIC BEINGS**.



Firefly (*Elater noctilucus*).

FIRENZUOLA, ANGELO, an author distinguished for the Attic choiceness of his language, was born at Florence in 1493. Having completed at Perugia the studies which he commenced in Florence, he proceeded to Rome in anticipation of a brilliant legal career, but shortly abandoned the eternal city, disappointed in hope and shattered in health. It seems well authenticated, that he finally enrolled himself among the monkish brotherhood of Vallombrosa, and rose to considerable influence, in spite of the extreme license of morals, and licentiousness of writing for which he was noted. The date of his death is doubtful, but it is generally placed between 1542 and 1544. His chief works are a spirited paraphrase of the *Golden Ass of Apuleius*—in which he is generally considered by his countrymen to have far excelled the original in nerve and beauty of language; *I Discorsi degli Animala*—containing some sound lessons of just legislation to the ruling powers, the censure being skillfully veiled by means of his animal orators; *I Ragionamenti*, a work in close imitation of the *Decameron* both as regards the impurity of sentiment, and classic purity of language; *Il Trattato della bellezza delle donne*, an eulogistic discussion concerning the charms of the gentle sex, to whom he was inordinately

devoted. His works were published in Florence after his death. The best edition is that of Florence (1763, 3 vols.).

FIRE-POLICY. See **INSURANCE**.

FIRE-PROOF BUILDINGS. The problem of constructing warehouses, dwelling-houses, &c., that shall be proof against all risk of conflagration, has not yet been solved. The liability to conflagration may be greatly diminished by the construction of a building, but cannot be entirely averted; and therefore, in all 'fire-proof' buildings containing furniture or other combustible materials of any kind, the ordinary precautions against fire should be strictly observed. It is well to state this at the outset, as, unless it be understood, a so-called fire-proof building may be more dangerous than an ordinary one, especially in warehouses, &c., intrusted to the care of watchmen and others, who, relying upon the supposed immunity the name expresses, are liable to neglect many precautions they would not fail to observe in a building believed to be dangerous. The most destructive fire that has occurred in London since 1666 was that at Cotton's Wharf, in 1861, the warehouses of which were what is called 'fire-proof.' The great fury of this conflagration depended on the nature of the goods that were stored. It is scarcely possible to believe that such combustibles as tallow, turpentine, &c., could have been stored in the vicinity of saltpetre, unless there had existed some faith in their practical isolation from each other by the fire-proof divisions of the building, as it is so well understood that saltpetre, though incombustible of itself, intensifies to an immense extent the combustibility of all combustibles, by supplying them with undiluted oxygen when heated in contact or within a moderate distance of them.

The nearest approximation to fire-proof construction may be obtained as follows: the walls should be stone or of brick, and any ties, lintels, &c., required in the construction should be of iron. The staircases should be of iron or stone, and the floors or landings of tiles, concrete, or stone. Wherever wood is inevitably used, it should be prepared with silicate of soda (see **FIRE-PROOFING**). Instead of wooden joists to support the floors of each story, arched stone or brickwork should be used, and this should be put together with sufficient care to be independent of the mortar. The roof should be constructed in like manner, wooden rafters being entirely excluded. The doors should be of iron, and the security would be much increased if the doors between any two apartments containing combustible materials were double, with a space between them equal to the thickness of the walls. Of course, it is not practicable to carry out all these precautions in a dwelling-house, but the danger from fire may be considerably diminished by attending to some of them. Wooden staircases are especially dangerous. The most important conditions for a warehouse are, that each apartment shall be separated from the next by stout walls of non-conducting materials, and more especially, that each shall be as nearly as possible air-tight; and whenever, from the nature of the goods, ventilation is required, it should be obtained by periodically opening the doors and windows. If this latter condition is fulfilled, any fire would extinguish itself, unless there be along with the combustible goods some oxygen-giving substance, such as saltpetre, chlorate of potass, or other nitrates or chlorates.

At first sight, it may appear that a warehouse built entirely of iron, would be effectually fire-proof, but this is far from being the case. In the first place, iron conducts heat more readily than any other material used in building; secondly, cast-iron is liable to crack and split when suddenly heated or cooled. Iron supports may, under some circumstances, be even more objectionable than wood, for if the water from a fire-engine were to play upon a heated cast-iron girder, it would probably give way immediately, while a stout wooden beam might be extinguished before being burned through. When buildings supported by iron girders are burning, they are far more dangerous to firemen than those with wood, as the experienced fireman can form a pretty accurate judgment of the time that burning wooden beams will stand, and may move about in their vicinity to direct the stream of water to where it is most needed, but iron girders split and fall without visible notice. It is on this account that floors of arched masonry are recommended above. In great fires, the heat is sufficient to fuse iron.

Without going to the expense of making warehouses and manufacturing absolutely fire-proof, certain precautions not of a costly nature might be usefully adopted, for the purpose of merely checking the progress of conflagration until the arrival of fire-engines. Among these simple measures, may be included iron-doors hinged on stone between different departments; a sufficient deafening not easy destructible between the ceiling of one story and the floor of that above; and stone stairs. For rendering timber difficult of combustion, see **FIRE-PROOFING**. See also **SAFES, FIREPROOF**.

FIRE-PROOF SAFES AND REPO'SITORIES are used as receptacles for deeds, paper-money, account-books and other val-

nables. They are now regular articles of commerce, and are to be found in almost every counting-house, lawyer's office, jeweler's or watchmaker's shop or warehouse, and are indispensable to banking and such-like establishments. Our forefathers used oaken chests secured with iron straps and studs for similar purposes. That which formerly contained the crown-jewels of Scotland, and is still exhibited in Edinburgh Castle, is a good example. Subsequently, iron chests made simply of stout cast or wrought iron were used. The modern safe has double walls and doors of stout iron plates, and the space between the plates is filled with some substance that shall resist the transmission of the heat which would be readily conducted through solid iron. The materials used for these linings are very various—sand, dried-clay, charcoal, ashes, bone-dust, alum, gypsum, &c. The safes of Messrs. S. Mordan & Co., which are largely used by bankers, are lined with a mixture of equal parts of saw-dust and alum. Some makers include small vessels containing liquids, the vessels burst when heated, and the liquids exert some cooling effect. Alum acts in nearly the same manner. It contains 24 equivalents of water, or nearly half its weight.

At 212°, ten equivalents are driven off in vapor; at 248°, ten more; and at 392°, the four remaining equivalents are volatilized. It is a mistake, however, to suppose that any of these linings can render such a safe really fire-proof; and this is admitted by the more scrupulous manufacturers, who carefully abstain from using the designation of 'fire-proof,' but apply that of 'fire-resisting,' which honestly describes all that they are capable of doing, as they may resist the action of fire for a considerable time; but whether or not their contents may be ultimately preserved from a fire, is simply a question of the duration and intensity of the heat to which they are exposed. Their great weight in some cases assists in preserving them, especially when on an upper floor, as such a safe would be the first thing to break through the burning joists and descend to the lower part of the building, where the fire is usually the most smothered. These safes are sometimes let into recesses of stout masonry, built on purpose, and protected by an additional double iron door. This, of course, adds greatly to their security. All such safes should be of course secured by the best locks that can be made, protected by every possible precaution against picking, blowing up by gunpowder, or other violence. See LOCK, and SAFES, FIREPROOF.

FIRE-PROOFING. Attempts have continually been made to render cotton, linen, and other textile fabrics, timber, &c., incombustible; but at present they have been but partially successful. There are many means by which fabrics may be prevented from flaming, their combustion being reduced to a slow smouldering; and the many cases of fatal results from the extravagant dimensions of ladies' dresses (crinoline) rendered the adoption of some such protection against fire very desirable. By moistening the fabric with a solution of any saline substance, which, upon drying will leave minute crystals deposited in or between the fibres, its inflammability will be greatly diminished, but the salt imparts a degree of harshness to the fabric, and in many cases weakens the fibres. Alum, sulphate of zinc, and sulphate of soda have been used, and are effectual to prevent flaming, but they weaken the fibre. Common salt does the same. Phosphate and sulphate of ammonia are less objectionable on this account, but the former decomposes by contact with the hot iron in ironing. Tungstate of soda has been proposed, and it is said to have no injurious effect on the fibre. Sulphate of ammonia, chloride of ammonium (sal ammoniac), and borax, are among the best fitted for domestic use, though they are not unobjectionable. For made-up clothing, borax is, perhaps, the best, as it is most effectual in its action, and is the least injurious to the appearance of the article, though it is stated to have some weakening effect on the fibre; this, however, is only perceptible in case of a tearing strain, and will not perceptibly damage such articles as ladies' under-clothing, or anything else only subject to ordinary wear. Wood has been treated in a similar manner.

Milk of lime, alum, sal ammoniac, sulphate of ammonia, chloride and sulphate of zinc, sulphuret of lime and baryta, &c., have been used, and its *inflammability*, but not its *combustibility*, is destroyed. Like the fabrics, when similarly treated, wood smoulders slowly. The most efficient protection to wood is silicate of soda. If planks of moderate thickness be brushed three or four times over, on each side with a strong solution, they are rendered almost incombustible; they will only burn when very intensely heated. The silicate fuses and forms a glass which envelops the surface, and even the internal fibres of the wood, if it be sufficiently saturated, and thus seals it from the oxygen of the air.

FIRE-RAISING, in the law of Scotland, is the equivalent term for Arson (q. v.) in England. If any part of a tenement, however small, has been set fire to wilfully, this crime has been committed. It is quite indifferent where the fire has commenced, and the offence is frequently perpetrated by setting fire to furniture,

or to other objects either within or without a house; but it is not regarded as completed, and is punished as a separate crime, of which we shall speak afterwards, unless the fire has communicated itself to some part of a building. If the fire originated in carelessness, however gross, it is not wilful fire-raising, but a minor offence, punishable with fine and imprisonment. But if the intention was to injure the proprietor of a tenement by burning, not his house, but an object in its neighborhood—e. g., a haystack—and the fire was accidentally communicated to the house, the offence is the same as if the fire had been applied to the house directly. The infliction of capital punishment for the offence of fire-raising is now in desuetude. Where a man burns his own house without endangering the life of any one, he has not committed the crime of fire-raising, but he may be punished criminally, if the act was done for the purpose of defrauding the insurers. Till recently, it was the rule in Scotland, that where fire was the result of inevitable accident, it freed a carrier or innkeeper from responsibility for any goods that were destroyed in his custody, unless where fraud or collusion could be shown; but the law in this respect has been altered by the Mercantile Law Amendment Act, 19 and 20 Vict. c. 60, which provides, s. 17, that after the passing of the act (1856), 'All carriers for hire, of goods within Scotland, shall be liable to make good to the owner of such goods all losses arising from accidental fire while such goods were in the possession or custody of such carriers'—thus equalizing the law of Scotland with that of England.

Attempting to set fire to houses, crops, &c., is a distinct crime from Arson (q. v.), or the actual destruction of property by fire. By 9 and 10 Vict. c. 5, it is enacted, that if any one shall attempt to set fire to a house, &c., with such intent that the offence, if committed, would be felony, and liable to be transported for life, he may be transported for fifteen years (now penal servitude), or imprisoned for two years. The attempt to burn growing crops of corn, &c., is a felony by 7 and 8 Geo. IV. c. 30, and punishable by transportation for seven years, or by imprisonment. These offences are also misdemeanors at common law. By 24 and 25 Vict. c. 97, s. 8, the attempt to set buildings on fire is punishable by penal servitude for fourteen years, or imprisonment for two years; if a male under sixteen, to be whipped.

In Scotland, an attempt to commit wilful fire-raising is an offence at common law. It is not necessary to constitute this offence that the fire should have consumed any part of the building, &c. Furniture—as a mattress—partly consumed, a lighted peat thrust under a stack without igniting it, are sufficient to warrant a conviction. Inciting others to commit fire-raising is an indictable offence; and, in some old cases, persons have been punished for the mere threats to commit the offence, without being guilty of any overt act.

The English Act 9 and 10 Vict. c. 25, declares that whoever shall maliciously, by the explosion of gunpowder or other explosive substance, destroy or damage any dwelling-house in which there is any person at the time, is guilty of felony, and shall be subjected to transportation for life, or not less than fifteen years, or to an imprisonment not exceeding three years. Blowing up a building with intent to murder, and thereby endangering life, or casting upon any person any explosive or corrosive fluid whereby grievous bodily harm is occasioned him, and similar offences, are declared subject to the same punishment. Attempting any of these offences subjects the perpetrator to a minor punishment. The manufacturing or having in possession any explosive substance, or dangerous or noxious thing, or any machine or instrument for the purpose of committing any of the above offences, is a misdemeanor, liable to imprisonment not exceeding two years. Male offenders under eighteen years of age, convicted under the act, may be whipped.

FIRE-SHIP, a vessel, usually an old one, filled with combustibles, sent in among a hostile squadron, and there fired, in the hope of destroying some of the ships, or at least of producing great confusion. Livy mentions the use of such by the Rhodians, B.C. 190; but among the first occasions in modern times when they are known to have been employed, were by the Dutch in the Scheldt during the War of Independence in the Netherlands, and, shortly after, by the English in 1588, against the Spanish Armada. The Chinese tried them against the British fleet before Canton in 1857, but unsuccessfully. The service of navigating one of these ships into the midst of an enemy, there firing it, and then attempting to escape, is always fraught with great risk of failure and disaster.

FIREWORKS. See PYROTECHNY.

FIRE-WORSHIPERS. See GUEBRES.

FIRISHTA, MOHAMMAD KASIM HINDU SHAH, a celebrated Persian historian, born towards the end of the 16th c. (1570?), at Astrabad, on the Caspian Sea. At a very early age, he went with his father (Gholam Ali Hindu Shah) to India, where we find him, when twelve years old, at Ahmednuggur, in the Deccan, sharing the instruction which the latter gave to Prince Miran Hussein

Nizam Shah. He afterwards became captain in the body-guard of Murteza Nizam Shah; and when this king was deposed by his own son, F.'s former fellow-student—who, in his own turn, was deposed and murdered in less than a twelvemonth afterwards—F. went to Bijapore (998 H., 1589 A.D.), where Ibrahim Adil Shah II., the reigning monarch, received him with great honor. He also appears to have conferred a military rank upon him, as, soon after his arrival, F. is mentioned as taking part in an action against Jumal Khan, in which he was wounded and taken prisoner, but ere long he made his escape. His death is supposed to have taken place shortly after the year 1612. His great work is the *Tarikh-i Firishda*, or History of the Mohammedan Power in India, which he finished in 1018 H. (1609 A.D.). Twenty years were spent in its preparation, and the number of books used for, and partly embodied in it—special histories of certain periods and provinces—amounts, according to F. himself (Introduction), to thirty-five; but twenty others besides these are quoted in the course of the work. It consists—besides a preamble or introduction on the Progress of Mohammedanism in India, and a final treatise on the geography and the climate of India—of 12 divisions, treating of the kings of Ghizni and Lahore, Delhi, the Deccan, Guzerat, Malwah, Candeish, Bengal and Behar, Mooltan, Sindh, Cashmere, Malabar, and of the saints of India. Written with an impartiality, simplicity, and clearness rare in an Eastern work, this history has become a standard work on the subject, into which it was the first to enter at length. Single portions of it have been translated by Dow, Scott, Stewart, Anderson, &c.; but the whole work, edited first by J. Briggs (Bombay, 1831, fol. 2 vols.), was also translated by him (London, 1832, 8vo., 4 vols.). A fuller account of F.'s life and writings, by the same, will be found in the second volume of the Transactions of the Asiatic Society.

FIRKIN (dim. from *four*, the fourth part of a barrel), an old measure of capacity containing nine gallons (old ale and beer measure). But previous to the year 1803 it had two values, being estimated at eight gallons in old ale measure, and at nine in old beer measure. The firkin is equivalent to 9½ imperial gallons. See **GALLON**.

FIRLOT (according to Jamieson, from Ang.-Sax. *feorth* and *lot*, the fourth part), an old Scotch dry measure, of which there were four in a Boll (q. v.). Though differing in value for different substances and places, its relation to the boll remained invariable. See **PECK**.

FIRM. See **PARTNERSHIP**.

FIRMAMENT, a word in use of old to signify the vault of heaven. The term found its way into English from the Vulgate, which renders the Septuagint *Stercoma*, and the Hebrew *Rakia*, by the Latin *Firmamentum* (Gen. i. 6). *Rakia* (from the verb *raka*, to beat or strike out) signifies whatever is expanded or stretched out, and was specially employed by the Hebrews to denote the hemisphere above the earth, compared (Exod. xxiv. 10) to a splendid and pellucid sapphire. Elsewhere (Ez. i. 22-26) it is spoken of as the 'floor' on which the throne of the Most High is placed. Hence it follows that the notions of solidity and expansion were both contained in the Hebrew conception of the firmament. The blue ethereal sky was regarded as a solid crystal sphere, to which the stars were fixed (compare the *calo affixa sidera* of Pliny, ii. 39 and xviii. 57), and which was constantly revolving carrying them with it. This sphere or firmament divided 'the waters which were under the firmament from the waters which were above the firmament;' and the theory of the phenomena of rain, &c., was, that there were 'windows in heaven'—i. e., in the firmament, through which, when opened, the waters that were above the firmament descended. 'The same day were all the fountains of the great deep broken up, and the windows of heaven were opened,' Gen. vii. 11. The view entertained by the Greeks, and other early nations, was essentially the same. In the progress of astronomical observations, it was found that many of the heavenly bodies had independent motions, inconsistent with the notion of their being fixed to one sphere or firmament. Then the number of crystalline spheres were indefinitely increased, each body that was clearly independent of the rest having one assigned to it, till a complex system was introduced, capable of being fully understood only by the philosophers who formed it. See **PTOLEMAIC SYSTEM**. It was long before men formed the idea of the possibility of a body being maintained in motion in space without a fixed support, and considering the number of phenomena of which the hypothesis of a crystalline firmament offered an apparent explanation, we must regard it as having been in its day a curious and ingenious speculation.

FIRMAN, a word of Persian origin, signifies an order, and is used by the Turks to denote any official decree emanating from the Ottoman Porte. The right of signing any firman relating to affairs connected with his special department is exercised by every minister and member of the divan, but the office of placing at the

head of the firman the *thograï*—a cipher containing the name of the sultan in interlaced letters, and which alone gives effect to the decree—is committed to the hands of a special minister, who is called *nichandji-effendi*. The name applied to such decrees as have been signed by the sultan himself is *katti-sherif*. The name firman may also signify a more formal kind of Turkish passport, which can only be granted by the sultan or by a pasha.—A written permission to trade is called in India a firman.

FIRMINY, a town of France, in the dep. of Loire, six miles south-west from St. Etienne, with which it is connected by a branch railway. Near it are rich coal-mines. It is a place of much activity, and has manufactures of silk, glass, and hardwares. Ribbons and nails are among the articles of manufacture most largely produced. Much lamp-black is also made. Pop. (1876) 10,101.

FIROLA, a genus of gasteropodous molluscs, of the order *Heteropoda*, entirely destitute of shell—although there is a small brachial shell in the nearly allied genus *Carinaria*; of a very elongated form, having the mouth situated at the extremity of a proboscis; tentacula wanting, or merely rudimentary; and generally remarkable for great transparency of substance, often enlivened with golden spots. They swim by means of the foot, which is compressed into a fin, are often to be seen at the surface of the water in calm weather, and are abundant in the warmer temperate and tropical seas. The oxygenation of the blood is supposed to take place in part through the delicate tissues, as there are no special breathing organs but a ciliated band.

FIRST-BORN (Heb. *Bekor*, Gr. *prototokos*, Lat. *primogenitus*), in scriptural use, signifies the first male offspring, whether of man or of other animals. By a principle of the Mosaic law, and indeed of the common law of nature, it was established that the firstlings of all the produce of creatures, whether animate or inanimate, were in some sense due to the Creator as a recognition of His supreme dominion. See **FIRST-FRUIT**. Under the title arising from this recognition are to be classed many observances regarding the first-born of animate beings, whether rational or irrational, which prevailed among eastern nations generally, or which are specially established by the Mosaic law: 1. The first-born male, whether of men or of animals, was devoted from the time of birth to God. In the case of first-born male children, the law required that, within one month after birth, they should be redeemed by an offering not exceeding in value five shekels of silver (Exod. xiii. 13). If the child died before the expiration of thirty days, the obligation of redemption ceased; but if that term were completed, the obligation was not extinguished by the subsequent death of the infant. This redemption took place according to a fixed ceremonial. The first-born male of animals also, whether clean or unclean, was equally regarded as devoted to God. The first-born of clean animals, if free from blemish, was to be delivered to the priests within twelve months after birth, to be sacrificed to the Lord (Deut. xv. 21); nor was it permitted to any but the priests to partake of the flesh of such victims (Num. xviii. 18).

If the animal were blemished, it was not to be sacrificed, but to be eaten at home (Deut. xv. 22). The first-born of unclean animals, not being a fit subject for sacrifice, was either to be put to death, or to be redeemed with the addition of one-fifth of its value (Lev. xxvii. 27; Num. xviii. 15). If not redeemed, it was to be sold, and the price given to the priests. 2. Primogeniture, both by the patriarchal and by the Mosaic law, had certain privileges attached to it, the chief of which were the headship of the family, and a double portion of the inheritance. Before the time of Moses, however, it was in the power of the father to decide which among all his sons should be considered the first-born. Moses ordained that the right should invariably belong to the first-born in point of time.

Among other nations, considerable variety existed as to the succession of children to the inheritance of their parent. The Greeks, especially the Athenians, excluded the females of a family so rigorously from the inheritance, that in the event of a father dying intestate and without heirs-male of his body, the nearest male kinsman succeeded to the estate. The later Romans, on the contrary, placed daughters on the same footing with sons as to the division of intestate property. Mohammedans gave the daughters a certain share of the father's estate, but only one-half of that assigned to the sons. All the nations of Germanic descent restricted the succession, especially in land, to heirs-male. But the Visigoths in Spain admitted females, except in certain contingencies.

The rights of the first-born in English and Scotch law are noticed under **SUCCESSION**, **PRIMOGENITURE**, &c. In France, the law of primogeniture fell at the Revolution, in common with many other relics of the feudal system. How far the results of the change have been beneficial, is still a moot-question among political economists. In the state of Virginia, also, after the American revolution, a similar change took place; and that the change has been in accordance with public opinion in that state may be inferred from the fact, that a parent now commonly makes, by will,

the same disposition of his property as that which would be provided by the law itself in the case of his dying intestate.

FIRST-FRUIITS (Heb. *reshith*, Gr. *protogennemata* and *aparchai*, Lat. *primitia*), that portion of the fruits of the earth and other natural produce, which, by the usage of the Jews and other ancient nations, was offered to God, as an acknowledgment of His supreme dominion, and a thanksgiving for His bounty. Among the Jews, the institution of first-fruits comprised both public and private offerings.

Of the former class, there were three principal offerings: the first was at the opening of the corn-harvest. On the day after the Passover Sabbath, the 16th of the month Nisan, a sheaf of new corn, which was cut and gathered with much solemnity, was carried to the Holy Place, and there waved before the altar (Lev. xxiii. 5 and foll.); nor was it permitted to commence the harvest-work till after this solemn acknowledgment of the gift of fruitfulness. Again, at the Feast of Pentecost, two loaves of leavened bread, made from the flour of the new harvest, were waved, with a similar form of worship, before the altar (Ex. xxxiv. 22). Thirdly, at the Feast of Tabernacles, in the 7th month, was held the great feast of the gathered-in harvest, the final acknowledgment of the bounty of God in the fruits of the year (xxiii. 16).

Besides these public offerings of first-fruits on the part of the entire people, individual Jews were bound to private offerings, each upon his own behalf. 1. A cake of the first dough of the year was to be offered to the Lord (Num. xv. 21). 2. The 'first of all the fruits' were to be placed in a basket, and carried to the appointed place, where the basket was to be offered with a prescribed form of words, commemorative of the sojourn of Israel in Egypt, and of his deliverance by the strong hand (Deut. xxvi. 2 and foll.). All these offerings were divided into two classes—the first, which were called *Bicurim*, comprised the various kinds of raw produce, of which, although the law seems to contemplate all fruits, seven sorts only were considered by the Jewish doctors to fall under the obligation of first-fruit offering—viz., wheat, barley, grapes, figs, pomegranates, olives, and dates. The law lays down no rule as to the quantity of the first-fruit offering; and it would be tedious to enter into the many questions regarding it which have been raised by the commentators. It was customary for the offerers to make their oblations in companies of twenty-four, and with a singularly striking and effective ceremonial.

The second class of first-fruit offerings were called *Terumoth*, and comprised the produce of the year in the various forms in which it is prepared for human use, as wine, wool, bread, oil, date-honey, dried onions, and cucumbers. As to the quantity of these offerings, and the persons on whom the obligation fell, there are many discussions, for which we must refer to the biblical authorities.

Under the kings, and again after the captivity, much laxity crept into the observance of this practice, which Nehemiah labored to revive in its primitive exactness. Offerings analogous to the Jewish first-fruits became usual very early in the Christian Church, as is clear from a passage in Irenæus (*Adv. Hær.*, b. iv. c. 17 and 34); but the extent to which it prevailed, and the amount and general character of the oblation, are exceedingly uncertain. It appears to have been merged in the legal provision established by the emperors.

The mediæval ecclesiastical impost known under the name of *primitiæ*, or first-fruits, and sometimes of *annates* or *annalia*, was entirely different. By the word, in its mediæval and modern sense, is meant a tax imposed by the popes on persons presented directly by the pope to those benefices which, by the canonical rules, or in virtue of privileges claimed by them, fall within the papal patronage. Persons so presented were required to contribute to the Roman see the first-fruits (that is, the income of the first year) of their benefice. During the residence of the popes at Avignon, when the papal necessities compelled the use of every means for eking out a precarious revenue, the impost was sought to be extended to every benefice; and this claim was the subject of many contests, especially in Germany and in England, where the claim, so far as regarded direct papal presentation, had existed from the reign of King John. Henry VIII., by two successive statutes (25 Henry VIII. c. 20, and 26 Henry VIII. c. 3), withdrew the right of first-fruits from the pope, in order to transfer it to the king; and he established a special court for the administration of first-fruits, which, however, was soon disused.

In the reign of Anne, the revenues arising from this impost in England were vested in a Board, to be applied for the purpose of supplementing the incomes of small benefices (2 Anne, c. 11). A similar change was introduced in Ireland by the 2. Geo. I. c. 15; but in the latter kingdom the payment was entirely abolished by the 3 and 4 Will. IV. c. 27. In France, this tax was abolished by the 'Pragmatic Sanction' enacted at Bourges in 1438, and subsequently by the *Concordat* of Leo. X. with France I. in 1512. In Spain, it ceased partially in the reign of Ferdinand and Isa-

bella, and finally under Charles V. In Germany, it formed one of the first among the *Centum Gravamina* presented to the emperor in 1521, and the claim ceased altogether from that period.

FIRTH. See **FRITH**.

FISCHART, JOHN, a very extraordinary German author was born either at Mainz or Strasburg, probably about the year 1545. Regarding his life, we know very little. He was by profession a jurist, but his writings exhibit an immense learning and reading in all the departments of human knowledge. About 1570, he made a journey to England. Towards 1580, he was living at Strasburg in terms of close friendship with the eminent book-printer, Bernhard Jobin. During 1581 and 1582, he was advocate to the Imperial Chamber at Speier, and in 1585 became bailiff of Forbach, where he probably died about 1590. Of the very numerous writings which appeared 1570—1590, partly under his own, and partly under various fictitious names, about 50 have been proved to be on the whole genuine, though disfigured by interpolations. In respect to others, however, the authorship is doubtful. The original editions of almost all F.'s works are extremely rare, but new ones have recently been published. His most celebrated works are based on foreign models, particularly Rabelais, but there is no servile imitation manifested: a free creative genius works plastically on the materials. To this class belong his *Aller Praktik Grossmutter* (1573); *Affentheurlich Nampengehörliche Geschicklitterung von U. S. W.* (1575); *Podagrammisch Trostbüchlein* (1577); *Büchlein des Heyl. Römischen Inneschwarms* (1579), and *Der Heilig Brotkorb* (1580). These writings are wholly satirical. With the most inexhaustible humor, he lashes, now the corruptions of the clergy, now the astrological fancies, the dull pedantry, or other follies, public and private, of the time. Next to these stands the outrageously comic work of F.'s—quite original in its conception—entitled *Flöhatz, Weibertratz* (1574). Essentially different in its homely and simple tone is his *Das glückhafte Schiff von Zürich*, written in verse, and published in 1576 (new edition by Halling, 1829). Similar in point of style are his *Psalmen und Geistliche Lieder* (1576, new edit. Berlin, 1849). The rest of F.'s numerous writings, partly in prose, partly in verse, are of unequal merit, singularly varied in style and contents; the prose works being in general more complete than the poetic.

What gives so high a value to F.'s satirical humor, is the warm and genuine feeling which he exhibits for the moral foundations of all public and private life—viz., religion, 'fatherland,' and the family, a feeling which betrays itself in his wildest mirth. His works are, moreover, one of the richest sources from whence to draw information with regard to the manners of his time. But perhaps the most extraordinary thing about F. is his treatment of the language. No German author can be compared with him, not even Jean Paul Richter himself. He coins new words and turns of expression, without any regard to analogy, but nevertheless displays the greatest fancy, wit, and erudition in his most arbitrary formations. The fullest collection of his writings is in the Royal Library at Berlin. For a critical account of the investigations concerning F. and his works, see Vilmar in Ersch and Gruber's *Encyclopædie* (s. 1, vol. 5).

FISH, a naval term of various application. The *fish* is an apparatus of pulleys employed in dragging the flukes of the anchor towards the bow after it has been hoisted to the cat-head.—*Fish-front*, or *paunch*, is a long piece of oak, or fir, convex without, concave within, securely fastened to the injured portion of a sprung mast or yard, to which it imparts rigidity. *Side-fishes* are long pieces of timber dove-tailed on the opposite sides of a made mast, to give it a circular form and the requisite diameter.

FISHER, JOHN, Bishop of Rochester, was born in 1456 at Beverly in Yorkshire, educated at Michael House College (now incorporated with Trinity College), Cambridge, where he took his degree in 1491, and of which he became master in 1495. Margaret, Countess of Richmond, mother of Henry VII., charmed by the report of his virtues and learning, next appointed him her chaplain and confessor. In 1501, he was elected chancellor of the university; and in 1502, became first Margaret Professor of Divinity. Two years later, he obtained the bishopric of Rochester. For many years after this appointment, he labored diligently for the welfare of the church and the universities. The Reformation of Luther found in him—as might have been expected from his devout ecclesiasticism—a strenuous, if not an able opponent. In 1527, a rupture took place between him and Henry in regard to the divorce of Queen Catharine. F. refused to declare the marriage unlawful. From this period, he figures in the politico-religious strifes of his time as a staunch adherent of the papacy. He opposed the suppression of the lesser monasteries in 1529, and the acknowledgment of Henry as head of the church in 1531, and thereby excited the dislike of the party of progress in the English nation. His credulity—many would apply a harsher term—in reference to Elizabeth Barton (q. v.), the 'Holy Maid of Kent,' involved him in a still more perilous antagonism to the king. He was imprisoned; and on refusing to take the oath affirming the

legality of Henry's marriage with Anne Boleyn, he was committed to the Tower, April 26, 1534, where he was treated with great barbarity. A kind but inconsiderate act of Pope Paul III. now hastened the destruction of the old man. His Holiness, as a reward of his faithful services, sent him a cardinal's hat in May 1535. When Henry was informed of this, he exclaimed: 'Mother of God, he shall wear it on his shoulders, then; for I will leave him never a head to set it on.' His ruin was now certain. He was accused of high treason, and after a brief trial was condemned, and executed, 22d June 1535. F. was one of those unfortunate persons who, with abundance of personal virtues, find themselves opposed to the overwhelming tendencies of the times in which they live.

FISHERIES. The capture of various kinds of fish for the purpose of trade has always been extensively carried on in maritime countries, and in those which are watered by large rivers; and has been the means in many instances of adding greatly to their prosperity. In Great Britain and Ireland, especially, this pursuit affords remunerative employment to a large proportion of the population, and forms an unequalled nursery for sailors to recruit the royal navy.

The art of capturing fish, like other arts, has been brought only by degrees to its present perfection. In remote ages, fish were caught in the rudest manner by men who lay on the rocks, ready to shoot them with arrows, or transfix them with spears. Even yet, in places which are only partly civilized, fish are taken with blankets or sheep-skins; and a roughly made spear, known as a leister, is still used in the country districts of the United Kingdom in the illegal capture of salmon. Advancing intelligence, however, and the use of fish as an article of barter for other kinds of food, soon led to more effective modes of capture. Persons who dwelt on the sea-coast began to exchange fish for animal food killed by the inland hunters, and in this way initiated a commerce which is now represented by a vast amount of capital and enterprise.

The importance of fisheries, as bearing on the food-supplies of nations, inland as well as maritime, and as forming a remunerative outlet for labor, can scarcely be overestimated, more especially as fish has ever been in the greatest demand by all classes of the people, and has been in use for human food from the most remote periods. Previous to the Reformation, it was in universal demand in Britain, being the prescribed diet during the fasts appointed by the church.

One great peculiarity of this source of wealth is that, with slight exceptions, the sea-harvest (if we may so call it) is ripened, without trouble or expense for the fisher, who only requires to provide the means of gathering it; and that, under certain regulations, it is free to all comers. River fisheries, except for salmon, are unproductive in Great Britain; and Lochleven is the only British fresh-water lake the produce of which is marketable.

The principal fisheries of Great Britain include the capture of salmon, herring, cod, soles, turbot, mackerel, lobsters, oysters, &c. Immense quantities of these are in constant demand: the various lines of railway that branch inland from the coast afford a means of rapid transit, and have in consequence considerably enhanced the value of sea-produce, much of which was at one time useless for want of sufficiently rapid conveyance to those seats of population where it would have found ready sale. It is affirmed, indeed, by those who have studied the subject, that increased demands, consequent upon improved facilities of transit, have affected the fisheries, and rendered them less productive than formerly. The machinery of capture is being extended every year, and the supplies have now to be brought from greater distances, the shoals frequenting the coast lines being much exhausted by the incessant inroads made upon them by the fishermen.

It is difficult to obtain reliable statistics of the different fisheries. Excepting the government Board for Scotland, there is no recognized authority on the subject. The following figures, bearing on the herring-fisheries of Scotland, which are the most important fisheries of the United Kingdom, are taken from official returns made by the commissioners, and annually laid before parliament. They only represent the quantity of herrings which is 'cured,' but immense numbers of that fish are sold fresh, as taken from the sea. The herring fishery of 1880 was by far the largest ever known on the coasts of Scotland. In that year 1,473,600 barrels were cured (in 1875, 942,980). If each barrel contained 700 herrings, the number cured in 1880 would be 660,086,000. It would be no exaggeration to say that an equal number would be sold fresh. A large number of the barrels were branded by the government inspectors, a sum of £11,488 being paid in brand fees. The number of boats engaged in the Scotch fisheries of 1880 was 14,751; the fishermen and boys employed in the fishing numbered 47,131 persons; and the estimated value of the boats and nets employed in the fisheries was £1,288,508. The Scottish-cured herrings are sold not only in Great Britain, but in

her colonies and foreign countries. At Hamburg and other continental seaports, there are merchants who deal largely in cured herrings, and employ agents who annually visit the various British ports to purchase supplies. It is for the satisfaction of these foreign buyers that the 'brand' is used; it denotes the quality of the herrings, and prevents one class of herrings being sold for another class that may be inferior. The principal seats of the herring-fishery in Great Britain are at Wick, in Caithness-shire, Scotland, and at Yarmouth, in England; but that industry is also carried on at many other places on the British sea-board, and on the coast of Ireland, which is 2500 miles in extent. Unfortunately, the Irish sea-fisheries are declining. In 1846, there was 20,000 boats and 100,000 men and boys engaged; in 1879, there were only 5834 boats, and 21,269 men and boys. At nine stations, £139,880 were realized for herrings in 1879.

A visit to Billingsgate affords the best means of obtaining a proper notion of the food-wealth of the sea, many tons of all kinds of fish being daily distributed from that mart. The average quantities of white fish estimated to pass through Billingsgate in the course of a year are as follows: Haddocks, 3,500,000; whiting, 20,000,000; soles, 100,500,000; cod, 950,000; plaice, 35,500,000; mackerel, 35,000,000. This estimate is only at the best a very rough one, as no machinery exists for gathering such statistics. So great is the demand for white fish throughout the kingdom, that many fishermen run north to the Orkney Islands to obtain them. Most of the cod-smacks carry their cargo alive as far as Gravesend; but they dare not venture farther up the Thames, as the fish would not live in its four waters. The Irish seas are famed for the fine quality of their white fish; the haddocks of Dublin, in particular, have a great reputation, but during late years they have become very scarce.

In Scotland, a vast proportion of the haddocks are slightly smoked, and sold as 'Finnans,' which form a well-known breakfast delicacy in all parts of the country. Large quantities of cod and ling are caught, split up, and sold in a dried state. In 1880 the cod, ling, and hake fishery produced 155,745½ cwt. cured in that way, in addition to 7794½ barrels which were pickled. In 1875 the yield was 187,788½ cwt. cured dried, and 11,749½ barrels pickled. The number of fish taken was 5,791,387, being 1,250,293 more than in the previous year. The most valuable white fish, individually considered, is the aldermanic turbot, which brings a high price. The supply of turbot is chiefly derived from Holland, the fishermen of that country making the capture of the turbot and the sole a *spécialité*. Eels are also caught in large quantities at all seasons, and fetch a remunerative price in the London fish-markets. As many as 16,285 boxes of eels are annually sent from Ireland to England. These boxes will each contain on an average 40 lb. weight, and the price at 6d. per lb. would give a money value equal to the number of boxes. In Scotland, where a prejudice has long existed against that fish, the eel fisheries are beginning to prove remunerative.

The lobster, being by far the most valuable of the crustacean kind, is most assiduously nursed in ponds, so as always to be ready for market. Mr. Scovell of Hamble, near Southampton, keeps a thousand or two always on hand, and steam-vessels are employed to bring them alive from the most distant parts of the coast: these boats are built exclusively for this purpose, and have immense wells in them to hold the living freight. The lobsters are not at once brought to London, but are kept ready in perforated boxes, in various parts of the Thames, to answer the demand as it arises. Norway supplies at least two-thirds of our lobsters, the daily consumption of which in Great Britain has been estimated at 60,000. The lobsters taken from the British seas have now to be sought for at greater distances from the shore than formerly—those obtained on the immediate coast being now very small, and technically called 'half-lobsters;' they do not, of course, yield such a remunerative price as the larger fish. There is also an enormous demand for oysters, and a considerable proportion of our maritime population earn a comfortable livelihood by breeding and dredging them. At Whitstable, in Kent, and at various places in Essex, there are dépôts for sorting and storing oysters. The 'spat' is procured and grown in the course of four years into a marketable commodity of much value, the wholesale prices for the various kinds having been doubled between the years 1860 and 1873. The oyster used to be found in great abundance on the British coasts, but some of the natural beds have been so largely drawn upon that they are becoming exhausted. The natural oysters in Ireland are now very nearly dredged up. In America, the oyster is a common mollusc, and notwithstanding a constantly increasing demand, the natural beds are still productive. See OYSTER.

Whilst sea-fisheries are open to all who have the means of working them, salmon-rivers are for the most part private property. The owners of particular streams usually form themselves into an association chiefly for the protection of the fish during the spawning season. The usual method is for the 'lairds' to let their fishings to tenants, who are called 'tacksmen,' and whose

interest it is to capture and sell all the fish they can find. The rents obtained are, in some instances, very large, and form a handsome addition to the land-revenues of the proprietors. Before the invention of packing in ice, and previous to the introduction of steam-boats and railways, salmon used to be hawked through the country towns by cadgers at an almost nominal price, whilst it was sometimes sold in the public markets at twopenne per pound. When the increased demand for it, created by these facilities of conveyance, caused it to attain its present price, tacks-men were tempted to overfish their streams, and the consequence was the comparative exhaustion of particular rivers; but by the wisdom of the legislature in passing one or two protecting acts of parliament, the salmon-fisheries are now proving very remunerative both to lessees and lairds, the fish having again become comparatively plentiful and increased in size. The rental of the river Tay, in 1876-7, was £20,381. To pay such a rent, over 100,000 salmon and grilse, of the average weight of 10 lbs. each, would require to be captured. See SALMON, PISCICULTURE. The annual value of the salmon fishing for 1877 in England was £100,000, in Ireland £400,000, in Scotland £250,000.

Recently a large import trade has sprung up in fresh, canned, and preserved salmon from British Columbia, Oregon, and New Brunswick. Below are the numbers of boxes of fresh salmon (each box 172 lbs.) received in London in 1880:

Scotch	17,408
Irish	9,666
English	1,993
From Berwick-on-Tweed	1,207
Dutch	568
Norwegian	400
Swedish	126
Canadian	103

Total for 1880 31,471

It is impossible, from the paucity of reliable information, to do more than roughly estimate the amount of capital employed in the British fisheries, or the value of the stock of boats, nets, and other instruments of capture. However, it is certain that the value of the annual produce of British fisheries of all kinds is not less than £6,000,000.

A semi-official estimate has been very carefully compiled of the supposed total annual value of the fisheries of Scotland (exclusive of salmon), with the following result:

Herrings	£960,485
Sprats	7,022
Cod and Ling	266,201
Haddock and Whiting	264,595
Turbot and other flat fish	12,280
Oysters	14,100
Lobsters, &c.	32,269
Mussels and Whelks	8,479

Total £1,505,431

Assuming that as many salmon are eaten in Scotland as are sent to London, that would give us 46,056 boxes of 112 lbs. each; and taking the average price as five pounds per box, the sum, added to the above, would be £230,280, making a grand total of £1,735,711.

Figures giving the comparative values of the fisheries of various nations must be regarded as only approximate; but authorities quoted in *Nature* for 1881 estimate the total annual value of British fisheries at £6,300,000; American, £5,500,000; French, £3,250,000; Norwegian, £2,600,000; Canadian, £2,250,000. International fishery exhibitions have been held at Berlin (1880), Norwich (1881), Edinburgh (1882), and London (1883), illustrating methods and apparatus for the breeding, capture, preparation, and preserving of sea and river fish, models of boats and their tackle being included.

The food-fisheries of France have recently become very extensive, especially in so far as the capture of sea-fish and crustaceans are concerned. A very large number of sardines are annually caught and cured in the French seas, the cure of this little fish being a very remunerative industry at Concarneau and other places. In the cultivation of those less important fishes which thrive best in lakes, canals, and rivers, the French excel us, for while we only cultivate these for purposes of amusement (see ANGLING), the French people make them an article of commerce, and derive considerable sums of money from their sale. At one time, the whole fresh-water fisheries belonging to France were not of so much value as one of our salmon streams; but by means of artificial cultivation and careful nursing, they have been much increased in value, and, by the care of the government, are being yearly improved. The fresh-water fisheries of France are of great extent, some of the fishponds in that country being upwards of

thirty thousand acres. These fisheries are all more or less under the control of the government. In Paris, the annual consumption of fish has been estimated to give for each individual 30 lbs. of sea-fish, and 1 lb. of fresh-water fish.

Among the foreign fisheries most worthy of notice are the river-fisheries of Germany, where the culture of the Danube salmon and other fresh-water fish is assiduously carried on. In the Mediterranean, various kinds of fish are taken, the one of the greatest value being the tunny. The anchovy and sardine are also taken in large quantities. An account of the great eel-fishery at the mouth of the Po, on the Adriatic, has already been given in this work. See COMACCHIO. The Dutch are at present as industrious upon the sea as they were at the time when they founded Amsterdam, and a large proportion of the population of Holland are engaged in their fisheries, which are still a source of wealth to that kingdom. The herring, although not taken by the Dutch in such large quantities as formerly, is as carefully cured as ever, Dutch-cured herrings having a great reputation. Excellent salmon are taken in the mouths of the Rhine, many of which are sent to London for sale, as they can be eaten at a time when British salmon cannot be obtained. The Norwegian fisheries afford large quantities of lobsters and turbot, while from Newfoundland is derived a plentiful supply of cod or ling. The Newfoundland fisheries, which are principally for cod, have existed for upwards of three centuries. Sir Francis Drake was the first person who fished there on behalf of England, and the fish he sent home soon excited a spirit of enterprise in the country, which led to the dispatch of a large number of ships and the extension of the fishery. The island is surrounded by the cod-banks, and the capture and cure of this fish form the staple occupation of the people. In America, immense quantities of shad are bred artificially in order to aid the natural supplies; the 'pisciculture' of salmon has also been commenced on a large scale, that fish having become scarce near the seats of great population. See NEWFOUNDLAND.

The oil-fisheries are not so important as they were at one time, the invention of gas and the discovery of other lubricants having rendered us independent of whale oil. The success of the whale-fisheries has also fluctuated so much as to prevent modern capitalists from embarking very largely in the trade. The only novelties that distinguish the whale fishery of the present day are the introduction of steam-whalers, and, in some instances, of vessels wintering in Greenland; but, with all these advantages, our whalers barely pay their expenses, and the fishery, as compared with former years, exhibits a considerable falling-off. The total whaling fleet numbered at one time 159 ships, but to-day it barely amounts to a tenth of that number. The seal is now largely captured for the purpose of obtaining its oil, many thousands being annually killed by British sealers, as many as 15,000 being taken by the men of a single ship. See WHALE, CACHOLOTT, SEAL, GREENLAND, &c. The South-Sea or sperm-whale fishery is principally in the hands of the Americans, who pursue this branch of commerce most successfully.

The British and Irish sea and salmon fisheries are, so far, regulated by numerous acts of parliament. It is quite impossible, however, to give a *précis* of all the provisions which the legislature have laid down for promoting and protecting our fisheries, they are so numerous, and many of them quite local. The sea-fisheries are, in effect, free to all who choose to fish; but the salmon is, by use and wont, as also by acts of parliament passed at various times, private property, although the owners of fisheries have had to submit them, from time to time, to the regulating power of the legislature.

The following is a summary of the leading points of fishery legislation:

From a very early time, statutes have been passed both in England and Scotland for the purpose of protecting the breeding of fish, and preventing the destruction of the spawn or fry. The development of the fisheries led to a system of advancing public moneys for their encouragement; for this purpose, commissioners were appointed, through whom money was advanced on loan. A treaty was entered into in 1839 between her Majesty and the late King of the French, and carried into effect by act of parliament, concerning the fisheries in the seas between the British Islands and France. By this convention, the limits within which the general right of fishing is exclusively reserved to the subjects of the two kingdoms respectively, are fixed at three miles distance from low-water mark. In 1854, a similar treaty was concluded regulating *inter alia* the common rights of fishery between the British colonies in North America and the United States. The Halifax Fisheries Commission constituted under the treaty of Washington (1871) gave in 1877 an award of 5,500,000 dollars to Canada for conceding to Americans the right of fishing in Canadian waters. Fresh fish of British taking, imported in British bottoms, may be landed without report or entry. Persons employed in the fisheries, in such manner and under such circumstances as are laid down in 50 Geo. III. c. 108, are exempted from impressment.

It would be well if the various acts of parliament regulating the fisheries were codified or arranged in some logical sequence; and the various fishery offices might be consolidated under one governing board, instead of being, as at present, scattered over various public departments, or administered in separate offices.

FISHES, ROYAL—i. e., those which at common law are the property of the crown—are the whale and the sturgeon, when either thrown on shore, or caught near the coast. The ground of the privilege is said to have been the superior value of these fishes. They were considered too precious for a subject, just as the Swan (q. v.), which was a royal bird, was too good for any table but the king's. 'Our ancestors,' says Blackstone, 'seem to have entertained a very high notion of the importance of this right, it being the prerogative of the kings of Denmark and the dukes of Normandy; and from one of these it was probably derived to our princes.'

It is expressly claimed and allowed in the statute *De Prærogativa Regis* (17 Edw. II. c. 11), and the most ancient treatises of law now extant make mention of it.—Stephen's *Com.* ii. p. 547. Strictly, it was the head only of the whale which belonged to the king, the tail being a perquisite of the queen-consort (*Ib.* p. 457). In Scotland, whales thrown on shore above six horse-power draught, belong to the queen or her donatary, the admiral. Smaller whales have been claimed both by the landlord and the tenant on whose ground they are cast, but they are usually given to the catcher. In Shetland, where the washing of whales on shore is an occurrence of sufficient frequency to have given rise to a local custom, they are equally divided between the proprietor of the soil and those concerned in catching them. See **SALMON**.

FISHES (*Pisces*), the fourth—or, according to Milne-Edwards and some other naturalists (see **AMPHIBIA**), the fifth—class of vertebrate animals; consisting of creatures which live in water, and accordingly breathe by gills (*branchia*), and not, at any stage of their existence, by lungs. In number—both of individuals and of different kinds—they are supposed to exceed all the other



Skeleton of Perch.

classes of vertebrate animals put together. Even the water of hot springs and the pools of caverns have their peculiar fishes, and some of these are only known as thrown out with torrents of muddy water by volcanoes.

The form of fishes is generally adapted to easy and rapid progression through water, being more or less nearly that of a spindle, swelling in the middle, and tapering towards the extremities; the outline unangular, and the surface smooth. But exceptions to this rule are numerous; and some, provided with other means of seeking their food, or of preservation from their enemies, exhibit the greatest possible departures from the ordinary shape: some are globe-shaped, some have a most irregular and angular outline, many are much elongated, as eels; and others are compressed and flattened, as flounders.

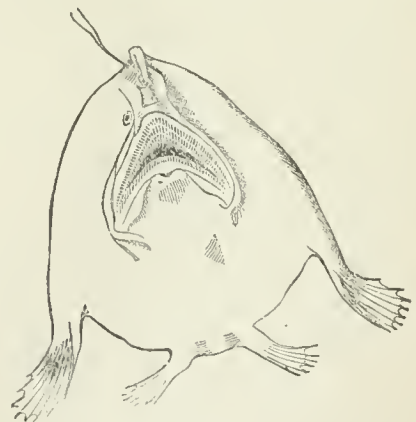
The bones of fishes differ much in their structure from those of other vertebrate animals: they are less dense and compact, and when their ossification is perfect, remain separate, as in the early embryotic state of the *Mammalia*. The bones of the sub-class of **Cartilaginous Fishes** (q. v.), however, never become properly ossified. The bones of fishes generally contain a smaller proportion of earthy matter than those of other vertebrate animals, and their cartilaginous basis contains no gelatine strictly so called. The typical character of the vertebrate skeleton is, however, maintained, although modified; and many of the bones—a great majority, for example, of those of the head—are evidently homologous with those of quadrupeds and of man. There is no neck, and the vertebrae are concave at each end, and pierced in the middle, the hollow space being occupied with a gelatinous substance. Spinous processes, sometimes short, sometimes long, extend upwards and downwards from the vertebrae to support the muscles.

Fishes also generally have ribs, connected with the abdominal vertebrae; and in many, an additional set of small bones (*epipleural spines*) connected with the ribs, and arising from near the base of the ribs, extends outwards and backwards through the lateral muscles. The four limbs which belong to the typical structure of vertebrate animals, assume in fishes the form of *Fins* (q. v.), and are generally, although not always, all present, the first pair being the *pectoral*, the second pair the *ventral* fins. In some fishes, the ventral fins, answering to the hind-feet of quad-

rupeds, are actually further forward than the pectoral fins, and are then called *jugal* fins. In some, as the common eel, the ventral fins are wanting; in some, as the *Murena*, there are neither pectoral nor ventral fins. Connected with these fins are bones, which show that they represent the limbs of other vertebrate animals. Fishes have, however, also other fins not so closely connected as these with the internal (*endo*-) skeleton, and not placed like them in pairs towards the sides, but vertically on the middle (*mesial*) line; one or more (*dorsal*) on the back; one or more (*anal*) on the opposite or ventral aspect, behind the anus; and one (*caudal*) at the extremity of the tail. The caudal fin is in general the principal organ of locomotion, and most of the muscles of the body combine to give great energy to its strokes, great part of the body moving with it, and the vertebrae with their processes being so framed as to admit great freedom of lateral, and scarcely any vertical motion. The pectoral and ventral fins seem to serve chiefly for balancing the body, and guiding and staying its motion; the dorsal and anal fins, like the keel of a ship, for keeping it in its proper position. All the vertical fins are supported by bones which do not join those of the internal skeleton, but are thickest at the skin, from which they penetrate towards the vertebrae, being interposed between the spinous processes of the vertebral column. Several of the last caudal vertebrae are generally very short and combined, and the interposed spines which support the caudal fin converge towards them. The rays of fins are either pointed bones (spines)—sometimes prolonged beyond the membrane, and forming defensive weapons—or they are cartilaginous and jointed, in which case they often also branch near their summit. The caudal fin never has any other than these soft rays, and many fishes have no other in any of their fins. A few fishes, belonging to different families, have the pectoral fins developed to an unusual degree, so as to make them capable of supporting short flights in the air (see **FLYING FISH** and **FLYING GURNARD**), and a few of them are capable of employing their fins as organs of locomotion in a very different way, creeping along the ground, or hopping among the weeds and stones of the shore.

The heart of fishes consists only of one auricle and one ventricle, receiving venous blood only, and sending it to the gills, where, being oxygenated, it passes into the greater or systemic circulation by the dorsal vessel. See **CIRCULATION**. In most fishes, there is, close to the heart, a thick *bulb* or muscular swelling of the great artery which conveys the blood from the heart to the gills, and which assists in propelling the blood, being furnished with valves to prevent its regurgitation into the heart; and this bulb and its valves exhibit varieties admirably characteristic of different natural groups, much founded upon in the system of Müller and Owen.

The blood of fishes is red; its corpuscles are oval and of considerable size, but in general not very numerous. Fishes consume little oxygen in respiration, and are *cold-blooded* animals, having in general a temperature little elevated above that of the water in which they live; although there are some singular exceptions to this rule, as the tunny, sword-fish, &c., which, having a compara-



Cheironeetes Candimaculatus.

tively high temperature, have also redder blood with more numerous corpuscles. The oxygen appropriated by means of the gills in respiration is not obtained by decomposition of water, but from the air which is mixed in it, and hence the necessity of aerating an aquarium; hence also we perceive one of the benefits resulting from the agitation of the ocean and of lakes by winds. Some fishes require a greater supply of air than they can easily obtain from the water, and frequently come to the surface to breathe. Fishes taken out of the water die from want of breath, in consequence of the drying up of the fine fringes of the gills;

and those which are capable of subsisting longer out of water than others, have generally small gill openings, not so freely admitting the air to dry the gills, whilst a few are provided with receptacles for water to keep them moist. See *ANABASIDÆ*.

The gills of fishes are situated at the back part of the sides of the head, and consist of a multitude of very vascular membranous plates, which are generally in double fringe-like rows fixed by the base only, and simple, although in a few fishes they are feathery, and in the greater number of *Cartilaginous Fishes* (q. v.), they are fixed both by their external and their internal edges, or consist of mere folds of membrane attached to the surface of the gill-cavities. In general, there are four gills on each side; the number is greater in some of the *Cartilaginous Fishes*. In *Osseous Fishes*, the gill-plates are attached to the external edge of the branchial arches, bony arches connected with the *hyoid bone* or bone of the tongue—which is unusually developed in fishes—and with the base of the skull, the connection at both ends being effected by intervening small bones, and the whole forming a complicated system; whilst the cavity containing the gills, on each side of the head, is covered by a bony plate, the gill-lid, gill-cover, or *operculum*, with two subordinate pieces, called the *sub-operculum* and *inter-operculum*, articulated on the temporal bone, and playing on the *pre-operculum*, a bony plate placed before them in the head. It is by the motion of these bony plates that the water is expelled which is taken in by the mouth, and which, after passing amongst the gills, and supplying them with air, passes out by the gill-orifices at the back of the head. Besides these opercular plates or bones, a series of flattened rays, connecting them with the bone of the tongue, and called the *branchiostegal rays*, aid in forming the gill cavities. In the *branchiostegal rays*, distinctive characters of fishes are often found.

The brain of fishes differs very considerably from that of other vertebrate animals. See *BRAIN*. In general, they possess the nerves and organs of all the senses, although the senses of touch and taste are commonly supposed to be more dull than in many other animals; and a few fishes, living chiefly in mud, or in the waters of caverns, are destitute of eyes, and consequently of sight, although even they possess optic nerves, and seem sensitive to light. But in most of them, the eyes are large, and vision is evidently very acute; and some have cirri or barbules near the mouth, filaments proceeding from some of the fin-rays, &c., which are regarded as delicate organs of touch, adapted to the wants and habits of the particular species. The eyes are covered by the skin, modified in its character, and have no eyelids nor nictitating membrane. They are very variously placed in different kinds. There is no external ear.

The mouth is the only organ of prehension. It is very different in different kinds—sometimes very small, sometimes extremely large, sometimes forming a sucker by which the fish can both fix itself and pump up the fluids of the animal on which it preys. The snout is also abbreviated, prolonged, or otherwise modified in very various ways. The teeth are far more various in form, number, position, and structure, than in any other class of animals. They never have any roots, but are fixed to the bones which support them; they fall off, however, and are replaced. Some fishes have no teeth; some have very small teeth; some have teeth in great number, but so fine as to resemble the hairs of a brush; some have short thick teeth; some have long sharp teeth, either straight or crooked; some have teeth so flat and closely set that they resemble a regular and beautiful pavement; and the teeth of fishes are sometimes situated not only on the jawbones, but on the *vomer* or bone extending along the middle of the roof of the mouth, and indeed, also, on other parts of the palate to the very throat, and very commonly on the tongue. The food of fishes is various: a few subsist on vegetable food of different kinds, but most of them on animal food, of which there is no kind that does not seem to be particularly agreeable to some of them, from the mere animalcule or the most minute crustacean to the flesh of the mammalia. In general they are excessively voracious, and seem to spend most of their lives in seeking food. Many of them prey on other fishes, and many seem equally willing to devour other species or the younger and weaker of their own. Some of them swallow their food almost or absolutely alive; others subject it to processes of comminution, trituration, and mastication in the mouth. Salivary glands are not found in fishes, although they exist in some of the invertebrate animals. The digestive process seems to be performed very rapidly. The stomach and intestines vary very much in different kinds. The kidneys are in general extremely large, extending through the whole length of the abdomen.

The *air-bladder* is found in many fishes, but not in all; and is present or absent in different fishes even of the same genus or family. See *AIR-BLADDER*. Its uses, and its connection with the habits of particular species, have as yet been but partially ascertained.

Fishes are oviparous (egg-producing); a few are ovoviviparous (eggs hatched within the body, and young produced alive). The

chief reproductive organs are generally two elongated lobes of a fatty substance, *milt*, in the males, and of rudimentary eggs, *roe*, in the females. Impregnation usually takes place after the *roe* or *spawn* is deposited, the male accompanying the female to the place of spawning. In some *Cartilaginous Fishes*, it takes place before the deposition of the eggs; and male sharks and rays are furnished with organs called *claspers*, the use of which is well indicated by the name. The fecundity of fishes is generally very great, and their eggs very small in proportion to the size which they ultimately attain, although this is not so much the case in the *Cartilaginous Fishes* already mentioned. Some of the fishes most valuable to man, as the salmon, herring, and cod, are remarkable for their fecundity. Nine millions of eggs have, according to Leuwenhoek, been ascertained to exist in the roe of a single cod; and provision is thus made both for the preservation of the species amidst all the dangers to which the spawn and the young are exposed, and for the wants of man. The spawn of fishes is deposited in very different situations, according to the different kinds—as by some on aquatic plants, by some on beds of sand or gravel; but many species leave the depths of the ocean in order to deposit it in shallower waters, and some, usually marine, ascend rivers for this purpose. Very few fishes take any care of their eggs or young; but there are remarkable exceptions to this rule, and some of the gobies and sticklebacks are known to tend their young with great care. Sticklebacks also construct nests. See *STICKLEBACK*. It is not long since this curious fact was discovered, although these little fish have been so long familiarly known; and it is therefore not improbable that many other fishes may have the same habit.

The growth of fishes is very rapid when supplies of food are abundant, but becomes slow in less favorable circumstances, or is arrested for a long time, in a manner to which there seems to be nothing similar among other vertebrate animals.

The skin of fishes is generally covered with Scales (q. v.), which, however, are sometimes minute and imbedded in the skin, and sometimes altogether wanting. The scales are either horny or bony, and are generally imbricated, like the slates of a roof, their free ends backwards; but sometimes form bony plates, fixed by the whole of their lower surface. They usually exhibit beautiful symmetrical markings and inequalities of surface of various kinds, and in some are covered with a thick coat of enamel. The differences of character in the scales have been made the foundation of a classification of fishes by Agassiz, by whom all fishes are distributed into the four orders of *Cycloid*, *Ctenoid*, *Placoid*, and *Ganoid Fishes* (see these heads), having respectively cycloid, ctenoid, placoid, and ganoid scales; a classification which has been found particularly convenient with reference to fossil fishes, although other systems maintain their ground against it as preferable for recent species. It is not, however, wholly artificial, for a relation can be very generally traced between the character of the scales and the general structure and economy of a fish.

The scales of a row extending from the head to or towards the tail on each side of the body of *Osseous* fishes in a somewhat waved line, called the *lateral line*, are pierced for the transmission of a slimy matter, with which the whole body is lubricated.

The colors of fishes depend upon a substance consisting of small polished laminae, secreted by the skin.

As fishes need no covering, like fur or feathers, to prevent the dissipation of their animal heat in the surrounding medium, their scales must be regarded chiefly as defensive armor. Some of them are also defended by large bony plates, which are either on the head alone or also on the body, and some by spines connected with the fins, gill-covers, &c. Few have any other offensive weapons than their teeth, but the spine attached to the tail of some rays is a remarkable exception, as is also the elongated snout or beak of the sword-fish, saw-fish, and a few others. But a much more remarkable kind of armor—probably both offensive and defensive—is possessed by a few fishes, in an electrical apparatus, by which they can give severe shocks. It is also an interesting fact, that the electrical apparatus is quite different in different fishes possessing it, the *Gymnotus* or Electric Eel, the *Torpedo*, and the Electric *Silurus* or *Malapterurus*. See *ELECTRICITY*, *ANIMAL*.

Many fishes are gregarious, swimming in shoals, which in some species consist of immense multitudes. Some also make periodic migrations; salmon, for example, ascending our rivers, and herrings and pilchards visiting our coasts, but the long migration formerly ascribed to these fishes is now doubted or disbelieved. The occasional overland migrations of eels, and the more frequent overland migrations of some tropical fishes, cannot but be regarded with peculiar interest; and the instinct is very wonderful by which, when fleeing from a pool that is about to be dried up, they direct their course towards a place where water is more abundant. This faculty is, however, rare, although possessed by tropical fishes both of the eastern and western hemispheres; but more generally the fishes destined to inhabit tropical ponds which are liable to be dried up, are capable of living dormant, imbedded

in the mud, till they are liberated again by the rains, when they reappear in their former multitudes.

Of the uses of fishes to man, by far the most important is that of supplying him with food. Fishes form an article of food in almost all countries, and in some a principal part of the food of the inhabitants. Many fishes are highly esteemed for the table, which are not procured in sufficient abundance to be a principal part of food in any country. Some fishes, on the contrary, are unpalatable; and some, mostly tropical, are poisonous, whilst others are poisonous only at particular seasons.—The skin of some Cartilaginous Fishes yields SHAGREEN (q. v.), and the air-bladder of some fishes yields ISINGLASS (q. v.). The minute laminae which give brilliancy of color to some, and the similar substance found in the air-bladder of others, afford the materials of which artificial pearls are made.—Oil useful for lamps is obtained from a number of fishes, and the medicinal value of cod-liver oil is now well known.

The classification of fishes most generally adopted is that of Cuvier, who divides them into OSSEOUS FISHES (having true bones), and CARTILAGINOUS FISHES (q. v.); and divides Osseous Fishes into Acanthopterous Fishes (*Acanthopterygii*, q. v.), and Malacopterous Fishes (*Malacopterygii*, q. v.). The system of Agassiz has already been noticed. That of Müller and Owen differs from both.

Fossil Fishes.—The medium in which fishes live, and the hard and almost indestructible nature of some portions of their skeletons—as their teeth, spines, and scales—would lead us to anticipate their frequent occurrence in the Sedimentary rocks; but inasmuch as the soft parts of the animal are liable to speedy decomposition, the remains of fish must often exist in a fragmentary and scattered condition. Thus, the teeth in the shark, the spine defence in the sting ray, and the scales in the bony pike, would survive the total destruction of the cartilaginous skeleton as well as the soft portions of these fish, and would alone remain to testify to their existence.

The earliest ichthyic remains are of this fragmentary character. They have been obtained from the 'Ludlow rock,' a member of the Upper Silurian series, and consist of spines and portions of skin, that have been thickly covered with hard tubercles and prickles, like the shagreen of the shark's skin. The spines most nearly resemble the dorsal spine of the dogfish; they are small, flattened and slightly curved. Along with other similar fragmentary remains, they have been placed under the somewhat indefinite generic title *Onchus*.

The minute, compressed, conical, and glistening bodies, called *Conodonts*, obtained in great numbers from the Lower Silurian strata in Russia, and considered by their describer, Pander, to have been the teeth of fishes, belong certainly to very different animals. Their small size and peculiar forms, and the entire margin of the hollow base by which they were attached, show them to have been the denticles from the lingual ribbon of shell-less molluscs, which have left no other traces of their existence than these remarkable *Conodonts*.

The Ludlow bone-bed contains the earliest noticed fish remains. No idea of the numerical importance of fishes at this early period can be satisfactorily formed; yet these remains being confined to a single thin bed, and occurring rarely even in that, would seem to indicate that the Silurian seas were but thinly tenanted by these earliest sharks.

In the immediately succeeding Devonian rocks, their numbers largely increased. The ichthyodorulites, or fossil spines of this period, have been referred to fourteen different genera. Numerous species of true ganoids have been determined from their well-preserved enamel scales, which occur singly or in confused groups, and frequently also associated with the head, fins, and tail, so as to present a faithful 'nature-print' of the fish upon the rock. See *DIPTERUS*, *DIPLACANTHUS*, &c. But the most remarkable and characteristic fossils of this period are the Buckler-fishes, whose head and part of their body were covered with bony plates, giving them so singular and anomalous an appearance, that some of them were originally considered crustacean. They are almost confined to the Old Red Sandstone series, a single species (found in Permian strata) being the only cephalaspid that is known later. See *CEPHALASPIS*, *COCCOSTEUS*, *PTERICHTHYS*, &c.

Fish remains are of frequent occurrence in the Coal-measures. Upwards of twenty species of plagiostomous fishes have been determined from the spine defences, some of which are very large and powerful. The frequency with which the peculiar teeth of the eeltracitors are met, show that they must have been common in the carboniferous seas. Ganoids were also abundant. See *PALEONISCUS*, *HOLOPTYCHIUS*, &c.

In the Permian period, the forms are similar to what exist in the older strata. Up to the last Permian deposit, the fish have all possessed heterocercal tails; but with the Secondary rocks, the homocercal tail not only appears, but becomes the more frequent form.

Numerous species and many new forms appear in the Trias

and Oolite. Sharks are remarkably abundant in the Cretaceous strata; but the Chalk is specially remarkable from containing the earliest discovered remains of the true bone-fishes—those covered with ctenoid and cycloid scales.

In the Tertiary strata, the character and proportion of ichthyic remains exhibit a condition in the inhabitants of the water very similar to what at present prevails. The cartilaginous orders decrease, and are replaced by osseous fishes, such as the salmon, cod, turbot, and herring.

See Günther's *Instruction to the Study of Fishes* (1880), Day's *Fishes of Great Britain and Ireland*.

FISH-HOOKS. A considerable amount of skill is required for the successful manufacture of these simple articles. There are two kinds in the market, the English and the Limerick fish-hooks, the latter being long in the highest repute among anglers. Now, however, the largest number of fish-hooks are made at Redditch, in Worcestershire. Steel-wire is cut into the required lengths, and softened; then the ends of three of these are inserted into shallow holes of a sort of rest or standard, and thus supported, the barbs of all three together are cut up by the skilful pressure of a stout knife; they are then pointed, and turned by pressing them against a little ridge of sheet-brass let into a block of wood, and having the requisite curvature. The other end is next flattened out, by laying it on a small anvil, and striking a blow with a hammer. This is done to prevent the silk ligature from slipping over the end. The finer worm-hooks have the shanks filed, in order that the silk dressing may not enlarge the shank so much as to prevent the slipping of the worm over it. They are then hardened, tempered, and blued. The Limerick hooks are made by cutting the steel, which is made from the best malleable iron, into lengths for two hooks. The ends are then forged out to the shape of barb and point, and the barb is undercut with a file from the solid forged end, instead of being cut and turned up with a knife. On this the reputation of the Limerick hooks depended. They are shaped to the required curve by grasping them in circular pliers, and bending the wire with a turn of the wrist.

FISHING. The capture of fishes for food has been carried on in a variety of ways from the most remote antiquity, and is probably at least as ancient as the hunting or trapping of any kind of wild animal. The supply of food yielded to man by the waters seems always to have borne a very considerable proportion to that yielded by the land. Of all modes of capturing fish, the most simple and primitive is that of taking them with the hand, which is still an amusement of boys, who thus catch trout in small streams by groping below the stones where they hide. This is called in the east of Scotland *gumpung*, in the west *ginneling* or *guddling*. Even sea-fish are sometimes taken by the hand, approaching the shore in such dense shoals that the water seems almost to be filled with them. This is particularly the case on the north-western coast of North America, a region which appears to abound in fish more than any other part of the world; and there, besides the occasional use of the mere hand, the Indian often catches fish by means of a hand-net or a basket, paddling his canoe into the midst of the shoal, and, as it were, baling the fish out of the water. The use both of the net, in various forms, and of the hook and line, as well as also of the fishing-rod, are very ancient. Allusion is made in several places of the Old Testament to the use both of nets and hooks in the capture of fish. Some of the most important fisheries, as the herring-fishery, are carried on almost exclusively by the net. For different fisheries, however, nets of very different kinds are used. See **FISHERIES and NETS**; also **HERRING**, **SALMON**, and other articles on the most important kinds of fish. The capture of some very valuable kinds of fish—as cod, haddock, and others of the same family—takes place chiefly by means of the hook and line, and either by what is called the *long-line*, to which many hooks are attached, and which is extended horizontally over a bank frequented by the fish, its place being marked by floats, and drawn after the lapse of at least several hours; or by the *hand-line*, which, being let down over the side of a boat with a *sinker* proportioned to the strength of the current, is watched by a fisherman holding it in its hand, and hauled up immediately on a fish being felt to bite. The baits are, of course, various, according to the opportunity of procuring them and the kinds of fish. The use of the fishing-rod along with the hook and line is not so general for the capture of sea-fish as of fresh-water fish. See **ANGLING**. A rude fishing-rod, however, is often used for the capture of some sea-fish. The Pollack (q. v.) or lythe, the mackerel, and some other fish of the British seas, are often caught by rod-fishing from boats under sail. The young of the Coal-fish (q. v.) are caught in great numbers by the fishing-rod from rocks on the British coasts; and this, which is chiefly an amusement for boys in most parts of Britain, supplies no inconsiderable part of their food to the inhabitants of Orkney and Shetland. The shooting of fishes with arrows is practised by some of the North American Indians; some very large kinds of fish—as the Arapaima (q. v.)—are occasionally harpooned; and many large

fish, both of the sea and of the fresh water, are killed by means of spears—a mode of fish-capture common enough in some parts of Scotland, and much employed by salmon-poachers, the spear—three-pronged—being known as a *leister*. Torches are also used by night in many parts of the world, both in sea and river fishing to attract fishes by the light, which in this way has an almost certain effect. The poacher on a Scottish salmon-river conjoins the use of the torch with that of the leister, and this is popularly known as 'burning the water.' It is now wholly illegal, as is the use of the leister under any circumstances. The flying-fish is similarly attracted by torches on the coasts of the South Sea Islands, but a small net is used instead of a fish-spear. The inhabitants of the South Sea Islands take advantage of the habit of some fishes, of leaping out of the water when alarmed, to catch them by means of rafts in the shallow lagoons, encircling them so that they finally leap upon the rafts. The Indians of North-western America sometimes adopt a similar method of capturing the Viviparous Fish (q. v.) of their coasts. Other very peculiar modes of catching fish which are in use among them are described in the articles CANDLE-FISH and SALMON OF NORTH AMERICA. They also take the Vancouver Island herring (see HERRING, VANCOUVER ISLAND) by constructing long dams of latticework on flats left dry by the retiring tide, in which the fish are caught which have come in with the tide. This method of taking herring, however, has long been known on the British coasts; and *cruives*, which are lattice-work constructions of a smaller size, have been used with great success in many places. Cruives are also very effective in the capture of salmon, a suitable place of the river being chosen for them, and they being so contrived that the fish readily get in, but do not readily get out. A very peculiar mode of taking fresh-water fishes is practised in Ceylon, by means of a funnel-shaped basket, open at both ends, which is suddenly plunged down, the wider end downwards, till it sticks in the mud, when, if a fish is felt to beat against the sides, it is taken out with the hand.

The capture of fresh-water fish by means of vegetable poisons of various kinds, is practised equally in the East Indies, in Africa, and in the warm parts of America. The poisons used do not render the fish poisonous. The poisoning of trouts and other river-fish with lime is too frequent in some parts of Britain, and is one of the worst kinds of poaching, all the fry, as well as the fish fit for the table, being destroyed, and the mischief often extending far farther down the stream than the perpetrators of it proceed in pursuit of their spoil.

Cormorants are trained by the Chinese for the capture of fish. Otters have also not unfrequently been trained and employed for the same purpose. For a full account of sea-fishing, and the apparatus employed, the reader is referred to *The Sea Fisherman*, by J. C. Wilcocks.

FISH-LOUSE, or SEA-LOUSE, names commonly given to the entomostracous crustaceans of the order *Siphonostoma*. All the creatures of this order are of small size, and parasitic on fishes, aquatic batrachians, &c., on the juices of which they live, although they have also the power of swimming freely in the water, some of their legs being adapted to this purpose, and, indeed, they can swim with extreme rapidity, making use of this power to gain that place where they may obtain food at the expense of other creatures. They do not begin life as parasites, the females depositing their numerous eggs on stones, plants, &c. They are animals of singular form and appearance. The genera *Argulus* and *Caligus* are now regarded as the types of two families. In the former, there is a curious sucking disc on each side of the beak or proboscis, although there are also jointed members terminated by prehensile hooks. In the latter, the hooks of the anterior pairs of feet are the principal organs of adhesion to the slippery bodies of the fishes from which food is to be drawn; and the abdomen of the female is furnished with two remarkably long tubes, the functions of which are not perfectly ascertained. The bodies of all of them are transparent, or nearly so. Some of the *Caligidae* are common on many of the British sea-fishes; *Argulus foliaceus* on fresh-water fishes, and even on tadpoles. Sickly fishes often become the victims of multitudes of these creatures.

The name fish-louse is sometimes given also to the *Lernæidæ*, but they are very different.

FISHING-FROG. See **ANGLER**.

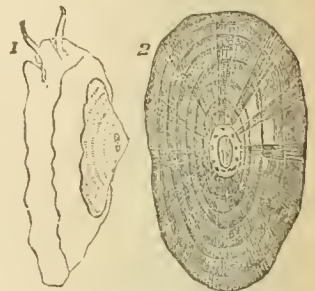
FISHING-TACKLE. See **ANGLING**.

FISHPONDS. See **PISCICULTURE**.

FISK, or FISC, a term often to be found in the Scottish law-books. It is derived from the Latin *fiscus*, literally, a wicker-basket, which came ultimately to signify the privy purse of the emperor, as distinguished from the public treasury, which was called *ærarium*. In Scotland, it signifies generally the crown's revenues, to which the movable estate of a person denounced rebel was formerly forfeited. It still gives his name to a very important officer, the Procurator Fiscal (q. v.), or public prosecutor in the first instance, by whom all crimes are prosecuted before sheriffs and other inferior judges, and whose duty it is to report to crown counsel—i. e., to the Lord Advocate, or his deputies—all cases which, from their aggravated character, require to be tried by a higher court. See **PUBLIC PROSECUTOR**.

FISSIROSTRES (Lat. split-beaked), a tribe of birds, one of the tribes into which the great order *Inscissores* is divided. It is characterized by peculiar width of gape, and the bill is depressed or horizontally flattened, short, and often furnished with strong bristles at the angles; the birds of this tribe being insectivorous, and generally subsisting by catching insects on the wing, to which this structure of bill is beautifully adapted. The powers of flight are generally great, but the legs are short and weak. Swallows and goat-suckers are familiar examples of this order.

FISSURELLIDÆ, a family of gasteropodous molluscs, of the order *Scutibranchiata*. The shell much resembles that of the limpet family (*Patellidæ*) but has either a hole at the apex, or a slit at the front margin. The hole at the apex characterizes the genus *Fissurella* (Keyhole Limpets), and the slit appears in the genus *Emarginula*. These openings of the shell are subservient both to the passage of the water requisite for respiration, and the discharge of the excrements. The fissurellidæ resemble limpets in their habits, and are found either on the sea-shore or at no very great depth. They are widely distributed over the world. Several species are British.

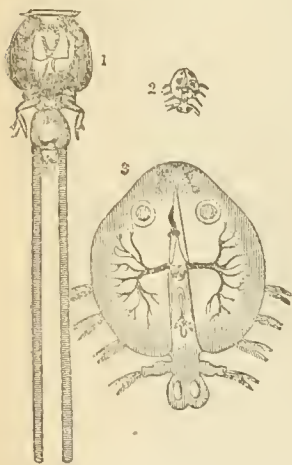


Fissurella:
1, the animal; 2, the shell.

FISTULA, in former times, was applied, in its etymological meaning of a *pipe*, to such Abscesses (q. v.) as had contracted to narrow, hard, open passages in the soft texture of the body (see **TISSUE**), lined by a kind of false membrane, giving rise to a thin discharge. At the present time, however, the term fistula is generally limited to the opening of such a passage when in close contact with a mucous membrane. Thus it is common to speak of salivary, urinary fistula, &c.; and the most common and troublesome kind of all is the fistula in ano, in connection with the lower bowel, or Rectum (q. v.). The treatment of fistula should only be intrusted to experienced surgeons; but there are always quacks in abundance willing to undertake it, and hold out flattering hopes of an early cure without proper surgical procedure.

For the cure of salivary or urinary fistula, all that is generally necessary is to restore the patency of the ducts, which is done by passing instruments along them. Should a fistula, however, be situated where it is surrounded by muscular fibres, as at the orifice of the lower bowel, it is necessary to divide these muscular fibres, so as to leave the part at rest while nature repairs it. As the sinus, which is the continuation inwards of the fistula, is lined with imperfectly organized lymph, it is generally necessary to stimulate the part by the introduction of lint, either alone or saturated with some irritant, such as sulphate of zinc, which, when mixed in the proportion of 1–3 grains to each ounce of water, and colored with lavender, makes the famous red lotion of the shops.

At times, however, fistulæ require more elaborate treatment, and are extremely difficult to close, especially those which result from loss of tissue between two adjacent mucous canals; fortunately, however, modern surgery is able to remedy these also. It is necessary to make the edges of the orifice once more raw, and to bring them in contact, but formerly the wound used rarely to unite, as the stitches produced such an amount of irritation. Now, however, by the use of silver or iron wire, according to the taste of the surgeon, the parts can be kept together long enough to insure union; and thus, by the ingenuity of American surgeons, especially Marion Sims of New York, and others in this country, certain diseases of women, arising from protracted labors, and formerly rendering the unfortunate subjects of them miserable and unfitted for any of the duties of life, may be now remedied by a skilfully performed, but almost painless proceeding.



Fish-Louse:

1, *Caligus* (female); 2, *Argulus*, natural size; 3, *Argulus*, magnified.

FISTULARIDÆ, AULOSTOMIDÆ, or FLUTE-MOUTHS, a family of acanthopterous fishes, remarkable for the conformation of the head; the skull being elongated into a tube, at the extremity of which are the mouth and jaws. The species are all marine; they are widely distributed; only one, the Snipe-



Snipe or Trumpet Fish (*Centriscus scolopax*),

fish, Sea-snipe, or Trumpet-fish (*Centriscus scolopax*), is found, and that very rarely, in the British seas. These fishes are not to be confounded with the Pipe-fishes, which have a similar elongation of snout, but are otherwise very different.

FISTULINA, a genus of fungi allied to *Boletus* (q. v.); the under surface (*hymenium*) at first covered with minute warts, which ultimately form tubes. *F. hepatica* is common in Britain and throughout Europe on old oak, walnut, and chestnut trees; it occurs also on ash and beech. It is semicircular, of very regular outline, with a lateral stem, or none; its color red; its substance fibrous and fleshy, much resembling beet-root. When old and beginning to decay, it looks like a mass of liver. It some-



Fistulina Hepatica.

times attains a great size. Dr. Dadham describes a specimen nearly five feet round, and weighing eight pounds. Mr. Berkeley mentions one which grew on an ash pollard, and weighed nearly thirty pounds. This fungus is much esteemed in some parts of Europe as an esculent; it is wholesome and nutritious; and the abundance in which it may often be procured, makes it the more worthy of regard; whilst there is almost no possibility of confounding it with any dangerous fungus. Its taste resembles that of the common mushroom, but is rather more acid. 'When grilled, it is scarcely to be distinguished from broiled meat.' It furnishes itself with abundance of sauce.

FITCHBURG, a city of Massachusetts, U.S., is 40 miles N.W. of Boston. It is the terminus of four railways, and has manufacturers of machinery, chairs, paper, and tools. Pop. (1880) 12,405.

FITCHY, or FITCHÉ. Crosses are said, in Heraldry, to be F. when the lower branch ends in a point.

FITS, a name popularly applied to Convulsions (q. v.), or, indeed, to any sudden seizure of disease implying loss of consciousness, or any considerable change in the condition of the mind.

FITZ is an old Norman word signifying 'son,' evidently from the Lat. *filius* (Fr. *fils*). Like the Scotch *Mac*, the Irish *O'*, and the Oriental *Ben*, it is prefixed to proper names to signify descent, as in the Norman names Fitzwilliam, Fitzwalter, Fitzgerald. A later application of it has been to denote the natural sons of royalty, as in Fitzroy, Fitzjames, and Fitzclarence. The Russian termination *witch* is a disguised form of the same word.

FIUME (in the Illyrian language, *Reka* or *Rika*; Latin, *Fanum* *Sti Viti ad flumen*) an important seaport of Austria, is situated at the efflux of the Fiumara into the Gulf of Quarnero, in the Adriatic, 40 miles south-east of Trieste, across the Istrian peninsula, in lat. 45° 20' N., and long. 14° 26' E. F. has quite the character of a German town, is adorned with many handsome buildings, and consists of an old and new town, which together contain (1880) 20,981 inhabitants. It has manufactures of tobacco, paper, ropes, Whithead torpedoes, and a flourishing trade in ship-building. F. has a fine quay, with a light-house, and its commerce is of late increasing. It has been a free port since 1722; and in 1849 was severed from Hungary with the territory to which it belongs, but since 1870 is again under the Hungarian administration.

FIVES, a popular game in England, and one especially enjoyed by school-boys, and in certain barracks where there is a 'court' by soldiers. The game existed at a very early period—14th c.—both in France and England, being termed 'palm-play' in the former, and 'hand-tennis' in the latter; its present name is derived from its being played usually by five on each side. The method of playing the game is very simple; a good roomy court is requisite, bounded by a high wall at one end, and against this wall a ball is propelled by striking it with the open hand. The players arrange themselves either five against five, as is usually the case, or in fewer numbers, and begin the game by one member striking the ball against the wall, and causing it to rebound anywhere beyond the floor-score, which is about two yards from the wall; one of the opposite party then strikes the ball as it rebounds, and if it does not touch the wall higher than three feet from the ground, his stroke goes for nothing, and the opposite party score one. The ball may be struck either from a direct rebound before it reaches the ground, or after it has 'dapped' or hopped from the ground once. Fifteen is usually game. When the players are skilful, the ball is kept going by the alternate strikers for many minutes at a time, and the game is thus rendered exciting both for players and onlookers.

FIXED AIR was the name given to Carbonic Acid (q. v.) by Dr. Black, who was the first to observe that the solid substance, carbonate of magnesia ($MgO.CO_2$), could, when heated, evolve carbonic acid (CO_2), proving that the latter was a *fixed air* whilst in union with the magnesia.

FIXED BODIES is a term applied in chemistry to those substances which remain fixed, and are not volatilized at moderately high temperatures.

FIXED OILS, are those oils which, on the application of heat, do not volatilize without decomposition. See **OILS**.

FIXED STARS. See **STARS**.

FIXING, in Photography. When a picture has been obtained through the agency of light, by the exposure of a sensitive surface suitably prepared, and the subsequent development of the latent image, there remains in the deepest shadows of the picture a portion of the sensitive material, unacted upon by light. The removal of this unaltered sensitive material by an appropriate solvent, is termed fixing, though the term *clearing* would perhaps be preferable, fixing being more strictly accurate in the case of the Daguerreotype process (q. v.), where the picture is literally *fixed* to the silver-plate by the deposition of a film of metallic gold, of extreme tenuity, from a boiling hot solution of Sel D'or (q. v.).

For particulars of failures arising from imperfect fixation or clearing, see **PHOTOGRAPHY**.

FIXTURES, in the Law of England, are those personal chattels (q. v.) which are let into the soil, or otherwise actually affixed to the freehold; a definition which is sufficiently accurate to afford a principle for the solution of the questions which arise between landlord and tenant as to the right of the former to retain, or of the latter to remove—but a principle, the application of which is attended with many practical difficulties. If the chattels be entirely clear of the soil, they are not fixtures at all, and may be carried off at pleasure like any other species of personal property. The general rule as to what constitutes a fixture legally immovable is, that it must be either let into the earth, or cemented or otherwise united to some erection previously attached to the ground, so that it would be waste to remove it afterwards (Woodfall, pp. 466, 467). But it must be remarked, that a tenant may in all cases construct any erection he may make in such a manner as that it shall not become a fixture. Thus, if he even erect buildings—as barns, granaries, sheds, and mills—upon blocks, rollers, pattens, pillars, or plates, resting on brickwork, they may be removed, although they have sunk into the ground by their own weight (*Id.* 467). To this rule various exceptions have been made in favor of what have been called *trade-fixtures*, or fixtures put up for the purpose of carrying on a trade; and the statute mentioned below has greatly modified the law as to those erected for agricultural purposes. It is difficult to state the limits of the exception with reference to trade-fixtures with any approach to accuracy. The following is perhaps as near an approach as the varying circumstances of each individual case will admit of.

'Whenever the following circumstances occur, it may be confidently pronounced that there the tenant may safely remove the article. Thus, things which the tenant has fixed to the freehold for the purposes of trade or manufacture, may be taken away by him whenever the removal is not contrary to any prevailing practice; where the articles can be removed without causing material injury to the estate, and where of themselves they were of a perfect chattel nature before they were put up, or at least have in substance that character independently of their union with the soil—or, in other words, where they may be removed without being entirely demolished, or losing their essential character or

value' (*Ib.* p. 468); see also the case of *Hellawell v. Eastwood*, 6 Excheq. Rep. 312. Nurserymen have been allowed to remove trees and shrubs which they have planted expressly for purposes of sale, but not to plough up strawberry-beds, out of the ordinary course of management of the nursery-ground. Neither can they remove hot-houses, green-houses, forcing-pits, or other erections of that description; and in no case can private persons sell or remove fruit-trees, though planted by themselves (*Amos and Ferand on Fictures*, 342, 2d edition). The provision of the common law of England with reference to agricultural fixtures has been modified by 14 and 15 Vict. c. 25, s. 3, which provides, that if any tenant of a farm or land shall, with the consent in writing of the landlord for the time being, at his own cost, erect any farm-buildings, either detached or otherwise, or put up any other building, engine, or machinery, either for agricultural purposes or for the purposes of trade and agriculture (which shall not have been put up in pursuance of some obligation in that behalf), then all such building, engines, and machinery shall be the property of the tenant, and shall be removable by him, notwithstanding the same may consist of separate buildings, or that the same, or any part thereof, may be built in or permanently fixed to the soil, so as the tenant making such removal do not in anywise injure the land or buildings belonging to the landlord, or otherwise do put the same in like plight and condition as the same were in before the erection of anything so removed, provided that no tenant shall be entitled to remove any such matter or thing without giving to the landlord or his agent one month's previous notice in writing of his intention so to do; and thereupon it shall be lawful for the landlord, or his agent, on his authority, to elect to purchase the matters and things proposed to be removed; and the right to remove the same shall thereby cease, and the same shall belong to the landlord; and the value thereof shall be ascertained by two referees, one to be chosen by each party, or by an umpire to be named by such referees, and shall be paid or allowed in account by the landlord who shall have so elected to purchase. This act is confined to England; but in questions of fixtures, as Mr. Hunter observes, the common law of England having been deemed practically authoritative in Scotland, the clause affords valuable matter for consideration, as showing what has been held advisable in England (*Landlord and Tenant*, p. 290, 3d edition). In Scotland, it has been customary, in agricultural leases more particularly, to determine the respective rights of landlord and tenant by positive stipulation, and, for this reason, fewer points have been decided by the courts than in England.

As regards urban tenements, the rule seems to be, that the tenant may remove whatever he has fixed up for ornament or domestic use—e. g., hangings, wainscot, stoves, &c., but not such erections as have become part of the tenement, and constitute permanent improvements. Thus, he cannot remove a conservatory fixed to and communicating with rooms in a dwelling-house by windows and doors.

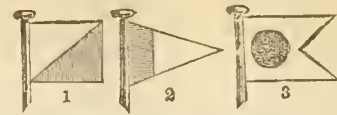
FLACCUS, C. VALERIUS, a Roman poet, who flourished in the 1st c., and is supposed to have died 88 A.D. Absolutely nothing is known regarding his life. He is the author of an epic poem on the Argonautic expedition, which in its extant form is incomplete. Some modern critics, Wagner among others, praise it extravagantly, and place the author next to Virgil; but the more general opinion of sound scholars is, that the work is rather a specimen of learned mediocrity than of genuine inspiration. The *editio princeps* of the *Argonautica* appeared in 1472. Of modern editions, may be mentioned those of Wagner (Gött. 1805) and Lemaire (Paris 1824). An English metrical translation was published by one Nicholas Whyte as early as 1565. Similar translations exist in French, Italian, and German.

FLACOURTIA 'CEÆ, a natural order of exogenous plants, allied to Passion-flowers, consisting of shrubs and small trees, almost exclusively confined to the warmest parts of the globe. Many of the species, particularly of the genus *Flacourtia*, produce pleasant, sweet, or subacid fruits. *Flacourtia inermis* is much esteemed and cultivated in the Moluccas. Aruotto (q. v.) is produced by a tree of this order.

FLAG, a popular name for many endogenous plants with sword-shaped leaves, mostly growing in moist situations. It is sometimes particularly appropriated to the species of *Iris* (q. v.), or Flower-de-luce; but is given also very indiscriminately to other plants of similar foliage, as the *Acorus calamus* (see ACORUS), which is called Sweet Flag.

FLAG (common to the Teutonic languages, and derived from a root signifying to fly), a cloth of light material, capable of being extended by the wind, and designed to make known some fact or want to spectators. In the army, a flag is the ensign carried as its distinguishing mark by each regiment; and also a small banner, with which the ground to be occupied is marked out. In the navy, the flag is of more importance, often constituting the only means vessels have of communicating with each other, or with the shore. For this purpose, devices of conspicuous colors

(usually black, white, red, yellow, or blue) are hoisted at the mast-head or at the gaff. The flags having three forms—viz.

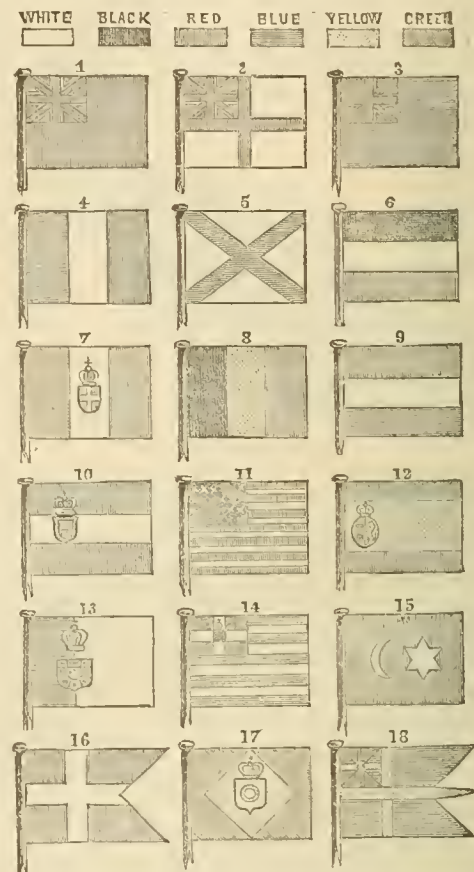


1, the Square Flag; 2, the Pennant; 3, the Burgee;

a very few patterns in each shape give sufficient combinations of three or four flags to express any letter or word in the language.

The flag is also a sign of the rank of the principal person on board a vessel, as the 'Royal Standard,' containing the arms of the United Kingdom, which is only hoisted when a member of the royal family is on board; the Anchor of Hope, on a red ground, denoting the Admiralty; the pennant, which specifies the ship of war; and the ensign, which denotes the nation.

The British ensigns and those borne by ships-of-war of the leading states of the world are as shown below (in these diagrams, the direction of the lines shows the color as in heraldry), viz.:



Flags of the Principal Maritime Nations:

- 1, Britain, red ensign; 2, Britain, white ensign; 3, Britain, blue ensign; 4, France; 5, Russia; 6, Germany; 7, Italy; 8, Belgium; 9, Holland; 10, Austro-Hungary; 11, United States; 12, Spain; 13, Portugal; 14, Greece; 15, Turkey; 16, Denmark; 17, Brazil; 18, Sweden.

A white flag is accepted throughout the world as a token of peace; a red flag, as defiance; and a black flag denotes a pirate; a flag of plain yellow usually signifies that the vessel bearing it is in quarantine. See also UNION JACK.

FLAG OF THE PROPHET (Sanjak-Sherif) is the sacred banner of the Mohammedans. It was originally of a white color, and was composed of the turban of the Koreish, captured by Mohammed. A black flag was, however, soon substituted in its place, consisting of the curtain that hung before the door of Ayesha, one of the Prophet's wives. This flag, regarded by the Mohammedans as their most sacred relic, first came into the possession of the followers of Omar at Damascus; it afterwards fell into the hands of the Abbasi; then passed into those of the califs of Bagdad and Kahirah; and, at a later period, was brought into Europe by Amurath III. It was covered with forty-two wrappings of silk, deposited in a costly casket, and preserved in a chapel in the interior of the seraglio, where it is guarded by several emirs, with constant prayers.

The banner unfolded at the commencement of a war, and like-

wise carefully preserved, is not the same, although it is believed by the people to be so.

FLAG-CAPTAIN, in the Navy, is the captain of the admiral's ship in any squadron, and is ordinarily his nominee.

FLAG-LIEUTENANT is an officer who, in the navy, performs such duties for an admiral as would devolve upon an aide-de-camp in the army. He communicates the admiral's orders to the various ships, either personally or by signal.

FLAG-OFFICER, in the British Navy, is an admiral, vice-admiral, or rear-admiral. He is so called from his right to carry, at the mast-head of the ship in which he sails, a flag denoting his rank. For an admiral, the flag is borne at the main; for a vice-admiral, at the fore; and for a rear-admiral, at the mizzen: the flag being, in either case, a red cross on a white ground. For the former division by squadrons, see **ADMIRAL**.

FLAG-SHIP, the ship in a fleet which bears the admiral's flag, and therefore forms a sort of center to which all other vessels must look for orders. It is usually the largest vessel in the fleet.

FLAGGELLANTS, the name given to certain bodies of fanatical enthusiasts, who, at various intervals from the 13th to the 16th c., made their appearance in the different countries of Europe, proclaiming the wrath of God against the corruption of the times, inviting sinners to atone for sin by self-inflicted scourgings or flagellations, and themselves publicly enforcing this exhortation by voluntary scourging of themselves, and by other forms of self-castigation. In large and disorderly bands—frequently headed by priests, and by fanatics in the costume of priests and monks, bearing banners and crucifixes aloft, their breast and shoulders bare, and their face concealed by a hood or mask, each armed with a heavy knotted scourge, loaded with lead or iron—they marched from town to town, chanting hymns full of denunciations of vengeance and of woe. In the most public place of each town which they entered, they threw themselves upon the earth, with their arms extended in the form of a cross, and there inflicted upon themselves the discipline of scourging, frequently to blood, and even to mutilation. Each member enrolled himself for 33 days, in honor of the 33 years of the life of our Lord on earth; and all for the time professed entire poverty, subsisting only on alms or voluntary offerings. These fanatical movements, resembling, in some respects, at least, the religious revivals of our own time, recurred at frequent intervals. The most remarkable, however, are three in number. The first originated at Perugia in 1260, at a time when society in Italy was greatly disorganized by the long continued struggles of the Guelph and Ghibelline factions.

The very disorders of the time prepared the way for this religious reaction. Numbers crowded to follow the new cry, until at last the body became so formidable as to draw upon itself the suspicions of Manfred, the son of Frederic II., by whom it was vigorously suppressed. Later offshoots of the party made their appearance in Bavaria, Austria, Moravia, Bohemia, Poland, and France; when to their extravagant practices, they added still greater extravagances of doctrine. In virtue of a pretended revelation, they asserted that the blood shed in self-flagellation had a share with the blood of our Lord in atoning for sin; they mutually confessed and absolved each other, and declared their voluntary penances to be a substitute for all the sacraments of the church, and for all the ministrations of the clergy. The Jews were to them an object of special abhorrence; and this unfortunate race, exposed at all times to every caprice of the popular will, suffered dreadfully from the fury of the Flagellants in many of the towns of Germany and the Netherlands. In the second outbreak of Flagellantism about 1349, the outrages against public decency were much more flagrant than at its first appearance. Men and women indiscriminately now appeared in public half naked, and ostentatiously underwent these self-inflicted scourgings. The immediate occasion of this new outburst of fanaticism, was the terror which pervaded society during the dreadful plague known as the Black Death, which Hecker, in his *Epidemics of the Middle Ages*, describes with terrible fidelity. The same extravagances were again repeated in Upper Germany, the provinces of the Rhine, the Netherlands, Switzerland, Sweden, and even England. Although rigorously excluded from France, these fanatics effected an entrance into Avignon, then the residence of the popes, when they were condemned by a bull of Clement VI. The mania gradually subsided, nor do we again find any permanent trace of it till the beginning of the next century. In the year 1414, a new troop of Flagellants, locally called *Flegler*, made their appearance in Thuringia and Lower Saxony, renewing and even exaggerating the wildest extravagances of their predecessors. These new fanatics appear to have rejected all the received religious usages, and indeed all external worship, placing their entire reliance on faith and 'flagellation.' Their leader was called Conrad Schmidt. They rejected not only the doctrines of the church upon the sacraments, but also purgatory and prayers for the dead. Schmidt pretended a divine mission; and proclaimed that the blood of

flagellation was the true wedding-garment of the gospel; that it was more precious than the blood of the martyrs, and a sure passport to eternal life. The violence of these fanatics drew upon them the severest punishments of the Inquisition. Many of them were capitally condemned, and Schmidt himself was burned at Sangerhausen in 1414. Their doctrines, comprised in fifty articles, were condemned in the Council of Constance.

These strange extravagances are reprobated by the Roman Catholic Church in common with all other Christian communities; but Roman Catholics (relying on 1 Cor. ix. 27, Coloss. iii. 5) held the lawfulness, and even the meritorious character, of voluntary self-castigation, if undertaken with due dispositions, practised without ostentation or fanaticism, and animated by a lively faith and a firm hope in the merits of Christ. This is the self-castigation known under the name of 'the Discipline'—a form of mortification not unfrequent in the monastic state, and even practised by lay persons, and these sometimes of the highest rank, both in ancient and in modern times. Compare Förstemann's *Die Christlichen Geisslergesellschaften*, Wadding's *Annales Minorum Fratrum*, Raynaldi's *Continuation of Baronius*, Mosheim's *Church History* (Soames' ed.), Gieseler's *Kirchengeschichte*, and Milman's *Latin Christianity*.

FLAGEOLET, a wind instrument with a mouthpiece like the common whistle. It is made of boxwood or ivory, in several pieces, and has holes for the fingers, like the flute. According to Burney, the flageolet was invented by Sienr Juvigny in 1580.

FLAGEOLET-TONES is the name given to the harmonic notes of the violin, violoncello, and other stringed instruments, which notes are produced by the finger lightly touching the string on the exact part which generates the harmony, and not by pressing the string down to the finger-board. The string vibrates on both sides of the finger, the long side dividing itself into parts of the same length as the short side. See **HARMONICS**. The inventor of the manner of playing flageolet tones is said to have been Domenico Ferrari. The best work on the subject is by Collinet.

FLAGSTONE, a rock which splits into tabular masses, or flags of various size and thickness, in the original plans of stratification. Flagstones are generally sandstones, combined with more or less argillaceous or calcareous matter; some, however, are indurated clays, and others thin-bedded limestones. They are used for paving, cisterns, &c. The most famous are those of Festiniog (North Wales), remarkable for their large size, even grain, and great beauty; those of Yorkshire, also of large size, and of great hardness and toughness; and those of Caithness, which are extremely tough and durable. The Caithness flags belong to the Old Red Sandstone; the Yorkshire are taken from the millstone grit division of the Coal Measures.

FLAHAULT DE LA BILLARDERIE, AUGUSTE CHARLES JOSEPH, COMTE DE, a French soldier and diplomatist, was born at Paris on 20th April 1785. He was destined for the army by his father, a general officer; and when a mere lad, he crossed the Alps with Napoleon as a volunteer in a cavalry regiment. He was rapidly promoted to the rank of aide-de-camp of Napoleon. He distinguished himself in the Peninsular War and the Russian campaign; and in 1813, received the title of Count, and the rank of general of division in the new army. On the return of Napoleon from Elba, he was one of those who recommended him to abdicate in favor of his son. He became an exile after Waterloo; and while in England married a Scotch heiress, Lady Keith, the proprietor of Tulliallan, in Clackmannanshire, and a British peeress in her own right. His name was afterwards removed from the list of exiles. After the revolution of 1830, F. returned to France, and was restored to his rank in the army. He entered the household of the king, and was appointed ambassador to Vienna, a post he held from 1842 to 1848. After the establishment of the second Empire, F. was called to the senate; and in 1860, sent as French ambassador to London, a post for which his acquaintance with this country, and connection through his wife with the higher classes in England, well fitted him, and which he retained until 1862. In 1864, he was named Grand Chancellor of the Legion of Honor. His daughter married the fourth Marquis of Lansdowne. He died in 1870.

FLAMBOROUGH HEAD (Saxon *Fleamburgh*), a promontory of the Yorkshire coast, and forming the northern boundary of Bridlington Bay. It terminates a range of white perpendicular chalk cliffs, 6 m. long, 300 to 450 ft. high. Its rugged sides contain many caverns, and in the sea near are picturesque chalk rocks, which swarm with sea-birds. The chalk contains fossil sponges, crinoids, &c. On the Head is a lighthouse, 214 ft. high, seen 19 m. off. Across the peninsula, ending in the Head, runs a ditch with two lines of defence and breast-works, called Dane's Dyke, but really ancient British work.

FLAMBOYANT, the latest style of Gothic architecture which prevailed in France. It prevailed there during the 15th and part of the 16th centuries, and corresponds to the Perpendicular (q. v.)

in England. The name is derived from the flame-like forms of the tracery of the windows, panels, &c. (fig. 1). The characteris-

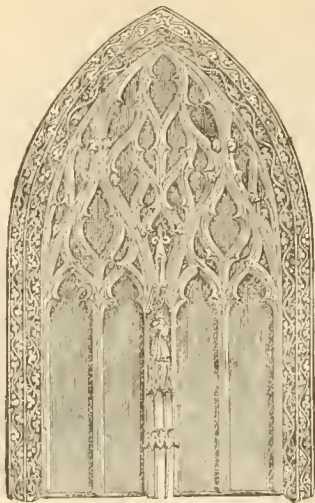


Fig.—Window, Harfleur.

tics of the style are minute and elaborate ornament, combined with general bareness of surface.

The crockets, for instance, are generally cut into a great number of small leaves, while they are placed far apart: the mouldings are divided into large empty hollows, and small thin fillets and beads: the finials have crockets minutely carved, set upon bare pyramidal terminals; the arch-mouldings are divided into a great number of small parts, and want the boldness and decision of the earlier styles. These mouldings are frequently abutted on the pillars, or continued down them without any caps; and when there are caps, they are small and without effect. See fig. 2. When mouldings join, they are frequently run through one another, so as to appear to interlace. The effect is intricate rather than beautiful, suggestive, like the rest of the style, of ingenuity in stone-cutting rather than art. The doorways and windows are sometimes large and fine (as in fig. 1); but while these are highly enriched, the general surface of the building is left too plain. There are many large buildings in France executed in this style, but it is usually portions only which

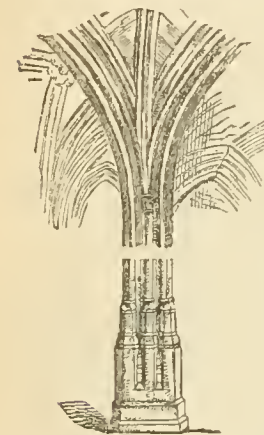


Fig. 2.

are fine, not the general effect. Some of the spires of this period are also very beautiful. The north spire of Chartres Cathedral, for example, is considered one of the finest in France.

FLAME is a particular form of Combustion (q. v.) of burning. Ordinary combustion consists in the oxygen of the atmosphere combining with some combustible substance so rapidly as to give out light and heat. When the combustible is either originally a gas, or becomes so by the heat, the combustion takes the form of flame. Flame, then, is the burning of a gas. In most cases, the gas of flame is a compound of hydrogen and carbon, with minute particles of solid carbon suspended in it, and is formed from the fuel (coal, tallow, &c.) being decomposed by the heat. The heat and light of flame vary with the gas: hydrogen produces great heat, but little light. The lighting power of a gas depends upon the proportion of carbon it contains, the particles of which become glowing hot before being consumed.



Fig. 1.

the dark central space above the wick, it will conduct away a por-

tion of the combustible vapor, which may be kindled like a gas-jet at its upper end, as represented in fig. 1. The dark portion of the flame may be called the *area of no combustion*.

The luminous cone which envelopes the dark space is the *area of partial combustion*. The oxygen of the atmosphere penetrates to this depth, but not in sufficient quantity to oxidize or burn both the carbon and the hydrogen; it therefore unites with the hydrogen, for which it has the stronger attraction, and leaves the carbon free. The outer cone is named the *area of complete combustion*, because there the carbon meets with sufficient oxygen to burn it entirely. The light is produced in the area of partial combustion, where the carbon is set free from the hydrogen in the form of solid particles, and is heated to whiteness by the combustion of the hydrogen. The combustion of the carbon in the outer cone, by which it is converted into carbonic acid gas, produces heat, but so little light as to be barely traceable.

That carbon exists in a solid state in the white part of a flame, is readily shown by holding a piece of white earthen-ware into it, which becomes coated with carbon in the form of soot. No soot is deposited in the dark or no-combustion area of the flame, because there the carbon is in chemical combination with hydrogen, forming a gas. The carbon becomes solid only when the hydrogen deserts it, as it were, to unite with oxygen.

The highly illuminating power of compounds of hydrogen and carbon is thus traced to the fact, that *their hydrogen and carbon do not burn simultaneously, but successively, and in such a way that the one heats the other white hot*. It is quite possible to make them burn simultaneously; but when they do, the light evolved is very feeble. This takes place in the 'Bunsen burner,' in which air is allowed to mix with the gas before combustion.

FLA'MENS were priests in ancient Rome devoted each to some special deity. There were fifteen in all. The chief of these (*Flamines Majores*) were the flamens of Jupiter, of Mars, and of Quirinus, who were always patricians, the remaining twelve (*Flamines Minores*) were chosen from the plebeians. The flamens were elected at first by the *Comitia Curiata*, but afterwards by the *Comitia Tributa*, and were installed into their office by the supreme dignitary of the Roman pagan religion, the *Pontifex Maximus*. The flamen of Jupiter was a privileged person; he was not required to take an oath, was attended by a lictor, his house was an asylum, and he had a seat in the senate. But all this was attended by numerous superstitious restrictions: he might not have a knot on any part of his attire, nor touch flour, or leaven, or leavened bread; he might not touch or name a dog, or mount a horse, or be a night out of the city, &c. His wife, called *Flaminica*, was subjected to similar restrictions, and when she died, the flamen was obliged to resign. The majority of Roman writers attribute the institution of flamens to Numa.

FLAMI'NGO (*Phœnicopterus*), a genus of birds which until recently was placed by all naturalists among the *Grallatores* (Waders, but is now generally ranked among the *Palmipedes*, and even referred to the family of *Anatidæ*. The bill is large, deeper than broad, and suddenly curved downwards near the middle, so that, as the bird wades and seeks its food, either in water or in the mud, it makes use of the bill in a reversed position, the upper mandible being lowest. The edges of both mandibles are furnished with small and very fine transverse laminae, which serve, like those in the bills of the ordinary *Anatidæ*, to prevent the escape of the small crustaceans, molluscs, worms, small fishes, seeds, &c., which are the F.'s food, and to separate them from the mud with which they may be mingled. The upper surface of the tongue is also furnished on both sides and at the base with numerous small flexible horny spines, directed backwards. Unlike the ordinary *Anatidæ*, flamingoes have great part of the tibia, as well as the tarsus, naked, in this resembling all the Waders. They are birds of powerful wing, and fly either in strings or in wedge-shaped flocks like geese, a single bird leading the way for the flock. They seldom make use of their webbed feet for swimming, to which the length of their legs is not well adapted, the use of the membrane being rather to support them on soft muddy bottoms. When feeding, they keep

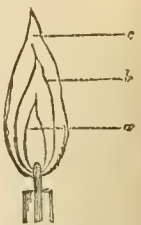


Fig. 2.
a, area of no combustion; b, area of partial combustion; c, area of complete combustion.



Flamingo (*Phœnicopterus ruber*)

their feet in almost constant

motion, as if to stir the mud. Hundreds may sometimes be seen feeding together in the shallow waters or salt marshes of tropical coasts, chiefly of Asia and Africa, or on the banks of rivers or inland lakes, and by their large size and rich colors making a brilliant spectacle. They make their nests in marshes, scraping together a heap of mud, on the top of which is the nest; and it is said that the long legs of the female F. often hang down into the water during the incubation, not being easily disposed of otherwise.—There are several species of F., but very similar to each other, both in appearance and habits. One species only visits the south of Europe, the Common F. (*P. ruber*), a bird measuring fully four feet from the tip of the bill to that of the tail, and six feet from the tip of the bill to the claws; the male, when in full plumage, is of a rose-red color, with deep purple wings; the female, and the young for several years, are less brilliant, the young at first being whitish, and the red first appearing on the wings.—The AMERICAN F. (*P. Americanus* or *Chilensis*) is of a more orange tint, and is abundant on many parts both of the eastern and western coasts of America.

FLAMINIAN WAY (*Via Flaminia*), the great northern road of ancient Italy, leading from Rome to Ariminum (*Rimini*) on the Adriatic. It was constructed by C. Flaminius during his censorship (220 B.C.), and was designed to secure a free communication with the recently conquered Gaulish territory. The F. W. was one of the most celebrated and most frequented roads of Italy both during the period of the Republic and of the Empire. Its importance may be estimated from the fact, that when Augustus (27 B.C.) appointed persons of consular dignity road-surveyors for the other highways of his dominions, he reserved the care of the F. W. for himself, and renewed it throughout its whole length. Its general direction was northerly. Leaving Rome, it kept for the most part at no great distance from the Tiber till it reached Narnia (*Narni*), where it struck off in a north-easterly direction, passing Interamna (*Terni*) and Spoletium (*Spoletto*), and reaching the foot of the Apennines, at Forum Flaminii. Crossing the central ridge of the Apennines, at Ad Ensem (*La Schiavina*?), it again proceeded in a northerly direction, pursuing much the same line of route as the modern road from Foligno to Fano, and reached the Adriatic at Fanum Fortunæ (Fano), whence it wound along the coast to Ariminum (*Rimini*), where it ended, or rather where the name ceased; for the *Via Æmilia* (see **EMILIAN PROVINCES**) was just a continuation of it. The whole length of the road from Rome to Ariminum was (according to the Jerusalem Itinerary), 222 miles, and according to the Antonine, 210 miles. Remains of it still exist at various places, and assist the antiquary in tracing its direction.

FLAMSTEED, JOHN, the first astronomer-royal of England, for whose use the Royal Observatory at Greenwich (called Flamsteed House) was built, was born near Derby, 19th August 1646, and early devoted himself to mathematical and astronomical pursuits. While yet a youth, he mastered the theory of the calculation of eclipses; and his calculations of some remarkable eclipses of the moon were the means of introducing him to the notice of the eminent scientific men of his time, among others to Sir Jonas Moore, then Surveyor-general of the Ordnance, through whom, and in connection with whose department, he was appointed astronomer to the king in 1675. The year following, the Observatory at Greenwich was built, and F. began that series of observations that constitute the commencement of modern practical astronomy. He formed the first trustworthy catalogue of the fixed stars, and furnished those lunar observations on which Newton depended for the verification of his lunar theory. Extracts from the papers of F., found in the Observatory by Mr. Francis Baily, and published by authority of the Admiralty in 1835, brought to light a very sharp quarrel that had taken place between F. and Newton and Halley with regard to the publication of the results of F.'s labors. The *Historia Cælestis Britannica*, his great work, in three vols., giving an account of the methods and results of astronomical observation up to his time, was begun to be printed before his death in 1719, but was not published till 1725. It may be mentioned that F., while following his scientific pursuits, qualified himself for holy orders, and in 1684 was presented to the living of Burslow, in Surrey, which he held till his death.

FLANCHES, or FLANQUES, in Heraldry, are composed of arched lines drawn from the upper angles of the escutcheon to the base points. The arches of the flanches almost meet in the center of the shield. The Flanches are an ordinary little used in Scotch heraldry.

FLANCONNADE, a thrust in Fencing (q. v.).

FLANDERS was formerly the name of an extensive and almost independent territory ruled by 'counts,' and embracing, besides the present Belgian provinces of the same name, the southern portion of the province of Zealand in Holland, and some of the departments in the north-east of France. Cæsar found

this district inhabited by the Morini, the Menapii, and the Nervii, and having conquered these tribes, he annexed the country. Under the rule of the Franks, the river Scheldt, which flowed through the district, formed the boundary line between Neustria and Austrasia, in consequence of which the northern and south-western part of the territory comprised under the term F., although its population was decidedly Germanic, came to belong to France, while the south-east, although to a large extent non-Germanic, was after 1007 included in the German Empire. F. obtained its name from the *Fländergau* (*pagus Flandrensis*, the district around Bruges and Sluis), whose counts had been made wardens of the north-eastern coasts of France at the period of the incursions of the Normans, in the latter half of the 9th c., and who extended the name of their hereditary possessions to the whole district which they governed. The first count or markgraf of the country is said to have been Baldwin, surnamed *Bras de Fer* (Iron-Arm), who married Judith, the daughter of King Charles the Bald of France, and widow of Ethelwulf, king of England, and afterwards received the newly created 'mark' or county, in 864, as a hereditary fief from his father-in-law. He extended his territories by the addition of Artois, which was held by his successors until Philippe Auguste reunited it to France. He died in 879, but not until he had inaugurated the industrial greatness of F. by introducing into it a great number of workmen skilled in the manufacture of woollen and other goods. Baldwin IV., or the Bearded, one of the successors of Baldwin *Bras de Fer*, received in fief from the Emperor Henry II. the burgraviate of Ghent, Walcheren, and the islands of Zealand, and thus became a prince of the German empire. He was succeeded by his son Baldwin V., or the Pious (1036—1067), who increased his possessions by the addition of the German territory between the Scheldt and the Dender, belonging to the duchy of Lower Lorraine. To this he added Tournay, the supremacy over the bishopric of Cambrai (to which, till the creation of the new bishopric of Arras, the county of Flanders had been ecclesiastically subordinate), and the county of Hainault. During the Middle Ages, F. figured prominently in the political affairs of Europe—the counts of F. being more powerful and wealthy than many European kings.

Baldwin IX., the founder of the Latin kingdom at Constantinople, died in 1206, leaving two daughters, one of whom died without children; the other bequeathed Hainault to John of Avennes, her son by her first marriage; and F. to Guy Dampierre, her son by a second marriage. Meanwhile, the industrial prosperity of the cities of F. had become so great, that the citizens began to feel their own power, and to claim independence. They formed republican communities like the free cities of Germany, with this difference, that they admitted the nominal suzerainty of the counts. But they were not afraid to take up arms in defence of their liberties against their nominal masters. Witness the insurrection headed by Jakob van Artevelde (q. v.) against the cruel government of Count Louis I. On the marriage of Marguerite, the daughter and heiress of Louis II., Count of Flanders, to Philip the Bold of Burgundy, the country was united to the Burgundian territories in 1384, and afterwards shared the fortunes of that duchy. The dukes of Burgundy brought great part of the former duchy of Lower Lorraine under their dominion, and thus laid the foundation of the subsequent union of the states of the Netherlands, in which F. continued to form one main component part. On the death of Charles the Bold, these territories passed, in 1477, to the House of Hapsburg, by the marriage of his daughter Mary to the Archduke Maximilian. After Burgundy had passed with King Philip II. to the Spanish line of the House of Hapsburg, the territory of F. was considerably diminished, as not only was the portion called Dutch Flanders transferred to the Estates-general by the peace of Westphalia, but, in the time of Louis XIV., France seized upon another portion of F., as also a part of Hainault, Cambrai, and Artois, and was confirmed in her possession by the peace of Aix-la-Chapelle, of Nimeguen, and of Utrecht. By the last, and by the treaty of peace concluded at Rastadt, the remains of the Spanish Netherlands again fell into the hands of the House of Austria. In 1794, F., like the other provinces of Belgium, was incorporated with the French Republic, and afterwards with the Empire, and formed the departments of Lys and Escaut; the congress of Vienna, however, conferred these portions on the new kingdom of the Netherlands, with which they remained united till the formation of the kingdom of Belgium (q. v.). The Belgian portion of F. is now divided into the provinces of East and West Flanders (q. v.).—Compare Praet, *Histoire des Comtes de Flandres, et de l'Origine des Communes Flamandes* (Brussels, 1828); Le Glay, *Histoire des Comtes de Flandres jusqu'à l'Avènement des Ducs de Bourgogne* (2 vols., Paris, 1843); Kervyn van Lettenhoven, *Histoire de Flandres* (6 vols., Brussels, 1847—1851), &c.

FLANDERS, EAST, a province in the north-west of Belgium, is bounded on the E. by the provinces of Antwerp and Brabant, on the S. by that of Hainault, on the W. by that of West Flanders. Chambers' Cyclo. Vol. III.—36.

ders, and on the N. by the Dutch province of Zealand. It has an area of 1150 square miles, and a population which amounted in 1876 to 863,453, or about 751 a square mile. East F. is the most populous province of the most populous country in Europe. See BELGIUM. It is watered mainly by the Scheldt, and by its affluents the Lys and the Dender. The surface is low and level. The soil has been rendered extremely fertile by means of spade cultivation and an excellent manuring system.

Besides the ordinary varieties of grain, potatoes, flax, hemp, and hops are produced in great quantity. The district in the north-east of the province, between the towns of Antwerp and Ghent, is celebrated as a flax-growing quarter. The manufactures are chiefly lace, damasks, linens, woollens, bobbin-net, silk, and cordage; sugar-refining, brewing, and distilling, are also carried on. Chief towns, Ghent, Alost, and Dendermonde.

FLANDERS, WEST, the most western province of Belgium, is bounded on the N. by the North Sea, and on the W. and S. by France. Its area is 1237 square miles, and its population in 1876 amounted to 684,468. Its chief rivers are the Lys and the Iser; but it is watered by numerous smaller streams, and is intersected by many important canals. Its surface is flat, with sandy hills in the south and along the coast; and its soil sandy, but well cultivated and productive. It has fewer products and manufactures than East Flanders. Chief towns, Bruges, Courtrai, and Ostend.

FLANGE, a rim or projection upon a tube or cylinder of metal or other material, to serve as a bearing, or afford means of fixing it; for example, the projecting rim on the tires of the wheels of railway-carriages is called a flange.

FLANK (the side), a word used in many senses in military matters. *Planks of an army* are the wings, or bodies of men on the right and left extremities, prepared to close in upon an enemy who shall attack the center. *Flank files* are the soldiers marching on the extreme right and left of a company or any other body of troops. *Flank company* is the company on the right or left when a battalion is in line; the grenadier and light infantry companies usually occupy these positions, and are known as flank companies, whether with the remainder of the regiment or not. A *flanking party* is a body of horse or foot employed in hanging upon and harassing the flank of an enemy's force.—Flank, as applied in Fortification, will be best described under that article (q. v.). The *flanks of a frontier* are certain salient points in a national boundary, strong by nature and art, and ordinarily projecting somewhat beyond the general line. The effect of these flanks is to protect the whole frontier against an enemy, as he dare not penetrate between them, with the risk of their garrisons, reinforced from their own territories, attacking his rear, and cutting off communication between him and his base. Silistria and Widin were flanks of the Turkish frontier during Omar Pasha's campaign in 1853 and 1854. Similarly, in the event of an invasion of England from the coast of Sussex or Kent, Portsmouth and Chatham would be formidable flanking garrisons, which would almost necessarily have to be subdued before the invader could march on London.

In evolutions, 'to flank' is to take such a position with troops as either to aid one's own army in an attack on the enemy, by leading the latter to suppose that his flanks are in danger in his present position, or to prevent him from advancing on one's comrades by threatening his flank if he should do so. To *outflank* is to succeed by manœuvres in commanding the flank of an enemy who has been, on his part, endeavoring to flank one's own force.

FLANNEL (Welsh, *gylanen*, from *gylan*, wool, allied to Lat. *lana*), a woollen fabric, differing from broadcloth and most other woollen fabrics in being woven of yarn more loosely twisted, and having less dressing. The best flannel is made in the neighborhood of Welshpool and Newtown, in Wales, from the wool of the Welsh mountain-sheep, and is commercially known as Welsh flannel. Large quantities are also made in West Lancashire, West Yorkshire, and the neighborhood of Leeds. A more closely spun and woven flannel, used for cricketing and rowing shirts, &c., and dyed and printed with various colors and patterns, is made in the west of England cloth-making district, in the vicinity of Stroud, in Gloucestershire. Fine light flannel of this kind is made in France and Belgium; some of this is twilled, and approaches nearly in quality to French merinoes, but is much softer. The demand for this sort of fancy-shirting flannel has of late become considerable, and has led to the production of many varieties, which, though bearing the name of flannel, vary so materially from the original Welsh flannel, that they can scarcely be included with them under any general definition. Coarse flannel, called *Gabreys*, is made in Ireland, and is chiefly used by the peasantry of the country.

FLAT, a musical character, and when placed before a note, lowers that note half a tone. When placed at the beginning of a piece of music, it denotes that all the notes on the line or space on

which it is placed, with their octaves above and below, are to be played flat.

FLAT-FISH, a popular name of the fishes of the family *Pleuronectida* (q. v.), as the flounder, plaice, sole, turbot, halibut, &c.; which have the body much compressed, and the sides unsymmetrical, swimming on one side. It is sometimes extended in its signification so as to include skates and other fishes of the Ray (q. v.) family, which are very different, being cartilaginous fishes, quite symmetrical, and swimming on the belly, although, like the *Pleuronectida*, generally keeping close to the bottom. It is never applied to the much compressed symmetrical fishes, such as the dory, which swim in the ordinary posture of fishes, the dorsal edge upwards, the ventral downwards.

FLA'TTERY, CAPE, a headland of Washington territory, on the Pacific coast of the United States, marks the south side of the entrance of the Strait of Juan de Fuca. It is in lat. 48° 24' N., and in long. 124° 40' W.—Another headland of the same name is found on the east coast of Australia, in lat. 14° 52' S., and long. 145° 20' E. It is about 30 miles to the north of Endeavor Bay.

FLA'TULENCE, distention of the stomach or bowels by the gases formed during digestion. See INDIGESTION.

FLAVINE, or FLAVIN, is a yellow coloring matter employed in dyeing, and imported in the condition of extract. It is understood to be the coloring matter of bark (quercitron bark), and is used in place of quercitron bark. When treated with hot water, flavine yields a yellow turbid solution, which, on settling, deposits a yellow-brown powder. When employed in dyeing, the cloth is first treated with an aluminous mordant (see CALICO-PRINTING); and on subsequent immersion in the solution of flavine, a fine yellow color is fixed on the cloth. The coloring power of the extract flavine as imported is so great that one ounce is equal in dyeing qualities to one pound of quercitron bark.

FLAX (*Linum*), a genus of plants comprising the greater part of the natural order *Linaceæ*; an exogenous order allied to *Geraniaceæ* and *Oralidææ*, and consisting of annual and perennial herbaceous plants, with a few small shrubs. There are about ninety known species of this order scattered over the globe, but most abundant in Europe and the North of Africa. Their leaves are simple, entire, without stipules, and generally alternate. The COMMON FLAX or LINT (*L. usitatissimum*) is an annual; a native of Egypt, of some parts of Asia, and of the south of Europe, not truly indigenous in Britain, although now naturalized, and often occurring in cornfields, which is the case also in many parts of the world. The most common variety of the flax plant has a very slender erect stem, two or three feet high, branching only near the top, so as to form a loose corymb of flowers. The leaves are small, distant, and lanceolate; the flowers of a beautiful blue, rarely white, rather broader than a sixpence; the petals slightly notched along the margin; the sepals ovate, 3-nerved, ciliated, destitute of glands; the capsules scarcely longer than the calyx, not bursting open elastically, but firmly retaining their seeds, which are dark brown, glossy, oval-oblong, flattened, with acute edges, pointed at one end, and about a line in length. Another variety, however, is cultivated to some extent in many parts of Europe, so different that some botanists account it a distinct species (*L. humile* or *L. crepitans*), which is less tall, is more inclined to branch, and is particularly distinguished by its capsules, twice as long as the calyx, and bursting open elastically when ripe. The seeds are also larger and paler. This variety is called *Springlein* and *Klanglein* by the Germans, the one name referring to the elastic bursting of the capsules, the other to the sound which accompanies it. The former variety is known to them as *Winterlein*, being often sown in the end of autumn in elevated districts where the summer is too short for spring-sown flax, and also as *Schlieslein* and *Dreschlein*, from its close capsules and the thrashing needed to separate the seed. The *Springlein* produces a finer, whiter, and softer fibre than the other, but shorter, and it is therefore not so extensively cultivated. There are many sub-varieties, to which and their different qualities no such attention has been paid, in Britain at least, as to those of other important cultivated plants.

The plant is highly valuable both for the fibres of its inner bark and for its seeds. The fibres of the inner bark, when sepa-



Common Flax (*Linum usitatissimum*).

rated both from the bark and from the inner woody portion of the stem, are **FLAX** or **LINT**, the well-known material of which **LINEN** thread and cloth are made, and used equally for the finest and for the coarsest fabrics, for the most delicate cambric or exquisite lace, and for the strongest sail-cloth. The seeds yield by expression the *drying* fixed oil called **LINSEED OIL**, so much used for mixing paints, making varnishes, &c.; whilst the remaining crushed mass is the **Linseed Cake**, or **OIL-CAKE**, greatly esteemed for feeding cattle, and when ground to a fine powder, becomes the **LINSEED MEAL** so useful for poultices. Linseed is sometimes used in medicine, as an emollient and demulcent in irritations of the pulmonary and of the urinary organs, and of the mucous membranes generally, deriving its value for this purpose from a mucilage which it contains, and which is extracted by hot water, making *linseed tea*. The fibre of flax is the ultimate material from which paper is made, and linseed oil is used in the manufacture of printer's ink. No plant not yielding food is more useful to man than the flax plant.

It has been cultivated from the earliest historic times. It is mentioned in the book of Exodus as one of the productions of Egypt in the time of the Pharaohs; and it has been recently ascertained by microscopic examination, that the cloth in which the mummies of Egypt are enveloped is linen. Solomon purchased linen yarn in Egypt. Herodotus speaks of the great flax trade of Egypt. Great quantities of flax are grown in that country at the present day; its cultivation is also very extensively carried on in some parts of Europe and of North America. The proportion of flax to other crops in Britain is probably smaller at present than it was at a former period, but an increase of its cultivation has been strongly recommended by persons whose opinion is entitled to great regard, and particularly in Ireland, where, however, it is more extensively cultivated than either in England or Scotland. It has the advantage of giving employment not only to an agricultural but to a manufacturing population. Flax is more extensively and more successfully cultivated in Belgium than in any other European country, particularly in Southern Brabant, Hainault, and West and East Flanders, in which the most beautiful flax in Europe is produced, employed for the manufacture of the famous Brussels lace, and sold for this purpose at about £100 to £180 per ton, the crop when prepared for the market sometimes exceeding in value the land on which it was produced. The village of Rebeque is distinguished for the production of this precious flax. The greatest care is bestowed on its cultivation, and to this its excellence is probably in a great measure to be ascribed. Not a weed is to be seen, and the care and labor are equal to those of gardening. Flax is extensively grown in the countries on the southern shores of the Baltic, and both the fibre and seed are largely imported from them into Britain. Besides the flax raised at home, the United Kingdom imported, in 1880, 76,822 tons dressed and undressed.

Flax has been cultivated from time immemorial, as a winter crop, in India, but only for its seed, and not at all for its fibre. This remarkable circumstance is supposed by Dr. Royle to be owing to the existence of the cotton plant in that country, the fibre of which more readily offers itself to view on the bursting of the pod. But Dr. Royle also states his opinion, that the climate of the greater part of India is unsuitable for the production of the fibre of flax; and the variety cultivated in India is only about a foot or eighteen inches in height, much branched, and yielding a very worthless fibre, whilst it is loaded with capsules, and the seeds yield a larger proportion of oil than those of flax grown in Europe. It is sometimes sown as an edging around fields.

Much depends on the thickness of sowing. Flax must be sown thick to yield a fine fibre; but when intended to produce a fibre for coarser purposes, the plants ought to have more room. For the finest fibre, also, they must be pulled before the seed is ripe; but a coarser fibre and a crop of linseed are often much preferred by the farmer. The crop is always *pulled* up by the roots.

The diminished cultivation of flax in Britain, after agriculture began to improve, is to be ascribed in part to the prevalence of the opinion, that it is a very exhausting crop for the land. This has been said to be particularly the case when the seed is ripened. But the introduction of new manures has rendered this objection less important than it formerly was; and it has been found that the refuse of flax itself is not a bad manure, and that the water in which it has been steeped is a good liquid manure. The water of flax-steeping pits or ponds is often strong enough to kill the fish of rivers into which it is allowed to flow.

The capsules (*bolles*) of flax are torn off, after it is pulled, by a sort of combing called *rippling* (see **FLAX-DRESSING**). Great care is requisite to dry them, and to keep them perfectly dry. For the subsequent processes, see **LINSEED**.

Besides the common flax, several other species are occasionally cultivated for their fibre, but are comparatively of very little value.

The *Linaceæ* are, in general, plants of elegant appearance and with flowers of much beauty; some of them have flowers larger

than common flax, and some are not unfrequent ornaments of our green-houses. *Radiola millegrana*, All-seed, is one of the smallest of British planerogamous plants.

PURGING FLAX (*Linum catharticum*) is a graceful little annual with branching stem, opposite leaves, and small white flowers, common in fields and meadows throughout Britain and most parts of Europe. It possesses purgative and diuretic properties, owing to the presence of a substance which has been called *linin*. As a domestic medicine, a handful of the fresh herb is often administered, infused in whey; and it has a popular reputation in rheumatism.

FLAX, NEW ZEALAND, a valuable fibre quite different from common flax, and obtained from the leaf of an endogenous, instead of the stem of an exogenous plant. The plant yielding it is *Phormium tenax*, often called New Zealand Flax, and sometimes Flax Lily and Flax Bush. It belongs to the natural order *Liliaceæ*, and is a perennial plant, a native of New Zealand and Norfolk Island; its leaves resemble those of an Iris, are from two to six feet long and one to two or three inches broad. The flowers are produced in a tall branched panicle; are numerous, brownish yellow, not very beautiful; the fruit is a three-cornered capsule with numerous compressed jet-black seeds. The fibre of the leaves is both very fine and very strong, and was used by the New Zealanders, before their country was discovered by Europeans, for making dresses, ropes, twine, mats, cloth, &c. New Zealand Flax is imported into Britain for making twine and ropes; and the plant is cultivated in its native country. Its cultivation has also been attempted in some parts of Europe; but the winters of Europe, except in the south, are too cold for it.



New Zealand Flax (*Phormium tenax*).

To obtain the fibre, the leaves are cut when they have attained their full size, and usually macerated for a few days in water. But the New Zealanders procure the fibre in its greatest perfection, very long and slender, shining like silk, by a more laborious process, and without maceration, removing the epidermis from the leaf when newly cut, separating the fibres by the thumb-nails, and then more perfectly a comb.

The roots are purgative, diuretic, sudorific, and expectorant; a good substitute for sarsaparilla.—The leaves when cut near the root, exude a viscid juice, which becomes an edible gum.—The New Zealanders prepare a sweet beverage from the flowers.

FLAX-DRESSING. When the seeds are beginning to change from a green to a pale brown, is the best time for pulling flax. Where the crop grows of different lengths, these lengths should be pulled and kept separately, uniformity in this respect being of great value in the after-process.

The process first gone through after pulling is *rippling*—which consists in tearing off the bolls by pulling the stalks through a series of iron teeth 18 inches long, placed within a distance of half an inch of each other. These are fastened in a block of wood, which is placed at the end of a plank or long stool on which the operator sits.

The next process is to obtain the flaxen fibre or lint free from the woody core, or *boom*, of the stem. This is effected by steeping the bundles in water till the boom begins to rot, in which state it is readily separated from the fibre. The operation is called *rotting* or *retting*, and requires to be managed with great care, as by continuing it too long, decomposition might extend to the fibre, and render it useless; while by discontinuing it too soon, the separation could not be effected with sufficient ease. The time is generally determined by the nature and temperature of the water, and the ripeness of the flax—decomposition taking place more rapidly in soft stagnant water than in running streams, in which the retting is sometimes conducted. After being sufficiently steeped, the flax is spread out on the grass, to rectify any defect in the retting, and ultimately to dry it for the breaking. In some districts, it is the practice to conduct the retting entirely on the grass—a process known as *dew-retting*, in contradistinction to *water-retting*. This is a safer and less offensive method, but it requires much longer time, and in a country where land is valuable.

would become very expensive. On the whole, the mixed method of retting is preferable—that is, to steep till decomposition of the boon is well advanced, and then to complete the process on the grass. It has been attempted to separate the fibre by machinery, without subjecting the flax to retting; but the article so produced has hitherto been rejected as inferior in quality.

To avoid the delays and uncertainty dependent upon the old processes of retting or watering, plans have been recently introduced, bringing the operation more under control, like the other processes of our manufactures. The methods which have been adopted, and are now working with success, are known as Schenk's and Watt's. By the first of these, the flax is placed in vats, in which it is kept down by means of strong framework. Water is allowed to pass into the vats, to become absorbed by the flax; steam is next admitted, till the temperature of the water is raised to, and maintained at, about 90°. Acetous fermentation ensues in a few hours; and after being maintained for about sixty hours, the decomposition of the gummy or resinous matter in the stalk is completed. The mucilage water is next withdrawn from the vat, and the flax taken out, separated and dried either in the open air or in desiccating rooms, according to circumstances.

In Watt's process, the flax is placed in a chamber provided with a perforated false bottom; the top is double, and filled with water to act as a condenser. Steam being admitted to the case, the first result is the freeing of the flax from certain volatile oils. The steam rising to the top of the chamber is condensed by contact with it, and falls in showers on the flax beneath—a decoction of the extracted matter is thus obtained. In 36 hours, the process is completed; and the flax taken out, is passed between rollers in the direction of its length, which presses out the water and decomposed gum, and splits and flattens the straw. By this process, all that the plant takes from the land is saved—the seeds being available as food for animals, and the chaff and refuse water as manure.

Prepared by either of the plans, the flax is now ready to be freed completely of its woody particles. This is effected by *scutching*. Previous to this, however, the flax is passed through a *brake* or revolving rollers, in order thoroughly to crack the boon. The brake, worked by manual labor, consists of a frame, in the upper side of which are a number of grooves; a movable piece is hinged at one end, and provided with a similar grooved piece on its lower side, but so placed that the projections pass into the hollows of the lower. The flax, placed between these, and struck by bringing down the hinged part, is broken, but the fibre remains uninjured.

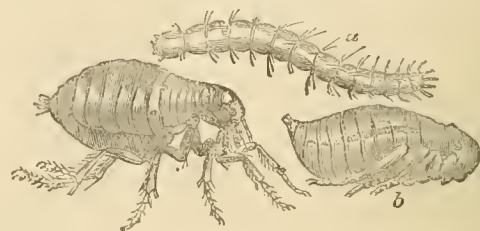
In the flax-breaking machine, the flax is passed through a series of horizontal fluted rollers; the flutes do not touch, thus preserving the fibre while breaking the boon. In continental countries, scutching is almost invariably performed by hand, the flax being held in a groove made in an upright stand, and struck by a flat blade. Machine-scutching is much more certain and expeditious than hand-scutching, and is, in consequence, fast superseding it in this country. After passing through the breaking-machine, the flax is subjected to the action of a series of knives, attached to the arms of a vertical wheel; these knives strike the flax in the direction of its length. The process is gone through three times before the flax is ready for the market. Although machine-scutching is expeditious, it is not capable of that pliant adaptation to the varying nature of the flax to be operated upon, which is obtained in hand-scutching. The effect of machine-scutching is to produce fineness by reducing and impairing, rather than sustaining, the character of the fibre—namely, the length and fineness of its 'staple' or fibre. To remedy these defects, scutching by means of revolving brushes has been introduced. This divides the fibre without tearing it. The subsequent manufacturing operations will be noticed under LINEN and SPINNING.

FLAXMAN, JOHN, the greatest of English sculptors, was born at York, 6th July 1755. At the age of 15, he became a student in the Royal Academy, but never worked in the studio of any master. In 1782, he married Miss Ann Denman, a lady of superior gifts and graces, who soon began to exercise a beneficial influence upon his studies. Accompanied by her, he went in 1787 to Italy, where, by degrees, he attracted the attention of all lovers of art. This was still more the case after his return to London in 1794. He was elected an Associate of the Royal Academy in 1797; Royal Academician in 1800; and, in 1810, was appointed Professor of Sculpture to that institution. After the death of his wife in 1820, he withdrew from society, and died 7th December 1826.

F.'s most celebrated works are his 'Outlines to Homer's Odyssey' (Rome, 1793), and 'The Iliad' (Lond. 1795), and his illustrations of Dante and Æschylus. Many of his works display wonderful grandeur of composition, and a pure and noble style. He was one of the first of those who, following the example of Winkelmann, strove to penetrate to the true spirit of antique art, in opposition to the false taste of the time. The study of vase-paint-

ings, and of the Pompeian mural pictures, then just revived, led him to abandon the sickly mannerism of his predecessors for the severe simplicity of the antique, and he may with justice be styled the author of modern *rilievo* (see ALTO-RIEVO). His works are not, however, all of equal value, and, in general, it may be said that this skill in modelling was not equal to his inventive genius. The poetry of his conceptions is of a high order. F. contributed much towards bringing the outline style, now so popular, into general use. Of his sculptures, the best known in England are his bas-relief monument to the poet Collins at Chichester, the monument to Lord Mansfield, and that to the Baring family at Micheldean Church, in Hampshire. His model for the shield of Achilles, taken from the 18th book of the *Iliad*, is particularly worthy of admiration. F.'s private collection is now in University College, London, in the gallery known as *Flaxman Hall*.

FLEA (*Pulex*), a Linnæan genus of apterous insects, now commonly regarded by entomologists as constituting a distinct order, *Suctoria*, *Siphonaptera*, or *Aphaniptera*. The species are not numerous, and little subdivision of the genus has been attempted. It



Metamorphoses of Common Flea (*Pulex irritans*), magnified.
a, larva; b, pupa or nymph; c, perfect insect.

has been suggested as probable, that further investigation may lead to a recognition of the fleas as belonging to some of the larger orders, with parts modified to suit their parasitical life. All the species are very similar to the COMMON FLEA (*P. irritans*), which is plentiful in all parts of the world, living by sucking the blood of man, and of some species of quadrupeds and birds. It abounds particularly in the nests of poultry, pigeons, and swallows, and wherever sand and dust accumulate in the chinks of floors, &c; it is to be found also plentifully in beds, wherever cleanliness is neglected. The abundance of fleas in some countries is an intolerable nuisance to travelers, and also to residents. Such is said to be particularly the case in many parts of Australia, where the general dryness and warmth encourage their growth to an extent against which the precautionary measures of housewives are almost entirely unavailing.

The female flea is rather larger than the male, but the sexes are otherwise very similar. The head is small, very compressed, rounded above, and has on each side a small round eye. The mouth has two lancet-like mandibles, the maxillæ being represented by two conical scales, the mandibles and maxillæ forming a suctorial beak, with a slender bristle-like tongue, the whole enclosed between two three-jointed plates. The thorax consists of three segments, the second and third of which bear a scale on each side; the scales are regarded as rudimentary wings. There is no marked division between the thorax and the abdomen, which consists of nine segments, much larger than those of the thorax, but much compressed. The whole body is covered with a tough integument. The activity of the flea, its power of leaping, and its extraordinary strength, are well known. Its strength has sometimes been applied to the drawing of miniature carriages, cannon, &c., which the public have been invited to witness through a magnifying-glass, as an amusing spectacle. Fleas undergo a complete metamorphosis. The female lays about a dozen eggs of a white color, and slightly viscous. The larva is a lively little worm, at first white, afterwards reddish, and destitute of feet. When about to change into a pupa, it encloses itself in a little silk cocoon, from which emerges the perfect flea. Cleanliness and careful attention are the principal means of keeping beds and houses free of fleas; but where these are found insufficient, as is apt to be the case in some climates, and in cottages where there is much wood-work with gaping joints, certain strongly aromatic plants are employed, of which the odors appear to be detestable to them, as the different *Compositæ* known by the name of fleabane, and also wormwood, the merits of which last are thus extolled by Tusser:

'While wormwood hath seed, get a handfull or twaine,
To save against March, to make flea to refrain;
Where chamber is swept, and wormwood is strown,
No flea for his life dare abide to be known.'

Other species of fleas infest particular animals, as the dog, fox, mole, &c.—The Chigoe (q. v.), or Jigger of the West Indies, nearly allied to the true fleas, is far more troublesome than any of them.

FLEA'BANE (*Pulicaria*), a genus of plants of the natural order *Compositæ*, sub-order *Corymbifere*, having hemispherical imbricated involucre and yellow flowers; the whole plant emitting a peculiar aromatic smell, sometimes compared to that of soap, which is said to be efficacious in driving away fleas. Two species are found in England, one of which (*P. dysenterica*), common in



Fleabane (*Pulicaria dysenterica*):

a, root; b, top of stem, with leaves and flowers; c, achene, with pappus; d, pistil; e, a floret of the disc; f, a stamen; g, a floret of the ray.

moist places, with oblong leaves, stem 12—15 inches high, cottony, and bearing panicle flowers, has a considerable reputation in diarrhoea and dysentery. The Russian soldiers, in the expedition to Persia under General Keith, were much troubled with dysentery, which was cured by this plant.—*Conyza squarrosa*, also called fleabane, belongs to a nearly allied genus.

FLECHE, LA, a town of France, in the department of Sarthe, is agreeably situated on the right bank of the Loir, 24 miles south-west of Le Mans. It is a well-built town, and has three principal streets, which are wide and well paved. Its principal building is the military school, with a library of 15,000 volumes, destined for the education of the sons of poor officers, or of soldiers who have highly distinguished themselves. The building now occupied by the school was once a royal palace, and was built by Henry IV. It was subsequently given by him to the Jesuits, and used by them as a Jesuit college. Here Prince Eugene, Descartes, and Picard the astronomer, were educated. F. has some trade in corn, hay, and wine, also manufactures of linen, hosiery, and gloves. Pop. (1876) 7468.

FLE'CKNOE, RICHARD, the date of whose birth is unknown, is said to have been an Irish Roman Catholic priest. He came to London, mingled in the wars of the wits, and wrote several plays, all of which are now forgotten. He died in 1678. F. came under the lash of Dryden, whose satire entitled *Mac Flecknoe*, is partly the model of Pope's *Dunciad* (q. v.), and will be remembered as long as the great satirist is remembered. From those who are acquainted with our extinct literature, we have the assurance that F. has been hardly dealt with; and though he did not rise to the rank of Dryden as a poet, he was the author of several fugitive pieces, not without grace, fancy, and happy turns of expression. Among the dramatic pieces are *Femina, or the Chaste Lady*; *Love's Dominion* (printed in 1654, and dedicated to Cromwell's favorite daughter, Mrs. Claypole); and *The Marriage of Oceanus and Britannia*. His *Miscellanea, or Poems of all Sorts*, appeared in 1653.

FLEET (that which floats), a collection of ships, whether of war or commerce, for one object or for one destination. The diminutives of fleet are 'division' and 'squadron.' In the royal navy, a fleet is ordinarily the command of an admiral or vice-admiral.

FLEET MARRIAGES. The practice of contracting clandestine marriages was very prevalent in England before the passing of the first marriage act (see MARRIAGE). The chapels at the Savoy and at May Fair, in London, were long famous for the performance of these marriages; but no other place was equal in notoriety for this infamous traffic to the Fleet Prison. It must be observed, that before the passing of the 26 Geo. II. c. 33, there was no necessity in England for any religious ceremonial in the performance of marriage, which might be contracted by mere verbal consent. Hence it was not in virtue of any special privilege existing within the liberty of the Fleet that marriages at that place became so common; but rather from the fact, that the persons by whom they were performed, having nothing to lose either in money or character, were able to set at defiance the penalties

enacted from time to time with a view to restrain this public nuisance. The period during which these marriages were in greatest repute was from 1674 to 1754.

The first notice of a Fleet marriage is in 1613, in a letter from Alderman Lowe to Lady Hickee, and the first entry in a register is in 1674. Up to this time, it does not appear that the marriages contracted at the Fleet were clandestine; but in the latter year, an order having been issued by the ecclesiastical commissioners against the performance of clandestine marriages in the Savoy and May Fair, the Fleet at once became the favorite resort for those who desired to effect a secret marriage. At first, the ceremony was performed in the chapel of the Fleet; but the applications became so frequent, that a regular trade speedily sprung up. By 10 Anne, c. 19, s. 176, marriages in chapels without banns were prohibited under certain penalties, and from this time, rooms were fitted up in the taverns and houses of the Fleet parsons, for the purpose of performing the ceremony. The persons who celebrated these marriages were clergymen of the Church of England, who had been consigned for debt to the prison of the Fleet. These men, having lost all sense of their holy calling, employed touters to bring to them such persons as required their office. The sums paid for a marriage varied according to the rank of the parties, from half-a-crown to a large fee where liberality and the purse combined to afford a large reward. During the time that this iniquitous traffic was at its height, every species of enormity was practised. Young ladies were compelled to marry against their will; young men were decoyed into a union with the most infamous characters; and persons in shoals resorted to the parsons to be united in bonds which they had no intention should bind them, and which were speedily broken to be contracted with some new favorite. The sailors from the neighboring docks were steady patrons of this mode: it was stated by the keeper of one of the taverns, that often, when the fleet was in, two or three hundred marriages were contracted in a week. Persons of a more respectable character also at times resorted to the Fleet. Thus the Hon. Henry Fox was here married to Georgina Caroline, daughter of the second Duke of Richmond. Pennant thus describes the neighborhood of the Fleet in his time: 'In walking along the street in my youth, on the side next the prison, I have often been tempted by the question: "Sir, will you please to walk in and be married?" Along this most lawless space was hung up the frequent sign of a male and female hand conjoined, with "marriages performed within," written beneath. A dirty fellow invited you in. The parson was seen walking before his shop, a squalid, dirty, figure, clad in a tattered plaid night-gown, with a fiery face, and ready to couple you for a dram of gin or a pipe of tobacco.'—*London*, p. 193. Registers of these marriages were kept by the various parties who officiated. A collection of these books, purchased by government in 1821, and deposited in the Consistory Court of London, amounted to the incredible number of between two and three hundred large registers, and upwards of one thousand smaller books, called pocket-books. These registers were not received as evidence in a court of law (*Doe v. Davies v. Gatacre*, 8 Carr. and P. 578), not because the marriage was invalid, but because the parties engaged in the ceremony were so worthless that they were deemed undeserving of credit.

Various attempts were made to stop this practice by acts of parliament. By 6 and 7 Will. III. c. 52, and again by 7 and 8 Will. III. c. 35, penalties were imposed on clergymen celebrating any marriage without banns; but these provisions were without effect upon men who had nothing to lose. At length, the nuisance became intolerable, for, owing to the difficulty of proving these marriages, respectable parties, who in folly had entered into them, found it often impossible to establish their marriage, and the greatest confusion was in consequence produced. The act of the 26th Geo. II. c. 33, was therefore passed, which struck at the root of the matter by declaring that all marriages, except in Scotland, solemnized otherwise than in a church or public chapel, where banns have been published, unless by special license, should be utterly void. This act met with strenuous opposition in the House of Commons, especially by Mr. Fox, who who had been himself married in the Fleet, but ultimately it was passed into a law. The public, however, were unwilling to surrender their privilege, and on the 26th March 1754, the day before the act came into operation, there were no less than 217 marriages entered in one register alone. See Burn's *History of Fleet Marriages*, to which we are indebted for many of the above particulars.

FLEET PRISON, a celebrated London jail, which stood on the east side of Farringdon Street, on what was formerly called Fleet Market. The keeper of it was called the Warden of the Fleet. It derived its name from the Fleet rivulet, so named from its rapidity, which flowed into the Thames. By the Act 5 and 6 Victoria, the Fleet Prison and the Marshalsea were abolished, and their functions transferred to the Queen's Bench, under the new name of the Queen's Prison. The Fleet was the king's prison so far back as the 12th c., and a receptacle for debtors since about

the same period. The followers of Wat Tyler burned it in the reign of Richard II. In the 16th and 17th centuries, it acquired a high historical interest from its having been the prison of the religious martyrs of the reigns of Mary and Elizabeth, and of the political victims of the Courts of the Star Chamber and High Commission in that of Charles I. On the abolition of the Star Chamber in 1641, it became a place of confinement for debtors and persons committed for contempt from the Courts of Chancery, Exchequer, and Common Pleas. During the 18th c., it was the scene of every kind of atrocity and brutality, from the extortion of the keepers and the custom of the warden underletting it. The Fleet was several times rebuilt; the last building was erected after the burning of the older one in the Gordon riots of 1780, the predecessor of which had been destroyed in the great fire of London in 1666. Latterly, it usually contained 250 prisoners, and kept ward of about 60 outdoor *detenus* for debt, privileged to live within the rules.

FLEETWOOD, or FLEETWOOD-ON-WYRE, a small but thriving town, seaport, and military station of England, in the county of Lancashire, is situated on a promontory at the mouth of the estuary of the Wyre, about 20 miles south-west from Lancaster. It is a modern town, and owes its origin and importance to its facilities for railway and steam-vessel communication. It is handsomely laid out, has an excellent harbor, and is a favorite resort for sea-bathing. There was formerly a government school of musketry, which promised to be for the north of England what Hythe and Aldershot are for the south, but it is now discontinued. It had a staff of instructors, and quarters for 300 men and 60 officers; besides a substantial hut-encampment, about a mile from the town, for 200 men and 14 officers, where there were quarters for married soldiers, hospital, lecture-rooms, &c., and a large tract of land for rifle practice. In 1880, 1138 vessels, of 388,019 tons, entered; and 1120, of 376,733 tons, cleared the port. Pop. (1871) 4428; (1881) 6513.

FLEMISH LANGUAGE AND LITERATURE. The Vlaemisch or Flemish is a form of Low German still spoken in the Belgian provinces of East and West Flanders, Limburg, Antwerp, North Brabant, and in some parts of Holland and the Walloon provinces of Belgium. So little change has taken place in this dialect, that the form of speech in which the Council of Liptines drew up (in 742) the creed in which pagans were made to express their renunciation of idolatry on being converted to Christianity, requires only the alteration of a few letters to make it intelligible to a modern Fleming. Flemish has much affinity with the Frisian, and constitutes, together with modern Dutch (which was originally identical with it, and now only differs from it in a few orthographical and otherwise unessential particulars), the national tongue of the whole of the Low Countries. The most ancient record of Flemish, is a fragment of a translation in prose of the Psalms a thousand years old. In the 13th c., public deeds began to be drawn up in the vernacular, which are perfectly intelligible in the present day (as the Ordinance of Henry I. of Brabant, 1229, in the *Brussels Book of Privileges*). In the same century, J. van Maerlant, the father of Flemish poets, author of *The Historical Mirror*, *Wapen Martin*, *Rymbibel*, &c., and W. van Utenhove composed numerous poems, and translated from the French and German, and very probably from the Latin. Willems and other critics believe that to the Flemish must be ascribed the honor of the original and entire poem of *Reinart Vos*, the first part of which they refer to the middle of the 12th c., while the second part is attributed to W. van Utenhove, and supposed to have been written about 1250. The 14th c. was remarkable for the numbers and excellence of the Flemish *Sprekkes*, *Zeggens*, and *Vinders*, or wandering poets, some of whose works have been published by Blommaert; and for the origin of the Chambers of Rhetoric, which exerted a marked influence on the progress of literature during succeeding ages, and became the arbiters of literary and dramatic fame through the Netherlands generally.

In the 16th c., the French element gained ascendancy, and the old Flemish lost much of its original terseness and purity. Numerous translations of the Scriptures appeared; among the most remarkable of which are the Psalms by Dathenus (1556), and by Marnix (1580), the author of the *Rooversche Biekerij* (1569). The translation of the entire Bible was not effected till 1618, when the General Synod of Dort decided to employ learned men capable of giving a correct version from the Hebrew and Greek texts; and this great work was finally completed by two Flemings, Randaert and Walons, and two Dutchmen, Bogermann and Hommius. Strenuous efforts were also made, at this period, to give greater freedom to the Flemish language; and hence this original Flemish version of the Bible has become a standard in regard to the construction and orthography of the language. Hooft, Vondel, and Cats, are the three men whose names stand foremost among the Flemish writers of the 17th century. Hooft was a poet, but he is best known by his *History of the Netherlands*, which is held in high esteem by his countrymen. Vondel, who was one of the leading men of his day,

made his tragedies the vehicles of hurling the most cutting satire on every obnoxious measure of the government; and his works still maintain their ground. He had great versatility of powers; and in his latter years, his talents were directed to the exaltation of Catholicism, to which he had been converted. Cats was essentially the poet of the people; and for 200 years, his works, popularly known as the *Household Bible*, have been cherished alike among the poor and wealthy. Although Cats was a skilful lawyer, an active statesman, and a profound scholar, he found time to compose a great number of works, as the *Zorgvliet*; *Trouwering* (the Wedding Ring); *Houwelyck* (Marriage), which exhibit the most intimate acquaintance with the everyday-life of his countrymen. His work entitled *Moral Emblems* was translated into English in 1859, and published by Messrs. Longman & Co. The 18th c. was barren of poetic genius in the Low Countries, but it produced several good philologists, as Stevens, Huydecoper, and Ten Kate, the latter of whom is the author of a work on the Flemish language, which has served as a fundamental authority for modern writers. The arbitrary measures of the French government, under Napoleon, against the official use of Flemish, had the effect of crushing for a time the very spirit of nationalism, while it completely annihilated native literature; and it was not till after the revolution of 1830, that the Flemish language regained its footing in the Belgian provinces. This revival of the national form of speech is mainly due to the unremitting efforts of such writers as Willems, Bilderdijk, Cornelissen, Blommaert, Conscience, Delecourt, Ledeganck, &c., whose works have imparted fresh vigor, and greater grammatical precision to the Flemish. In 1841, on the occasion of a linguistic congress held at Ghent, the members of the government for the first time publicly recognized the existence of the Flemish element in the people, and addressed the meeting in the national dialect. The last thirty years have confirmed this movement; and while the best foreign works have been rendered into Flemish, the writings of Blommaert, Conscience (q. v.), and other native authors have been translated into many of the European tongues. Vandenhoven (i. e., Delecourt), *La Langue Flamande* (1844); Lebroucqy, *Analogies Linguistiques* (1845); Höfken, *Vlaamisch België* (Bremen, 1847); the bibliographical works of Snellaert (1867) and De Poller (1867); also Düringsfeld's *Von der Schelde bis zur Maas* (Leipzig, 1861).

FLEMMING, PAUL, one of the best German poets of the 17th c., was born 5th October 1609, at Hartenstein, in the Erzgebirge. He studied medicine at Leipzig, but retired to Holstein in 1633. In the same year he accompanied the embassy sent by the Duke of Holstein to Russia, and in 1635, was attached to the more splendid embassy sent out to Persia. He returned in 1639, married, and resolved to settle as a physician in Hamburg, but died there 2d April 1640. F. stands at the head of the German lyric poets of the 17th c. His *Geistliche und weltliche Poemata* (Jena, 1642) contain many exquisite love songs, which, for more than a century, remained unequalled in finish and sweetness. Others are distinguished for enthusiasm of feeling, ardent patriotism, and manly vigor, while his sonnets are marked by strength and thorough originality. F.'s longer poems describe the adventures of his journey; occasionally at least with great spirit, though they are not free from the weaknesses of his time. His beautiful hymn, *In allen meinen Thaten*, composed before his journey to Persia, proves his genius as a writer of sacred songs. His life, with his select poems, was published by Schwab (Stuttgart, 1820). Compare Knapp, *Evangelischer Liederschatz* (Stuttg. 1837), and Müller in the *Bibliothek Deutscher Dichter des 17. Jahrhunderts* (3 vols., Leipzig, 1822); and Varnhagen von Ense, in the 4th vol. of the *Biographische Denkmale*.

FLENSBURG, an important town in the province of Schleswig-Holstein (now Prussian; see SLESVIG), at the extremity of the Flensborg Föhrde, an inlet of the Baltic, and 19 miles north of the town of Slesvig. Pop. (1880) 30,956. It is the capital of a bailiwick of the same name, which included the north part of the district supposed to have been the country of the Angels, or Angli. F. is said to have been founded in the 12th c., and named from its founder, the Knight Flenes. In 1284 it received municipal rights from King Valdemar. F. is pleasantly situated, and has a good harbor, breweries and distilleries, iron and brass foundries, oil mills and brickworks, manufactures paper and glass, and has a great yard for building iron ships. The fisheries are productive, and the trade in grain and timber, &c., is brisk.

FLERS, a town of France, in the department of Orne, north of France, 35 miles west-north-west of Alençon. It has an old castle, which was burned down in the Chouan war, but since restored. F. has considerable manufactures of linen, fastian, and especially of ticking. Pop. (1876) 8571.

FLESH is the ordinary term for muscular tissue. After the removal of the blood-vessels, nerves, connective (or cellular) tissue, &c., the flesh is found to consist of various textural elements, which are described in the article Muscle (q. v.). Numerous analyses have been made of the muscular substance of various

animals. In Dr. Day's translation of Simon's *Animal Chemistry*, published by the Sydenham Society, there are analyses of the flesh of man, the ox, calf, pig, roe, pigeon, fowl, carp, and trout. The following table gives the determinations of the individual constituents of the flesh of oxen, or, in ordinary language, of beef freed, as far as possible, from blood-vessels, &c., and may be regarded as fairly representing the composition of flesh generally.

	Per cent.	Per cent.
Water	varies from 74.0 to	80.0
Solid constituents	vary " 26.0 "	20.0
	100.0	100.0
The latter being made up of		
Muscular fibre which	varies from 15.40 "	17.70
Gelatinous substance	" " 0.60 "	1.90
Albumen	" " 2.20 "	3.00
Creatine	" " 0.07 "	0.14
Creatinine	undetermined.	
Inosic acid	do.	
Fat	" " 1.50 to	2.30
Lactic acid ($C_3H_5O_3$, HO)	" " 0.60 "	0.68
Phosphoric acid	" " 0.66 "	0.70
Potash	" " 0.50 "	0.54
Soda	" " 0.07 "	0.09
Chloride of sodium	" " 0.04 "	0.09
Lime	" " 0.02 "	0.03
Magnesia	" " 0.04 "	0.08

Long as the above list of substances is, it does not include all the ingredients of flesh. In the freshly expressed muscular juice, which exhibits a strong acid reaction (from free lactic acid, and from acid phosphates of the alkalies), we also find small quantities of Sarcine or Hypoxanthine (q. v.), and of formic, butyric, and acetic acids—which may, however, be mere products of decomposition; very minute quantities of uric acid, and sometimes a trace of urea, which, however, occurs in very appreciable quantity in the muscles of persons who have died of cholera, and in very considerable quantity in the flesh of the plagiostomous fishes, while in other fishes not a trace of it can be detected—an apparent anomaly to which at present we see no clue; and in the juice of the heart of mammals and in smaller quantity in their other muscles, a kind of sugar termed Inosite (q. v.). Bernard has recently discovered Glycogen (q. v.) in the muscles of the embryos of various animals.

In regard to the inorganic constituents of the juice of flesh, Liebig directs especial attention to the fact, that this fluid 'in all animals is particularly rich in potash, and that it also contains chloride of potassium, with only traces of chloride of sodium; while in the blood only proportionally small quantities of the salts of potash and preponderating quantities of the salts of soda and of common salt, are present.' He further notices the constant excess of the phosphates over the chlorides, and of the phosphate of lime over that of magnesia in the former fluid, as points of physiological importance. The value of these investigations will be shown in the article TISSUES (q. v.).

It is worthy of notice, in connection both with physiology and dietetics, that the dried flesh of the ox is identical in its ultimate composition with dried blood, as is shown by the following analyses, which were made by Professor Lyon Playfair:

	Beef.	Ox-blood.
Carbon.....	51.83	51.95
Hydrogen.....	7.57	7.17
Nitrogen.....	15.01	15.07
Oxygen.....	21.37	21.39
Ashes.....	4.23	4.42

This analysis singularly confirms the statement made previously by an eminent French physiologist, that in so far as ultimate organic composition is concerned, 'the blood is liquid flesh.'—For further information on the subject, we may refer to Liebig's *Researches on the Chemistry of Food*, translated by Gregory; Gamgee's *Physiological Chemistry* (1880), or other standard works on the subject.

FLESH-FLY, or BLUE-BOTTLE-FLY (*Musca vomitoria*), an insect of the same genus with the common HOUSE-FLY (q. v.), which it much exceeds in size, although it is not equal in size to the Blow-fly (q. v.). The forehead is rust-colored, the thorax grayish, the abdomen blue with three black bands. The expanse of wings is nearly one inch. It is abundant throughout Britain and Europe generally, and deposits its eggs on flesh, for which purpose it often enters houses, having a remarkable delicate sense of smelling. The maggots are of very frequent occurrence on meat in summer, notwithstanding all care that can be taken.—A nearly allied species (*M. Casar*) is distinguished by its golden green color, and is also common in Britain. It is found in houses from the beginning of spring to the end of autumn. Another (*M.*

lardaria), with silky tawny face, a black stripe on the crown, thorax glittering white with four black stripes, and abdomen bluish-gray, tessellated with black, is most common in the end of autumn, frequenting bushes of ivy and late flowers, and is also a pest of the larder.

FLETA, the title of a valuable treatise on the law of England. It is not known by whom this treatise, which is one of the earliest authorities on English law, was written, and it derives its title from the circumstance that it was written in the Fleet prison. Lord Campbell remarks—*Lives of the Chancellors*, i. 166 and note: 'I shall rejoice if I do tardy justice to the memory of Robert Burnet, decidedly the first in this class, and if I attract notice to his successors, who walked in his footsteps. To them, too, we are probably indebted for the treatises entitled *Fleta* and *Britton*, which are said to have been written at the request of the king, and which, though inferior in style and arrangement to Bracton, are wonderful performances for such an age. *Fleta* must have been written after the 13th year of the king (Edward I.), and not much later; for it frequently quotes the statute of Westminster the second, without referring to the later statutes of the reign.'

FLETCHER, ANDREW, of Saltoun, a celebrated Scottish patriot and politician, was the son of Sir Robert Fletcher and Catherine Bruce, daughter of Sir Henry Bruce of Clackmannan. He was born in 1653. Notwithstanding the strong anti-English feelings which characterized him through life, F. was of English descent by the father's side; his father being the fifth in the direct line from Sir Bernard Fletcher of the county of York. But his mother was of the royal House of Scotland, the first of the Clackmannan family having been the third son of the Lord of Annandale, Robert de Bruce, who was the grandfather of the great King Robert. F.'s father, who died in his childhood, consigned him to the care of Gilbert Burnet, then minister to Saltoun, afterwards the well-known Bishop of Salisbury; by whom he was instructed not only in literature and religion, but in those principles of free government of which he afterwards became so zealous an advocate.

So early as 1681, when he sat in parliament for the first time as commissioner for East Lothian, F. offered so determined an opposition to the measures of the Duke of York (afterwards James II.), then acting as the Royal Commissioner in Scotland, that he found it necessary to retire, first into England, and then into Holland. He there entered into close alliance with the English refugees, who had assembled in considerable numbers; and on his return to England in 1683, he shared the counsels of the party of which Russell, Essex, Howard, Algernon Sydney, and John Hampden (the grandson of the still more famous patriot of the same name) were the leaders. Though usually regarded as a republican, F.'s political creed, like that of Algernon Sydney, approached far nearer to aristocracy than to democracy in the modern sense; for though he was disposed to restrict the monarchical element of the constitution within the narrowest limits, if not to abolish it altogether, he was so far from being an advocate for a universal participation in political rights, that one of his favorite schemes for the reformation of the hosts of vagrants and paupers by whom Scotland was infested in his day, consisted in the establishment of slavery in the form in which it had existed in the classical nations of antiquity. On the discovery of the Rye House plot, F. returned to Holland. His next visit to England was as a volunteer under the unfortunate Duke of Monmouth in 1685; but he was compelled to leave the insurgent army, at the beginning of the enterprise, in consequence of his having shot the mayor of Lynn, with whom he had had a personal quarrel about a horse. The next hiding-place which F. selected was Spain; but he had no sooner arrived, than he was thrown into prison at the instance of the English ambassador, and would have been transmitted to England, to share the fate of his fellow-patriots, had he not been mysteriously delivered from prison by an unknown friend. From Spain he proceeded to Hungary, where he entered the army as a volunteer, and greatly distinguished himself. He returned to England at the Revolution. A few years later, he met in London, accidentally, it should seem, the famous William Paterson, the founder of the Bank of England, and the projector of the Darien Expedition in London; and it was at F.'s solicitation that Paterson came to Scotland, and offered, to the acceptance of his countrymen, a project which he had originally intended should be carried out by the far greater resources either of the trading communities of the Hanse towns, or of the princes of the German empire. The bitterness caused by the treatment which the Darien colonists received at the hands of King William's government, tended to confirm F. and his friends in their opposition to the Union with England, and led to his delivering in parliament those spirited harangues in favor of an exclusive Scottish nationality, which still stir the blood of his countrymen. After the Union, he retired in disgust from public life, and died in London in 1716. F.'s writings originally appeared in the form of tracts, and anonymously; they were, however, col-

lected and reprinted at London in 1737, under the title of *The Political Works of Andrew Fletcher, Esquire.*

FLETCHER, GILES and **PHINEAS**, were the sons of Dr. Giles Fletcher, Queen Elizabeth's ambassador to the court of Russia, and consins to Fletcher the dramatist.

GILES, the elder, was born about 1580; he was educated at Cambridge, and died at his living at Alderton in 1623. His chief poetical work is a sacred poem, entitled *Christ's Victory and Triumph*, which appeared at Cambridge in 1610. This poem, although once admired, is now unknown to general readers, and is chiefly remarkable for having, to some extent, moulded the majestic muse of Milton.

PHINEAS, the younger brother of Giles, was born about 1584, educated at Eton and Cambridge, and became rector of Hilgay, in Norfolk, in 1621, and died there in 1660. His most important poem, the *Purple Island, or the Isle of Man*, was published in 1633. It contains an elaborate description of the human body and mind—the former being given with great anatomical minuteness. The mind is represented as being beleaguered with the vices, and likely to be subdued, when an angel comes to the rescue—the angel being James I. Although to a large extent formal and pedantic, the *Purple Island* abounds in fine passages, in which the lusciousness of Spenser and the gravity of Milton are curiously mingled.

FLETCHER, JOHN. See **BEAUMONT AND FLETCHER.**

FLEUR-DE-LIS. Authorities are divided as to whether this celebrated emblem is derived from the white lily of the garden, or from the flag or iris, which, as generally represented, it more resembles both in form and color. 'Ancient heralds,' says Newton (*Display*, p. 145), 'tell us that the Franks of old had a custom, at the proclamation of their king, to elevate him upon a shield or target, and place in his hand a reed or flag in blossom, instead of a sceptre; and from thence the kings of the first and second race in France are represented with sceptres in



Fleur-de-Lis.

their hands like the flag with its flower, and which flowers became the armorial figures of France.' However this may be, or whatever may be the value of the other legendary tales, such as that a blue banner, embroidered with golden fleur-de-lis, came down from heaven; that an angel gave it to King Clovis at his baptism, and the like; there can be little doubt that, from Clovis downwards, the kings of France bore as their arms first an indefinite number, and latterly three golden lilies on a blue field, or, as heralds would say, azure, three fleurs-de-lis, Or—It was Charles VI. who reduced what had hitherto been the indefinite number of fleurs-de-lis to three, disposed two and one; 'some conjecture upon account of the Trinity, others say, to represent the three different races of the kings of France.'—Nisbet, i. 333. Many English and Scotch families bear the fleur-de-lis in some portion of their shield, and generally with some reference to France.

FLEURUS, a small town of Belgium, in the province of Hainaut, is situated north of the left bank of the Sambre, and 15 miles west of Namur: pop. about 2200. It has been the scene of several contests, the last and most important, however, being the battle of F., fought here 26th June 1794, between the army of the French Republic, consisting of 89,000 troops, under Jourdan, and the allies, who were inferior in numerical strength, under the Prince of Saxe-Coburg. The latter leader gave orders for a retreat at the very moment when a resolute advance might have decided the victory in his favor, and the result was, that Jourdan was enabled to unite his army with those of the Moselle, the Ardennes, and the North, and that the allied forces were compelled for a time to evacuate Flanders.

FLEURY, FLORY, FLOWRY, FLEURETTE, &c., in heraldry, signifies that the object is adorned with fleurs-de-lis; a cross-fleury, for example, is a cross, the ends of which are in the form of fleurs-de-lis. There are several varieties in the modes of representing these crosses, which has led to distinctions being made between them by heralds too trivial to be mentioned: but they are all distinguishable from the cross-potance, or potancée, incorrectly spelled ponce by English heralds. (Mackenzie's *Science of Heraldry*, p. 44). In the latter, the limbs are in the form of the segments of a circle, and the foliation is a mere bud; whereas the cross-fleury has the limbs straight and the terminations distinctly floriated. Thus—



Cross-potance.



Cross-fleury.

Perhaps, the most celebrated instance of this bearing, is in the case of the double prepuce flowery and counter-flowery gules

which surrounds the red lion in the royal arms of Scotland, and which Charlemagne is said to have conferred on Achaius, king of Scotland, for assistance in his wars. The object, according to Nisbet (ii. 101), was to show that, as the lion had defended the lilies of France, these 'hereafter shall continue a defence for the Scots lion, and as a badge of friendship, which has still continued.' That the lilies were assumed in consequence of the intimate relation which prevailed between France and Scotland for so many generations, will not be doubted; but the special occasion of the assumption may not be admitted in our day to be quite beyond the reach of scepticism, notwithstanding Nisbet's assertion that it is so fully instructed by ancient and modern writers that he need not trouble his readers with a long catalogue of them.

FLEURY, CLAUDE, a French church historian, was born at Paris, 6th December 1640, and was educated at first for the law, but preferring an ecclesiastical career, subsequently took priest's orders. In 1672, he became tutor to the young Prince de Conti, who was brought up along with the dauphin, and at a later period to the Comte de Vermandois, natural son of Louis XIV. After the death of the Comte in 1683, the French monarch appointed him, under Fenelon, tutor to the Princes of Burgundy, Anjou and Berri, and also abbot of the Cistercian monastery of Loc-Dien. When the princes had completed their education, F. was rewarded with the priorate of Argenteuil. The Duke of Orleans selected him for confessor to the young king, Louis XV., giving as his reasons for so doing, that F. was neither Jansenist, nor Molinist, nor Ultramontanist, but Catholic. F. held this office till 1722, when the infirmities of age compelled him to resign it. He died 14th July 1723. F. was as learned as he was modest, and as mild and kind-hearted as he was simple in his manners, and upright in his conduct. Among his numerous works may be mentioned, *Mœurs des Israélites* (Paris, 1681); *Mœurs des Chrétiens* (Paris, 1662); *Traité du Choix et de la Méthode des Etudes* (Paris, 1686); *Institution au Droit Ecclésiastique* (1687); and above all, the *Histoire Ecclésiastique* (20 vols., 1691–1720). On this work, F. labored thirty years. It is marked by great learning, and, on the whole, by a judiciously critical spirit. What may be called his professional sympathies, are held in check by a noble desire to be impartial, which might well put to the blush the unvarnished partisanship of many Protestant writers. Semler (q. v.), an eminent German theological professor, avowed that his lectures were at first mainly extracts from the *Histoire Ecclésiastique*. Even Voltaire praised it. 'The history of F.,' says he, 'is the best that has ever been executed.' D'Alembert and many others recommend F.'s style as a model of elegant simplicity. The so-called *Abrégé de l'histoire Ecclésiastique de Fleury*, published at Berne in 1776, is ascribed to Frederick the Great. A posthumous work of F.'s, entitled *Discours sur les libertés de l'Eglise Gallicane*, has always been very popular.

FLEXURE, or **FLEXION**, is the bending or curving of a line or figure (see **CURVATURE**). A curve is said to have a point of *contrary flexure* at the point where it changes its character of concavity or convexity towards a given line. In the art of building, flexure denotes the bending of loaded beams. If a beam, supported at its two ends, be loaded, it bends its lower surface becoming convex, and its upper concave. In this bending, the particles in the lower surface are drawn away from each other, and those in the upper are more closely packed together, while between the surfaces there is a line called the *line of no disturbance*, wherein the particles are neither drawn asunder nor compressed, and from which the mathematical theory of the flexure of beams starts. Experiments show that the flexure of solid beams, supported at their ends, and loaded, varies—(1.) directly as the load; (2.) inversely as the product of their *breadths*, and the cube of their *depths*; and (3.) directly as the cube of the distance between the supports, while the flexure, if the load be uniformly distributed over the beam, is $\frac{1}{8}$ ths of the amount produced by the load placed on its center. See **STRENGTH OF MATERIALS**.

FLIES, SPANISH or **BLISTERING**. See **CANTHARIS**.

FLINDERS, MATTHEW, an adventurous English navigator, to whom we are indebted for a correct knowledge of a great portion of the Australian coasts, was born at Donington, in Lincolnshire, 1760. He entered the merchant service at an early age, and subsequently the royal navy. In 1795, the vessel in which he was midshipman conveyed the governor of New Holland to Botany Bay; and while there, F. determined to investigate the coast south of Port Jackson, about 250 leagues of which were laid down in the charts as 'unknown.' with an equally daring and ambitious young surgeon in his ship, called Bass, he departed on the enterprise in a small decked vessel, with a crew of only six men. Their chief discovery was the straits between Van Diemen's Land (now Tasmania) and the main land of Australia, which were named after Bass. In 1801, F. obtained from the British government the command of a scientific expedition for the investigation of the Australian coasts and their products. Commencing his examination at Cape Leuwin, F., in the course of two years, gradually

explored the coast to Bass's Straits, thence northwards—laying down carefully the Great Barrier Reefs—to the Gulf of Carpentaria, which he thoroughly surveyed across to Timor, then back to Cape Leuwin, and round the south coast to Port Jackson. In 1810 he was liberated from a six years' imprisonment by the French in the Isle of France, returned to England, and gave the world the result of his researches in a work, entitled *A Voyage to Terra Australis*. He died July 19, 1814, the day on which his book was published.

FLINDERS LAND, now South Australia (q. v.).

FLINDER'SIA, a genus of trees of the natural order *Cedrelaceæ*, one species of which, *F. australis*, yields timber little inferior to mahogany. It is much used in Australia, and is there called CALLCEDRA WOOD.

FLINT, a mineral which may be regarded as a variety of quartz, or as intermediate between quartz and opal, consisting almost entirely of silica, with a very little lime, oxide of iron, water, carbon, and sometimes even traces of organic matter. It has a flat shell-like fracture, is translucent or semi-transparent, and varies in color from a very dark brown, or almost black, to light brown, red, yellow, and grayish white, and is sometimes veined, clouded, marbled, or spotted. Dark-colored flints are most common in the chalk, in which principally *F.* occurs imbedded, forming nodules of various sizes, sometimes large nodular masses, of irregular and often grotesque shape; but gravel formed of light-colored flints is very common, and it is disputed whether or not a change of color has taken place by exposure to atmospheric and other chemical agencies. *F.* is sometimes found in beds or veins. It is very abundant wherever the chalk formation extends, in England and other countries; rolled *F.* nodules are also often found in compound rocks, and in alluvial soils; vast alluvial tracts being sometimes full of them. *F.* geodes often contain crystals of quartz. *F.* nodules are usually moist in the interior if broken when newly taken from their beds.

F. is sometimes harder than quartz, sufficiently so to scratch it. The readiness with which it strikes fire with steel is well known, and it would seem that the sparks are not all merely incandescent particles, heated by the friction, but that in some of them a chemical combination of silica and iron takes place, causing great increase of heat. The use of the *F.* and steel for igniting tinder, once so common, has been almost superseded by that of lucifer-matches, and gun-flints have given place to percussion-caps. According to Pliny, Elias was the first who struck fire with flint; or more probably, he was the first to show its application to useful purposes; and he therefore received the name *Pyrodes*. The most ancient use of *F.* was probably for sharp weapons and cutting instruments; and *F.* knives, axes, arrow-heads, &c., are among the most interesting relics of rude antiquity.

At present, a principal use of *F.* is in the manufacture of fine earthenware, into the composition of which it enters, being for this purpose first calcined, then thrown into cold water, and afterwards powdered.

The origin of *F.* is a subject of considerable difficulty. Silicious deposits are sometimes a purely chemical operation, as in the case of the silicious sinter formed round the geysers of Iceland, from the evaporation of water largely charged with silex. But at the bottom of the sea, as no evaporation could take place, some other agent than springs of water saturated with silex must have supplied the materials. It is a fact of considerable importance in this inquiry, that almost all large masses of limestone have thin silicious concretions, or flints. Thus, chert is found in carboniferous and other limestones, and menilite in the tertiary limestones of the Paris basin. The conditions necessary for the deposition of calcareous strata seem to be those required for the formation of silicious concretions. The materials of both exist in solution in sea-water, and as it needed the foraminifer, the coral, and the mollusc to fix the carbonate of lime which formed the chalk deposits, so the silex was secreted by innumerable diatoms and sponges, and their remains most probably supplied the material of the flint. The discovery by Dr. Bowerbank and other microscopists of the spicules of sponges and the frustules of diatoms in almost every specimen of *F.*, has clearly shown that *F.* to a large extent, if not entirely, owes its origin to these minute organisms. It is, however, difficult to account for the changes that have taken place in these materials subsequent to their deposition.

FLINT, a parliamentary borough and seaport in the east of Flintshire, North Wales, formerly the capital of the county, on the left side of the estuary of the Dee, 191 miles north-west of London by rail, and 12½ miles north-west of Chester. It forms a rectangle like a Roman camp, and is surrounded by now nearly obliterated ramparts and intrenchments. The Dee estuary is some miles wide here, but is shallow and narrow at low water. Vessels of 300 tons reach the town. The principal exports are coal and lead from mines in the vicinity, which afford the chief employment. Pop. (1881) 5126. It unites with seven other places in

sending one member to parliament. Roman relics and traces of Roman lead smelting-works have been found here.

On a low freestone rock in a tidal marsh are the remains of a castle, built by Henry II., and dismantled in 1647. The double tower or keep is 40 feet in diameter, and includes two concentric walls, each 6 feet thick, with an intervening gallery 8 feet broad; within is a circle 20 feet in diameter, with four entrances. Deterioration of the channel of the Dee has made *F.* in a great degree a port of Chester, and here larger vessels, especially with timber, are discharged, and the cargoes floated up the Dee in smaller vessels, the timber in rafts.

FLINT, a river of Georgia, one of the United States of America, unites on its right with the Chattahoochee, at the south-west angle of the state, to form the Appalachicola, which, after a course of 100 miles, enters the Gulf of Mexico. The *F.* itself is about 300 miles long, being practicable for steam-boats up to Albany, about 250 miles distant from the sea.

FLINT, TIMOTHY, REV., an American clergyman and author, was born, in 1780, at Reading, Massachusetts, and graduated at Harvard College. In 1802 he became minister of the Congregational Church in Lunenburg, county of Worcester in that state, where he remained till 1814. In the following year, he became a missionary for the valley of the Mississippi, where he was engaged in itinerant preaching and teaching a school. In 1825, he returned to the northern states; and in 1826, published his *Recollections of Ten Years passed in the Valley of the Mississippi* (Boston, 8vo). The same year appeared from his pen a novel, entitled *Francis Berrian, or the Mexican Patriot*, purporting to be the autobiography of a New England adventurer who acted a conspicuous part in the first Mexican revolution, and in the overthrow of Iturbide. In 1828, he issued two works: *A Condensed Geography and History of the Western States in the Mississippi Valley* (Cincinnati, 2 vols. 8vo); and *Arthur Clenning*, a novel (Philadelphia, 2 vols. 8vo). Another novel, *George Mason, or The Backwoodsman*, and a romance in 2 vols., *The Shoshonee Valley*, appeared at Cincinnati in 1830. In 1833, he edited several numbers of the *Knickerbocker Magazine*, and was subsequently editor for three years of *The Western Monthly Magazine*. His other works are: *Indian Wars in the West* (1833, 12mo); *Lectures on Natural History, Geology, Chemistry, and the Arts* (Boston, 1833, 12mo); translation of Droy's *L'Art d'être Heureux*, with additions by translator; and *Biographical Memoir of Daniel Boone, the first Settler of Kentucky* (Cincinnati, 1834, 18mo). In 1835, he contributed to the London *Athenæum* a series of Sketches of the Literature of the United States. He died at Salem, August 16, 1840.—His son, MICHAEL P. FLINT, published a volume of poetry, entitled *The Hunter and other Poems*.

FLINT GLASS. See GLASS.

FLINT IMPLEMENTS AND WEAPONS, believed to have been used by the primitive inhabitants, have from time to time, in more or less number, been turned up by the plough and the spade, dug out from ancient graves, fortifications, and dwelling-places, or fished up from the beds of lakes and rivers, in almost every country of Europe. They do not differ, in any material respect, from the flint implements and weapons still in use among uncivilized tribes in Asia, Africa, America, and the islands of the Pacific Ocean. The weapons of most frequent occurrence are arrow-heads (see ELF-ARROWS), spear-points, dagger-blades, and axe-heads or Celts (q. v.). The more common implements are knives, chisels, rasps, wedges, and thin curved or semi-circular plates, to which the name of 'scrapers' has been given. There is great variety, as well in the size as in the shape, even of articles of the same kind. There is equal variety in the amount of skill or labor expended in their manufacture. In some instances, the flint has been roughly fashioned into something like the required form by two or three blows; in others, it has been laboriously chipped into the wished-for shape, which is often one of no little elegance. In yet another class of cases, the flint, after being duly shaped, has been ground smooth, or has even received as high a polish as could be given by a modern lapidary. Examples of all the varieties of flint weapons and implements will be found in the British Museum, in the Museum of the Royal Irish Academy at Dublin, in the Museum of the Society of Antiquaries of Scotland at Edinburgh, and above all, in the Museum of the Royal Society of Antiquaries at Copenhagen, which is especially rich in this class of remains. Representations of interesting or characteristic types may be seen in the *Catalogue of the Archaeological Museum at Edinburgh* in 1856 (Edin. 1859); in Mr. Wilde's *Catalogue of the Antiquities in the Museum of the Royal Irish Academy* (Dubl. 1857—1861); in Worsaae's *Nordiske Oldsager i det Kongelige Museum i Kjøbenhavn* (Copen. 1859); and in M. Frederic Troyon's *Habitations Lacustres* (Lansanne, 1860).

Geological discoveries have recently invested flint implements with a new interest. At Abbeville, at Amiens, at Paris, and elsewhere on the continent, flint weapons, fashioned by the hand of man, have been found along with remains of extinct species of the

elephant, the rhinoceros, and other mammals, in undisturbed beds of those deposits of sand, gravel, and clay to which geologists have given the name of 'the drift.' They so far resemble the flint

little altered since the days when the Gauls and the Romans constructed their sepulchres in the soil overlaying the drift which contains these relics of a far earlier race of men.' See MAX.



Flint Implements from the Valley of the Somme—Reduced.

implements and weapons found on the surface of the earth, but are generally of a larger size, of ruder workmanship, and less varied in shape. They have been divided into three classes—round-pointed, as in fig. 1; and sharp-pointed, as in fig. 2, both being chipped to a sharp edge, so as to cut or pierce only at the pointed end; and oval-shaped, as in fig. 3, with a cutting edge all round.

The first and second classes vary in length from about four inches to eight or nine inches; the third class is generally about four or five inches long, but examples have been found of no more than two inches, and of as much as eight or nine inches. In no instance has any flint implement discovered in the drift been found either polished or ground. The French antiquary, M. Boucher de Perthes, was the first to call attention to these very interesting remains, in his *Antiquités Celtiques et Antédiluviennes* (Paris, 1847—1857). But it has since been remembered that implements of the same kind were found in a similar position at Hoxne, in Suffolk, along with remains of some gigantic animal, in 1797, and at Gray's Inn Lane, in London, along with remains of an elephant, in 1715. Both these English examples are still preserved—the first in the Museum of the Society of Antiquaries at London, the second in the British Museum, and they are precisely similar in every respect to the examples more recently found in France.

To what age these remains should be assigned, is a question on which geology seems scarcely yet prepared to speak with authority. But, in the words of Mr. John Evans, in his essay on 'Flint Implements in the Drift,' in the *Archæologia*, vol. xxxviii. (Lond. 1860), 'thus much appears to be established beyond a doubt, that in a period of antiquity remote beyond any of which we have hitherto found traces, this portion of the globe was peopled by man; and that mankind has here witnessed some of these geological changes by which the so-called diluvial beds were deposited. Whether these were the result of some violent rush of waters, such as may have taken place when "the fountains of the great deep were broken up, and the windows of heaven were opened," or whether of a more gradual action, similar in character to some of those now in operation along the course of our brooks, streams, and rivers, may be matter of dispute. Under any circumstances, this great fact remains indisputable, that at Amiens, land which is now 160 feet above the sea, and 90 feet above the Somme, has, since the existence of man, been submerged under fresh water, and an aqueous deposit from 20 to 30 feet in thickness, a portion of which, at all events, must have subsided from tranquil water, has been formed upon it; and this, too, has taken place in a country the level of which is now stationary, and the face of which has been

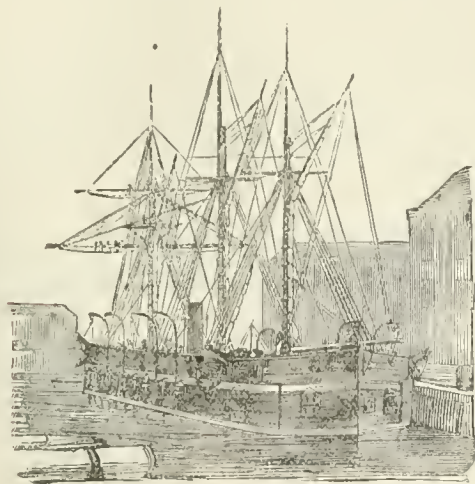
FLINTSHIRE, a maritime county of North Wales, bounded on the E. by Cheshire and the River Dee, on the S. and W. by Denbighshire, and on the N. by the Irish Sea. The main portion of the county is 25 miles long by 10 broad, and the larger of the two outlying portions, which lies toward the south-east of the main part, is 10 miles by 5. F. is the smallest of the Welsh counties, its area being only 169,162 acres, of which $\frac{1}{4}$ th is arable. The coast, 20 miles long, is low and sandy, but on the Dee estuary fertile. A hill-range, parallel to the Dee, runs through the length of the county, and rises in Garreg to 825 feet. Another range along the south-west border of the county rises in Moel Famma, 1845 feet. The chief rivers are the Dee, Alyn, and Clwyd. The chief strata are Permian, Carboniferous and Devonian. Coal, and ores of iron, lead, silver, copper, and zinc are the chief mineral products and exports. In 1880, 3198 tons of lead were raised from 34 mines. The soil is fertile in the plains and vales. In 1880, the total acreage under all kinds of crops, bare fallow, and grass was 128,738, of which 9693 acres were under wheat, 10,797 under oats, and 7722 under barley. Cotton is the main manufacture. The London, Chester, and Holyhead Railway skirts the east and north shores. Pop. (1881) 80,373. F. sends two members to parliament. The chief towns are Flint, formerly the county town; Mold, St. Asaph, Holywell, Rhyddlan, and Hawarden. F. has traces of Roman lead-mines, is traversed by Wat and Offa's Dykes, and has some ancient castle and ecclesiastical ruins. In F., in the 7th c., Saxon invaders massacred 1200 Christian monks of the monastery of Bangor. In 796, the Saxons defeated the Welsh here with dreadful slaughter, which event gave rise to the still popular plaintive air of *Morfa Rhyddlan*.

FLINTY SLATE, of which there are beds in some parts of Scotland, and in many other countries, is an impure quartz, assuming a slaty structure. It contains about 75 per cent. of silica, the remainder being lime, magnesia, oxide of iron, &c. Its fracture is rather splintery than shell-like. It is more or less translucent. It passes by insensible gradations into clay-slate, with which it is often in most intimate geological connection. Lydian Stone (q. v.) is a variety of flinty slate.

FLOATING BATTERY is a hulk, heavily armed, and made as invulnerable as possible, used in defending harbors, or in attacks on marine fortresses. The most remarkable instance of their employment was by the French and Spaniards against Gibraltar, in the memorable siege which lasted from July 1779 to February 1783, when ten of these vessels, carrying 212 large guns, were brought to bear on the fortress; they had sides of great thickness, and were covered with sloping roofs, to cause the shot striking

them to glance off innocuously. But their solidity and strength were unavailing against the courage and adroitness of the defenders, under the gallant General Elliot, who succeeded in destroying them with red-hot cannon balls.

Steam floating batteries of iron were constructed for the war with Russia in 1854, both by the British and French governments; but, notwithstanding that they rendered good service before Kin-



Floating Battery used in the Russian War, 1854—1855.

burn, they have since been generally discarded for other than purely defensive purposes, as too cumbersome for navigation, and too suffocating from the smoke that collected between their decks during action. Indeed, vessels of this class may be regarded as having been superseded for all purposes both of attack and defence by the newer kinds of gunboats and armor-clad frigates, as well as by the Turret-ships (q. v.) which are among the more recent contrivances of skill in naval engineering.

FLOATING-DOCKS. So long as ships remained of a small size, no difficulty was found in effecting repairs on their hulls by the simple method of laying them on any convenient beach or sandbank at high water. The receding tide would leave them high and dry for a few hours at a time; and by actively working at the repairs during low-water, they could generally be accomplished, without any special contrivance for taking the vessel out of the water. Even now this plan is not unfrequently resorted to, the part of the beach on which it is to be carried out being laid with parallel rows of timber beams, called collectively a *grill-iron*. The rise and fall of the tides is in many localities insufficient for the purpose of leaving the hull dry at low-water, and

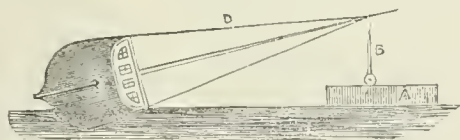


Fig. 1.

the larger the ship the greater the risk of 'beaching.' Numerous plans have been adopted for getting at the bottoms of large vessels. Fig. 1 represents a mode of heeling over ships which was at one time very extensively used. A is a lighter of sufficient size and weight, provided with very powerful 'heaving-down tackle,' consisting of strong ropes, B, passing through very large blocks. These tackles are made fast to the masts of the vessel, which are previously secured by extra stays, on the upper side at D; and then, by working the tackles, the hull of the vessel is heeled over until it assumes the position shown in fig. 1. Of course, this plan necessitates the removal of the whole of the cargo. By hauling the vessel over first on one side, and then on the other, the whole of the hull can be got at without difficulty. Of course, still water is required to carry out this method with safety. When there is no rise and fall of tide, the lighter, A, is not required, as the tackles, B, can be made fast to the quay or pier. It was while being careened over that the *Royal George* went down at Spithead in 1782, with 600 men on board. Graving or Dry Docks (q. v.) offer a very easy plan for repairing ships; but they are always very costly to construct, and in many localities sufficiently firm foundations are not attainable.

Another common method of getting at the bottom of ships is by bringing them on to sloping ways, called *slips*, carried out from

the yard a long distance under water, and then hauling them right up on to the shore end of the ways by means of suitable tackle, generally worked by hydraulic power. During the operation, the vessel rests upon a suitable carriage. Mr. Norton of Leith, in 1818, invented a carriage for this purpose, which has contributed much to render this method of hauling up vessels easy.

Floating-docks have been in use for many years. Until of late years, they were built of timber, in the form of a large box with a flap-door falling down on strong hinges at one end. They are moored in still and shallow water, with a depth just sufficient to allow the vessel to float into them as they rest on the bottom. The flap-door is then raised up, and the water pumped out. These timber docks are incapable of being used in deep water, in consequence of their want of stability. If the vessel being docked happened to be so light that the dock began to float before the water was all pumped out of the dock, it was very apt to heel over, and thus cause the water to rush to one side, endangering both ship and dock. A considerable number of wooden floating-docks, of a size sufficient to dock large vessels, have been built in the United States of America. Some of these American docks have been built in sections—that is, a number of short docks are joined together to make a structure long enough to take in a long ship; but those wooden erections have little strength or durability.

It was not until the introduction of iron as the material for constructing them, that floating-docks were made capable of working in deep water, and able to take in the largest class of ships.

Mr. R. W. Thomson, C.E., of Edinburgh, designed in 1859 a great iron floating-dock for the port of Sourabaya, Java. Contrary to the method which had always before been adopted, Mr. Thomson determined to make every separate piece of the Sourabaya Dock from drawings, and to dispense altogether with the costly operation of building up in this country. Some idea may be formed of the skill and care required for the proper fulfilment of this undertaking, when it is stated that there were upwards of 75,000 separate plates, ribs, and angle-irons, every one of them shaped, punched with numerous holes, and ready in every respect to be riveted into their places without any further preparation. It was absolutely necessary that every one of the two millions of holes that were to be punched in all these plates and pieces of iron should be accurately in its right place. Mr. Thomson succeeded in carrying out his system so completely, that there were only about 450 separate forms to be made for all the 75,000 different pieces. By systematizing the work in this manner, it became possible to spend sufficient time and care on the making of drawings and templates for each of the separate 450 forms which composed the whole dock, to insure almost mathematical accuracy in the form of each piece, and in the positions of every hole in it. Another advantage of this method is the immense saving of labor in erecting the dock. Under the old plan of shaping each piece of iron so that it would fit only into one special place, it had to be searched for amid thousands of pieces similar to, and yet not capable of being substituted for it.

The mere turning over of the innumerable plates and angle-irons in search for individual pieces becomes a source of great expense. Under Mr. Thomson's system, however, when the material for the docks is discharged from the ships, each of the 450 classes of pieces is piled up by itself, and the workmen have nothing more to do than to take the piece on the top of the pile, perfectly sure that it will fit accurately any of the hundred possible positions to which its class belongs. All the iron for the Sourabaya Dock was used just as it came from the rolling-mills. The plates were all flat and rectangular, and the angle and T-iron all straight. The structure was so designed that no bending or heating of the pieces was required. It can easily be imagined that a dock so carefully planned would be cheaply made.

Fig. 2 represents an end view of the dock. The water-tight

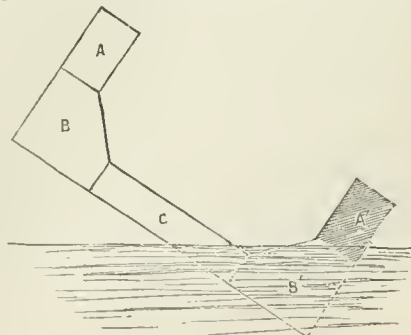


Fig. 2.

compartments, A, A', B, B', and C, were all completely under

the command of the powerful centrifugal steam-pumps, so that they could be separately filled or emptied in a very short time. In fig. 2, the dock is shown heeled over to one side, for the purpose of getting at the bottom for repairing or cleaning it. This tilting over could be accomplished by filling the compartment A', and emptying all the others. The water-tight compartments were divided in their longitudinal direction into five separate divisions, making in all 25 water-tight compartments, any one of which could be filled or emptied at pleasure; thus affording complete command over the dock, and admitting of its being put into any required level, notwithstanding any irregularity in the distribution of the weight resting on the dock.

The French government had to provide a dry dock at Saigon, in Cochinchina, for the use of the large steamers which had been subsidized by it to run between France and China. The soft muddy character of the soil at Saigon rendered the construction of a stone graving-dock impracticable. The French admiral, commander-in-chief of Cochinchina, hearing of the construction of the Sourabaya floating-dock, and having examined the plans of it, recommended his government to have a similar dock, on a much larger scale, constructed for Saigon.

Fig. 3 is a view of this dock, which was erected some years

'floats,' each about 47 ft. $\times$ 11 ft. $\times$ 5 ft., are placed between the side girders, and are capable of being moved up and down by screws in order to preserve the stability of the whole while it is being raised or lowered. By an accident which happened very soon after its arrival at St. Thomas, this dock was sunk, and a hurricane which followed close on its sinking, injured it still further. It remained under water for a long time, but was raised to the surface in January 1871, after operations which lasted a year and a half, and were quite unique in their way. This dock, as originally constructed, could take in and lift a vessel not drawing more than 24 ft., and not weighing more than 4000 tons. The weight of the dock itself, with the machinery all complete, is about 3400 tons. The docks made by the Messrs. Rennie for Carthage and Ferrol are even larger than the St. Thomas Dock. The former weighs about 4400 tons, and has lifted the Spanish iron-clad *Numancia*, weighing 5600 tons, and supported it for 80 days.

FLOATING WAREHOUSES. The danger that attends the storing of petroleum and other inflammable and explosive chemicals has led in France to the construction of warehouses, storehouses, or magazines that will float in a dock or basin, and can be

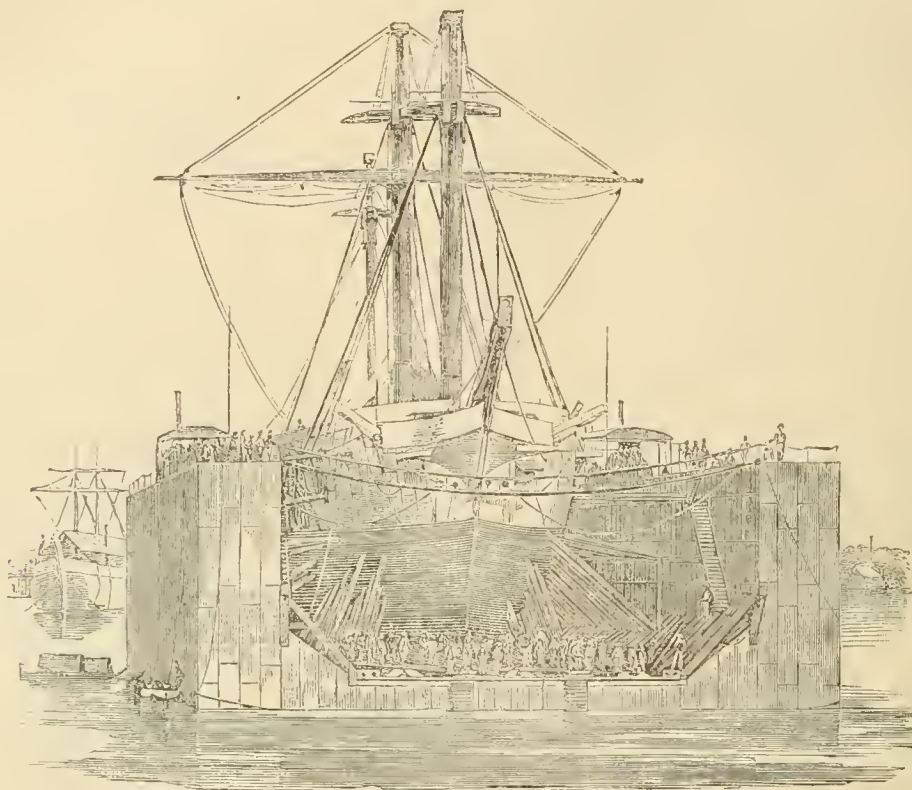


Fig. 3.—Floating-dock at Saigon, with the *Persévérante* of 70 guns. (From a Photograph.)

ago. The performances of the Saigon Dock are in every way most satisfactory; it has lifted, high and dry out of the water, the 70-gun frigate *Persévérante*.

Another great dock on Mr. Thomson's principle has been erected at Callao, and is likewise answering its purpose admirably. It has lifted out of the water many large vessels—among others, the United States man-of-war *Waterloo*, and the Peruvian iron-clad *Independencia*. The latter ship weighed 3300 tons. As the Callao Dock floats in an open roadstead, some apprehension was felt that the swell would cause too much movement to admit of ships being safely docked, but it has done its work in the most satisfactory way. None of these iron docks have doors or gates for excluding the water. The bottom part is made of sufficient buoyancy to float the vessels clear out of the water, and the equilibrium of the dock is maintained during the time it is under water, for the purpose of admitting a vessel, by the great displacement offered by the hollow sides, AA' (fig. 2).

One of the most remarkable of recently constructed floating docks was that sent out to St. Thomas (West Indies) in 1867, and designed by Mr. Frederick J. Bramwell. It is 300 ft. long, 72 ft. wide clear between the sides, and has a double bottom 9 ft. 9 in. deep. The sides are open girders, not hollow boxes, as in the Sourabaya dock, and immense rectangular air-vessels called

moored at a distance from buildings on land. So far as concerns England, an act of parliament was passed in 1866, relating to the carriage and storing of dangerous substances; this law was amended and considerably extended by an act passed in 1875, applying to gunpowder and other explosive substances (including nitroglycerine, dynamite, gun-cotton, blasting-powders, fulminate of mercury, fireworks, percussion caps, &c.). This act requires such substances to be marked 'gunpowder' or 'explosive,' and to be conveyed or stored with special precaution; it leaves much power to the Secretary of State to intervene in special cases and arrange the precise conditions. The storing of petroleum is regulated by the act of 1871. In France, as we have said, floating warehouses have been constructed, two being finished in 1864, and others added in later years. The construction of the floating fabrics is remarkable. Each warehouse or magazine consists essentially of one hundred hollow iron cylinders, arranged in four rows of 25 each, firmly lashed or strapped together to form a kind of raft. Each cylinder, sixteen feet long by six or seven in diameter, has hemispherical ends, with a man-hole at one end. They are placed upright when in position, so as to be filled with petroleum, glycerine, gunpowder, or any other substance, through the man-hole. As they will hold 25 tons each, their united capacity is 2500 tons. There is a wooden covering to the top of the collected mass of

cylinders, and round the sides as far down as the line of flotation, to shield the iron from fluctuations of temperature. This covering is made of thick planking, fastened to the cylinders by angle-irons which have been riveted to the latter. At the head and stern are large hawser-holes, to admit hawsers for towing and mooring the floating fabric, bringing it into and taking it out of a basin or dock, and warping it to a quay or dock wall; or, when the vessel is moored in the middle of a basin, far away from buildings, a barge may deliver or receive the dangerous cargo, and thus the vessel be kept altogether away from quays and wharfs.

FLOATING ISLANDS exist in some lakes, and more rarely in slow and placid rivers. Not unfrequently, they are formed by the detachment of portions of the bank; the interlaced roots of plants forming a fabric sufficiently strong to endure the occasional buffeting of waves, and to support soil for herbage or even trees to grow in. Floating islands are often formed by aggregation of drift-wood in the creeks and bays of tropical rivers, and being wafted into the channel of the river when it is flooded or by the wind, are carried down to the sea, with the soil that has accumulated, and the vegetation that has established itself upon them. They are sometimes seen at a distance of 50 or 100 miles from the mouth of the Ganges, with living trees standing erect upon them.

Portions of the alluvial soil from the deltas of rivers, held together by the roots of mangroves and other trees, are sometimes also carried out to sea after typhoons or hurricanes, and ships have, in consequence, been involved in unexpected dangers, as amongst the icebergs of colder latitudes. Imagination has always invested with a peculiar interest the

Straggling plots, which to and froe doe come
In the wide waters;

and ancient legend did not fail to notice the floating islets of the sacred Vadimonian Lake, which were large enough to bear away cattle that were tempted upon them by their fresh green grass; and the island of the Cutilian waters, which carried on its surface a dark and gloomy grove, and was constantly changing its place. A small lake in Artois, near St. Omer, is remarkable for the number of its floating islands, as are also the marshy lakes of Comacchio near the Gulf of Venice. Among the largest in the world are those of the lake of Gerdui, in Prussia, which furnish pasturage for 100 head of cattle; and that of the Lake of Kolk, in Osnabruck, which is covered with beautiful elms. Loch Lomond was long celebrated for its floating island; it, however, can no longer boast of one, as it has long since subsided and become stationary. Floating islands are found in some lakes of Scotland, and also in Ireland, and consist for the most part of large floating masses of peat. Pennant gives a description of one which he saw in Breadalbane, the surface of which exhibited plenty of coarse grass, small willows, and even a little birch tree. More interesting to the scientific inquirer, as presenting a phenomenon not so easily explained, are those floating islands which from time to time appear and disappear in the same spot, of which there is one in the Lake of Derwentwater in Cumberland, one in the Lake Ralang in the province of Smaland in Sweden, and one in Ostrogothia. That in Derwentwater is opposite to the mouth of a stream called the Catgill; and the most probable of the many theories which have been proposed to account for it is that which ascribes it to the waters of the stream, when flooded by rains, getting beneath the interlaced and matted roots of the aquatic plants which there form a close turf on the bottom of the lake. This floating island, when it rises above the water, is most elevated in the center, and on its being pierced with a fishing-rod, water has spouted up to the height of two feet.

The marshy ground of the vale of Cashmere, and particularly around the city of Cashmere, containing many lakes, and liable to inundations, exhibits a peculiar form of human industry in its numerous **FLOATING GARDENS**, employed chiefly for the cultivation of cucumbers, melons, and water-melons. These floating gardens may be described as portions of the marshy ground artificially made to float, by cutting through the roots of the reeds, sedges, and other plants about two feet below the surface, upon which mud is then spread. The floating of the garden secures the soil and crop from destruction by inundations.

Floating gardens are said to have existed on the Lake of Mexico before the Spanish conquest. The Mexicans had made great progress in the art of gardening, and particularly in the cultivation of flowers, which were much used both in their festivities and in their worship. How they were induced to attempt the formation of floating gardens, and at what period it was first done, are mere matters of conjecture. The shallowness of great part of the lake was favorable to the success of the attempt, and perhaps the gradual receding of its waters may be reckoned among the reasons of the gradual diminution of the number of the floating gardens, which have almost ceased to be reckoned among the wonders of the world. The Abbé Clavigero, in his *History of Mexico*, describes them as formed of wicker-work, water-plants, and mud; as

sometimes more than 20 poles in extent; the largest ones commonly having a small tree in the center, and sometimes a hut for the cultivator; and as employed for the cultivation both of flowers and culinary plants. Humboldt confirms this description, but states that the real floating gardens or *chinampas*, are rapidly diminishing in number. The existing *chinampas* are in general not floating gardens, but plots of ground with very wide ditches between them, formed by heaping up earth from the ditches in the swamps or shallows at the side of the lake. P. 1. at mouths or rivers serve an important function in carrying animals and plants from land to land. See Wallace's *Island Life* (1880).

FLOATSTONE, a variety of quartz, consisting of fibres—delicate crystals—aggregated so that the whole mass is sponge-like, and so light, owing to the air confined in the interstices, as to float for a while on water. It is found in a limestone of the chalk formation near Paris, in imbedded masses, or incrusting flint nodules.

FLOBECQ, a small town of Belgium, in the province of Hainault, 20 miles north-east of Tournai. It has extensive manufactures of linens, has breweries, salt-works, oil and flour mills, and has two fairs annually. Pop. 5258.

FLODDEN, BATTLE OF. On the 24th January 1502, a 'perpetual peace' was concluded between England and Scotland. In the course of a few years, however, a series of petty quarrels had done much to bring this peaceable arrangement to a termination; and in 1513, on the invasion of France, Scotland's ancient ally, by Henry of England, a war broke out between the two countries. James IV., the chivalrous but rash king of Scotland, summoned the whole array of his kingdom to meet on the Borough or Common Moor of Edinburgh, which extended from the southern walls of the city to the foot of the Braid Hills, and which was then 'a field spacious, and delightful by the shade of many stately and aged oaks.' Here an army, it is said, of 100,000 men assembled. With this force James crossed the border on the 22d August 1513; but instead of advancing at once, and achieving a decisive success, he lingered in the neighborhood of the Tweed until his army had become reduced by desertion to about 30,000 men.

On the 6th September, James took up his position on Flodden Hill, the last and lowest eminence of the Cheviots towards the north-east. On the morning of the 9th, the Earl of Surrey, lieutenant-general of the northern counties of England, at the head of an army of about 32,000 men, advanced from the south-east, crossed the Till by a skilful and unexpected movement, and thus cut off all communication between King James and Scotland. While the English were crossing the Till, the Scots might have attacked them with every chance of success, and their not taking advantage of this opportunity was the first great mistake of the battle. Observing that the English were aiming at a strong position to the north-west of Flodden Hill, and desirous of preventing this, James, having ordered his tents to be set on fire, advanced against them in battle-array. The two armies were drawn up in similar order, each consisting of a center, a right and left wing, and a reserve placed behind the center. At about four o'clock on Friday, 9th September, the battle commenced with cannonading on both sides. The Earls of Huntly and Home, who commanded the left wing of the Scottish army, charged the English right, which was led by Sir Edmund Howard, and entirely defeated it. Instead, however, of following up their success, Home's borderers commenced pillaging the baggage of both armies; and Huntly, after his first charge, is said to have left the field. On the Scottish right, the clansmen under Lennox and Argyle, goaded to fury by the English archers, rushed forward, heedless of order, and fell with the greatest violence upon their opponents, who, however, received them with wonderful intrepidity and coolness, and at length put them to flight with great slaughter. Meantime, a desperate resistance was being made by the Scottish center, where the king fought on foot among his nobles. Scottish history presents no instance in which the national valor burned with a purer flame than in this. Hemmed in by outnumbering enemies, the king among his slender group of lords fought manfully until, when the night was closing on Flodden, he fell pierced by an arrow, and mortally wounded in the head. The hill was held during the night by the Scots; but at dawn, learning the state of matters, they abandoned their position. Their loss amounted to from 8000 to 10,000 men. 'Scarce a Scottish family of eminence,' says Scott, 'but had an ancestor killed at Flodden.' Besides the king, the Archbishop of St. Andrews and twelve earls were among the slain. The English loss amounted to about 6000 or 7000; but Surrey's victory was so nearly a defeat that he was unable to prosecute the war with any vigor. The sixth canto of Sir Walter Scott's poem of *Marmion* contains a magnificent, and in the main an accurate, description of the battle.

FLOGGING, ARMY AND NAVY. Corporal punishment has existed from time immemorial in the British army and navy; formerly having been inflicted upon slight occasion, and often with barbarous severity. In deference, however, to public opinion, it

has been much less resorted to during recent years, and under the Army Bill of 1881 was finally abolished. This bill repealed as much of the Army Discipline and Regulation Act as prescribed punishment for offences committed by persons subject to military corporal law. When a soldier on active service is now guilty of a punishable offence, he shall be awarded for that offence such summary punishment, other than flogging, as may be directed by rules to be made from time to time by one of Her Majesty's principal secretaries of state; and such summary punishment shall be of the character of personal restraint or of hard labor, but shall not be of a nature to cause injury to life or limb, and shall not be inflicted when the confirming officer is of opinion that imprisonment can with due regard to the public service be carried into execution.

Corporal punishment is not recognized in the French army. Its soldiers are drawn from all ranks of society, and have, on an average, a higher moral tone than the British recruits, who volunteer usually from the lowest orders. On the other hand, the discipline in the French army, and especially during war on a foreign soil, is universally admitted to be inferior to the strict rule preserved among British troops. The French soldier, though escaping the ignominy of personal chastisement, is governed by a code harsher than our army regulations as actually administered; and the punishment of death, scarcely known in the British service during peace, is not unfrequently visited in France upon offenders against discipline.

FLOOR-CLOTH, a coarse canvas coated on both sides, and partly saturated with thick oil-paint, one side having usually a colored pattern printed upon it in oil-paint. The canvas basis for floor-cloth is chiefly manufactured in Dundee. As it is required to be without seam, and of sufficient width to cover considerable spaces of flooring, special looms are required for weaving it. It is made from 18 to 24 feet in width, and in lengths from 100 to 113 yards.

The first step towards converting this canvas into floor-cloth consists in stretching it on a frame. This is a work of some difficulty, on account of the great size of the pieces. Some of the frames are as much as 100 feet in length by 24 feet in height, and the canvas must be stretched over it as tight as a drum. The back or plain side of the cloth is first operated upon, by *priming* it with a solution of size, and scouring it with pumice. The object of this is to prevent too much of the paint from penetrating the canvas, and rendering it brittle, and to make an even surface to receive the paint, which is mixed with linseed oil, with very little or no turpentine, and is consequently thicker than common paint. This is thrown or splashed upon the surface with a brush; and then with a long steel trowel the workman spreads the dabs of paint, and produces a tolerably smooth surface. This *trowel-color* is left for 12 or 14 days to dry, and then another coat is laid on in a similar manner; and this completes the back or under side of the floor-cloth.

While the first coat of the back is drying, the front is *primed* and pumiced, and a coat of trowel-color laid on. As more care is required on this side, this coat of color is scoured quite smooth with pumice, and two more trowel-colors are added, and each scoured like the first. Another coat is now carefully laid on with a brush, and is called a *brush-color*. This forms the ground upon which the pattern is to be printed.

The printing is done by means of wood-blocks. The pattern is first drawn and painted, in its complete form and colors, upon a piece of paper; another piece of paper is now laid under this, and the outlines of that portion of the pattern included in one color are pricked through to the lower paper. In like manner, pricked outlines of each of the other colors are prepared. Each of these pricked sheets is laid upon a block of pear-tree wood, and dusted over with powdered charcoal or lampblack, and thus the pattern is drawn in dots upon the wood; the carver cuts away the wood surrounding the pattern, and leaves it standing in relief.

The pear-tree blocks are backed by gluing them to a piece of deal, and this piece again to another, with the fibres at right angles, to prevent warping.

The colors are spread by boys upon padded cushions covered with floor-cloth, and each printer dabs his block upon that containing the required color, and then places it upon the floor-cloth, and striking it with the handle of a short heavy hammer, prints his portion of the pattern. He then proceeds with a repetition of this, and as he advances, he is followed in order by the printers of the other colors, who place their blocks accurately over the pattern the first has commenced. The first printer's chief care is to keep the repetitions of the pattern accurately in line.

The quality of floor-cloth depends mainly upon the number of coats of paint, the kind of medium used for the color, and the time given to drying. For the best qualities, a fortnight must elapse between the laying on of each coat, and finally, several months' exposure in the drying-room is necessary. As the rental of the space thus occupied, and the interest of the capital

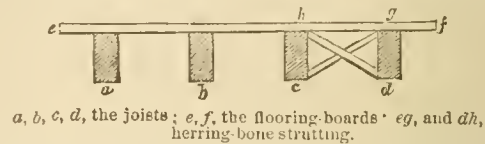
left stagnant during this time, amount to a considerable sum, there is a strong inducement to manufacturers to hasten the processes, which may easily be done by using gold size of boiled linseed oil, or other rapid 'dryers,' instead of raw linseed oil; but just in proportion as the drying is hastened by these means, the durability and flexibility of the floor-cloth are deteriorated. In order to secure the maximum of durability, floor-cloth should still be kept three or four years after it has left the drying-room or the manufacturer, and purchasers should always select those pieces which they have reason to believe have been the longest in stock. Narrow floor-cloth, for stair-carpeting, passages, &c., is made as above, and then cut into the required widths, and printed. It usually has a large pattern in the middle, and a border of a smaller design.

The laying of lobbies and passages with encaustic tiles has led to the superseding of floor-cloth in such situations, while for some other purposes, such as covering the floors of churches, reading-rooms, and waiting-rooms at railway-stations, it is superseded by the material called *Kamptulicon* (q. v.), or vulcanized india-rubber cloth, which is impervious to wet, soft and quiet to the tread, and warm to the feet. This material is made plain or figured to resemble painted floor-cloth. See also **LINOLEUM**.

FLOORS, FLOORING, the horizontal partitions between the stories of a building, the upper part of which forms the floor of the apartments above, and the lower portion the ceiling of those below.

Floors are variously constructed, according to their dimensions, and to the weight they have to sustain. *Single-joisted floors* are the simplest and most cheaply constructed, and are used for ordinary buildings, where the distance between the bearings does not exceed 20, or at most 24 feet.

The annexed figure represents a section of a single-joisted-floor, in the line of the flooring-boards, and across the joists. These



joists are beams laid edge upwards, and resting at their ends upon wall-plates built into the walls. Their width should not be less than two inches, for if narrower, they would be liable to split with the nailing of the flooring-boards. They are placed edge upwards, in order to economize timber, as the strength of a beam to bear a transverse strain varies simply with the breadth and with the square of the depth. See **STRENGTH OF MATERIALS**. When a deep and long joist is used, there is danger of its twisting or turning over; this is prevented by *strutting*, that is, nailing cross pieces of wood between them, as shown between the joists *c* and *d* of the figure, or less effectually, by driving pieces of planking between them. Strutting is required when the length of the joists exceeds eight feet. The laths for the ceiling of the room below are nailed to the bottom of the joists. In good substantial work, the distance between the joists from center to center is about 12 inches, but this is often exceeded in cheaply built houses.

Double-joisted floors are constructed by laying strong timbers, called *binding-joists*, from wall to wall, at a distance of about six feet apart; and a double set of joists, one above for the floor, and one below for the ceiling, are laid across these, and notched down upon them. These latter, when thus placed, are called *bridging-joists*, as they bridge over the interval between the larger binding-joists. This is adopted when a more perfect ceiling, free from cracks, produced by the yielding of the floor, is required, or where there is a difficulty in obtaining a sufficient amount of long timber for single joisting the whole of the floor.

The *framed floor* is one degree more complex than the double joisted. Binding and bridging joists are used in the framed floor, but the binding-joists cease to be the primary support, as for this purpose strong barks of timbers, called *girders*, are used. They are laid across, at distances of from eight to ten feet, and the binding joists are framed into them by a *tusk-tenon* joint. See **CARPENTRY**. The bridging-joists are notched to these in the same manner as for double-joisted floors. A *bay* is the general name for the space between girders: if between a girder and a wall, it is called a *tail bay*; or between two girders, a *case bay*; and the work between is described as a *bay of joisting*.

When the space to be spanned is too great for a simple wood-girder, trussed or built up wooden girders or iron girders are used: the latter have of late come into extensive use, even where simple wood-girders are applicable. See **GIRDER**.

With a given quantity of timber, and a moderate space, the single-joisted floor is the strongest of any. One of its disadvantages is the free communication of sound to the apartment below, unless some additional means of obstructing the sound be adopted.

When first laid, the floor should be rather high in the center, to allow for settling at the joints; and when settled, it should be perfectly level, for if it rises in the middle, it will exert an outward thrust upon the walls, and if hollow it will pull inwards; but if level its whole strain is perpendicular.

The flooring-boards are usually nailed to the joists, and vary from 1 to 1½ inch in thickness; for common floors they are from 7 to 9 inches wide, but for better floors a width of only 3 to 5 inches is used. The advantage of the narrow boards is, that the shrinkage and warping have not so much effect on the spaces between. This refers to the ordinary deal-flooring used in modern British domestic buildings. The facing of the floor in many old mansions is formed of small pieces of oak carefully inlaid. See PARQUETRY. For other kinds of inlaid fancy floors see MOSAIC, ENCAUSTIC, TILES, and CONCRETE. In France, and most of the southern continental countries, where carpets are rarely used, the flooring-boards of the better class of houses are made of hard wood, carefully and closely jointed, and these floors are commonly rubbed with bees-wax, and polished. In humbler dwellings, even the bedrooms are paved with tiles, or strong plaster, or concrete; and considering the prevalence of fleas, &c., in such places, they are certainly better adapted for them than our deal-boards and carpets. They may be freely sprinkled and even swilled with water in hot weather.

For warehouses where heavy goods are stored, for ball-rooms, &c., special construction is required to adopt the floor to the strain put upon it.

FLO'RA, among the Romans, was the name of the goddess of flowers and of the spring, and was latterly identified with the Greek *Chloris*. Her temple was situated in the vicinity of the *Circus Maximus*. The worship of F. was one of the oldest manifestations of the Roman religious feeling, and is affirmed to have been introduced by Numa.

The *Floralia*, or festivals in honor of the goddess, were first instituted 238 B.C., and were celebrated from the 28th of April to the 1st of May, with much licentious merriment, prostitutes playing an important part on such occasions. On coins, F. is represented with a crown of flowers.—In Botany, the term *Flora* is a collective name for plants, and is used with regard to the vegetable kingdom in the same way as the term *Fauna* with regard to the animal. It is common to speak of the *Flora* of a country or district; and a work devoted to the botany of a country or district is often entitled a *Flora* of that region.

FLO'RENCE (Ital. FIRENZE), a city of Italy, capital of the former duchy of Tuscany, is situated in the valley of the Arno, in lat. 43° 46' N., and long. 11° 15' E. It is about 123 feet above the level of the sea; 60 miles from Leghorn, 40 from Siena. Pop. (1881) of town, 122,039; of commune, 169,001. The Arno, spanned by four fine bridges, divides the city into two unequal parts, the chief of which stands on the northern bank of the river. In shape, an irregular pentagon, F. is enclosed by walls of about 6 miles in extent, and communicates with the exterior by means of eight gates, which conduct to thickly peopled suburbs, and a lovely, fertile, and salubrious neighborhood, encircled by sloping hills, and studded with picturesque villas and fruitful vineyards and gardens. F. and her environs, viewed from the heights of Fiesole, appear but one vast city. The influx of population consequent on the establishment here, in 1865, of the seat of the Italian government, necessitated a considerable extension of the city, and it is now nearly double its former extent. Many causes render this city a most attractive place of residence to foreigners—a lovely country and healthful climate, cheap living, and the universal courteous intelligence of the people, united to the immense sources of interest possessed by the city in her grand historical monuments and collections of art. The massive and austere forms of Florentine architecture impart an air of gloomy grandeur to the streets, for the most part regular and well kept. The chief monuments of the city are *Il Duomo*, or the Cathedral, the foundations of which were laid with great solemnity in 1298. The Florentines having ambitiously resolved on erecting a monument which for architectural splendor and proportions should outvie all preceding structures, the honor of preparing the design was intrusted to Arnolfo de Cambio da Colle. On his death, Giotto superintended the works; and many eminent architects were employed before this splendid edifice was completed—Brunelleschi, the last, conceived and erected the grand cupola, so much admired by Michael Angelo as to have served him as model for that of St. Peter's. At the side of the cathedral springs up the light and elegant bell-tower, detached, according to the custom of the times. In front is the Baptistery of San Giovanni, in form an octagon, supporting a cupola and lantern; all three edifices being entirely coated with a varied mosaic of black and white marble. Three bronze gates in basso-relievo are a great additional adornment of the Baptistery; the two by Ghiberti have been immortalized by Michael Angelo with the name of Gates of Paradise. See Sgrilli's description.

The church of the Santa Croce, the Pantheon of F. (built in 1291—architect, Arnolfo), contains monuments to Gaddi, Dante, Machiavelli, Michael Angelo, Alfieri, &c. The church of San Lorenzo was consecrated as early as 393 by St. Ambrose, and rebuilt by Brunelleschi in 1425, by command of Giovanni and Cosmo de' Medici. It contains an interesting monumental memorial of Cosmo il Vecchio, bearing inscribed the title *Pater Patrie*, which had been conferred on his memory by public suffrage the year following his death. In the *Nuova Sagrestia*, or New Sacristy, are the two famous monuments of Michael Angelo to Julian and Lorenzo de' Medici. The figures of these two statues are marvels of deep and living expression, and unsurpassable in their mute and eloquent beauty. The Medicean chapel, gorgeous with the rarest marbles and most costly stones, agate, lapis, lazuli, chalcedony, &c., stands behind the choir, and contains the tombs of the Medici family, and those of the grand dukes their successors. Annexed to the church is the Laurentian Library, with its inexhaustible store of rare MSS., founded by Giulio de' Medici. Bandini has published the catalogue of the Greek, Latin, and Italian MSS.; and Biscioni and Assemanithose of the Hebrew and Oriental ones. Amongst the numerous palaces, *Il Bargello*, now converted into a prison, is one of the most ancient, and was formerly the abode of the republican magistrate, the Podestà. In 1841, some interesting portraits were brought to light by the removal of a coating of whitewash from the revered features of Dante, Brunetto, Latini, Corso, Donati, &c., in the chapel of the palace. The Palazzo Vecchio, the seat of the republican government from its establishment till 1530, when it was abolished, is an imposing mass of building, surmounted by a lofty tower 260 feet high, the great bell of which used to warn the citizens of danger, or summon them to defence. Adjoining the palace is the Piazza del Palazzo Vecchio, a square containing a fine collection of statues, and a noble arcade, the Loggia de' Lanzi, under the porticos of which are magnificent groups of sculpture (see Rastelli's *Illustrazione Storica del Palazzo della Signoria detto Palazzo Vecchio*); Gli Uffizi, a handsome building between the Palazzo Vecchio and the Arno, founded by Cosmo I., in the first floor of which are deposited the archives of the court of justice and other public offices, also the Magliabechi Library of 150,000 volumes, and 12,000 MSS. On the second floor, in a circular suite of 23 rooms, is contained the famous Florentine gallery of art; rich in paintings, engravings, sculpture, bronzes, coins, gems, and mosaics. A splendid apartment, known as the Tribuna, contains the rarest treasures of the collection, and is in itself a wonder of art, with its cupola inlaid with mother of pearl, and its rich marble pavement. The Palazzo Pitti, the modern grand ducal residence, boasts of a superb gallery of paintings, and a collection of 70,000 rare volumes, and 1500 MSS.

The Palazzo Riccardi, now public property, is much frequented for its fine library. The Palazzo Strozzi is a fine type of Tuscan architecture. Florence abounds in other public edifices and monuments well meriting notice, but our limits oblige us to omit all mention of them. The practical and philanthropic institutions are also numerous and excellently organized. The hospital of Santa Maria Nuova contains a college of medicine and surgery, which enjoys a European fame. The Academy of the Fine Arts and the Museum of Natural History afford unlimited resources to the public interested in their collections. There are three hospitals, one lunatic asylum, nine theatres. The Academy della Crusca is intrusted with the care of sifting and preserving uncorrupted the Italian language. The Academy dei Georgofili was established in the interests of agriculture. F. is the see of an archbishop, the seat of a prefecture and of numerous provincial courts, as well as the military headquarters of the region. Its railway communications are ample. The chief industrial occupations of the Florentines are the fabrication of silk and woollen textures, and of straw-plaiting for hats, &c., jewelry, and exquisite mosaics in rare stones. Education is more diffused in Tuscany than in any other Italian state; and the Florentines are famous for their caustic wit and natural gifts of eloquence, as well as for their shrewd thriftiness and unflagging labor. In their moral superiority to other states may be recognized the effects of a better and more upright government than those which existed in most parts of the peninsula previous to the recent union of Italy.

History of Florence.—The city of F. sprang originally from Fiesole (q. v.), at the foot of which it lies extended. The inconvenient and hilly site of the Etruscan Fiesole, perched on the crest of an irregular height, rendered the town so difficult of access to the traders who resorted to its market-places with their varied merchandize, that it was at length decreed they should assemble at the base of the hill, in the fertile plain traversed by the Arno. The few rough shelters erected for the accommodation of these traders may be considered the original nucleus of the important and splendid city of Florence. Such at least is the traditional history of its origin generally accepted by the Florentine historians. It would seem that as early as the time of Sulla there had

been a Roman colony here; another was sent after the death of Julius Caesar, and it soon became a thriving town. The *Florentini* are mentioned by Tacitus, 16 A. D., as sending delegates to Rome, but it was not till the time of Charlemagne that F. began to rise out of obscurity. It was now governed by a political head with the title of Duke, assisted by various subordinate officers, who were elected by the united suffrages of the duke and citizens. In the 11th c., F., and a great part of Tuscany, were bequeathed to Pope Gregory VII., by his friend and partisan the Countess Matilda, who inherited from her mother, the Countess Beatrix, her jurisdiction over the city.

Under the protection of Rome, F. speedily adopted the forms and institutions of a free city; and the republican spirit which then arose amongst the people imparted an impulse to national and individual life, and awoke a spirit of ardent patriotism and splendid enterprise. As early as the 11th c., the Florentines were European traders, and the possessors of grand commercial dépôts in the seaports and cities of France and England, and their skill as workers in gold and jewels had grown proverbial. In proportion as papal preponderance increased in F., that of the empire sank; and in 1113 the citizen forces routed the troops, and slew the delegate of the emperor at Monte Cascioli, near Florence. During the bitter wars between pope and empire, F. and all Tuscany seemed to have been saved from the civil feuds which raged throughout Italy between the contending factions of Guelphs and Ghibellines; the former, adherents of the pope; the latter, of the empire. But in 1215, F. became involved in the great party struggle, owing to a private feud breaking out between two noble families, chiefs of the contending principles. A Guelph noble, Buondelmonti, mortally incensed the Ghibelline family of the Amidei, by breaking off his alliance with a daughter of their house, and contracting marriage with a member of a Guelph family. To avenge this insult, the Amidei appealed to their powerful kinsmen, the Uberti, and, in fact, to all the Ghibelline party of Florence. Buondelmonti was stabbed to death as he crossed the bridge of the Ponte Vecchio, and was speedily avenged by the Guelphs in the blood of his enemies. Thus for 33 years was F. distracted by the deeds of bloodshed and violence of these two rival factions, who assumed the names and adopted the respective causes of Guelph and Ghibelline. See GUELPH AND Ghibelline. In 1250, the animosity of these parties seemed somewhat blunted, and public attention was directed to wise internal reforms. Twelve magistrates, or *anziani*, were appointed in place of the consuls, each of the six sections into which the city was divided being intrusted to two of these magistrates, whose tenure of office was annual. To avoid all local dissensions, two other magistrates, strangers by birth, were elected; the one, invested with supreme authority in civil and criminal cases, was called the *podestà*; the other, with the title of captain of the people, had the chief command of the militia, in which were enrolled all the youth of the state, who were bound, at the call of this magistrate, to join their company fully equipped for fight: 20 companies defended the town, 96 the country. After the death of the Emperor Frederick II., the great protector of the Ghibellines, the Guelph or papal party gradually rose in power in F., and during ten years of their predominance, the city ascended in grandeur and prosperity, until it stood not only the first in Tuscany, but one of the first of all Italy. In 1254, the Florentines first coined their noble golden florin, unequalled at the time for beauty: in weight, a drachm, it bore on one side the national emblem, a lily; and on the reverse, the effigy of the popular patron, St. John the Baptist. It commemorated a period of great success in the annals of F., whose forces had successively humbled the adjoining towns of Siena, Arezzo, Pisa, and Pistoja in 1252, and in 1254 captured Volterra.

In 1260, the standard of civil war was again raised by the Ghibellines of F., who, in league with Manfred of Naples, attacked the Guelphs, and cut their forces to pieces in the sanguinary battle of Monte Aperto. The conquerors entered F. forthwith in the name of Manfred, abolished all trace of the popular institutions, establishing an exclusively aristocratic executive, and even strongly advocated the entire destruction of the city, the hotbed of Guelphism. This barbarous scheme was indignantly repudiated by their own famous leader, Farinata degli Uberti, immortalized by Dante for his patriotism. He declared his intention of heading the Guelphs, whose cause was such a sacrilege perpetrated by his own party. Pope Urban IV., French by birth, summoned against the Ghibelline Manfred a French army, led by Charles of Valois, to whom he offered the prospective kingdom of the Two Sicilies. Manfred was defeated and slain in the famous battle of Benevento, and Guelph ascendancy was restored anew throughout Italy and Florence. Charles fully restored to the Florentines their internal institutions, and received their offered allegiance for ten years, 1266. In 1282, the *Priori*, a new executive power, was established in F.; and in 1293, by the consent of the *Priori*, a higher chief than their own order was elected, with the title of *Gonfaloniere*. In 1300, Dante became one of the *Priori*, and the former feud

was recommenced with new vigor between the two factions, who bore the names of Bianchi (Whites) and Neri (Blacks). Their dissensions were, however, interrupted by the appearance of Charles of Valois, sent by Boniface VIII. to restore tranquillity, 1301. Charles espoused the part of the Guelphs or Neri, and sanctioned every outrage on the Bianchi, who were plundered and murdered barbarously, the survivors being exiled and beggared; among these were Dante, and Petracco dell' Ancisa, the father of Petrarca. In 1306, Pistoja was besieged, and taken by famine with great barbarity. In 1315, the Florentines met with a severe check from the Ghibellines of Pisa, under the command of Ugucione della Faggiuola; and in 1325, were completely defeated by Ugucione's successor in command, the valiant Castruccio Castracani, in the battle of Altopascio. F., weakened by long dissensions, and alarmed by Castruccio's threat of marching on the city, appealed to the king of Naples for aid. They received joyfully an officer of the king, entitled the Duke of Athens, sent as royal vicar; and such was the public demoralization of the moment, they proclaimed him dictator of the republic, unanimously suppressing the offices of *priori* and *gonfaloniere*. The intrigues of this ignoble schemer to overturn the republic being discovered, he was ignominiously expelled by a general popular rising, and narrowly preserved his life. An attempt to admit a proportion of the nobles into the government signally failed at this time and only led to renewed animosity between them and the citizens. This was the last effort of the nobles to secure power. See Machiavelli, Book ii. A terrible pest decimated F. in 1348, sweeping off 100,000 of her inhabitants. See Boccaccio, *Decameron*. The chief power of F. about this time seems to have been alternately wielded by the democratic families, the Alberti and the Ricci, and by their patrician rivals, the Albizzi, who, for the space of 53 years, guided the republic in the path of independence and progress.

In 1406, the ancient and illustrious republic of Pisa (q. v.) fell under the sway of F., after a most heroic resistance. From 1434, the history of F. is intimately bound up with the House of Medici, whose influence supplanted that of the Albizzi. See MEDICI. The Medici were repeatedly banished from F., in consequence of their aiming at sovereign power; and to their intrigues F. owes her final loss of republican rights and institutions. Pope Clement VII., of the House of Medici, formed a league with the Emperor Charles V., by which the liberties of F. were to be extinguished, and the sovereign power to be invested in the pope's bastard son, Alexander de' Medici. In September 1529, an army of imperialists, under the Duke of Orange, entered Tuscany; and on the 8th of August 1530, the siege of F. terminated, after a defence of unexampled devotion and bravery on the part of the citizens. Thus fell the name and form of the republic of F., quenched in the best blood of the city, a sacrifice to a renegade pope, who employed both foreign robbers and internal traitors to destroy and humiliate the city of his birth. From this period, F. loses her distinctive history, and is only known as capital of the grand duchy of Tuscany, Pope Clement having conferred on Cosmo de' Medici the ducal dignity. Some idea of the splendor and prosperity of F. as a republic may be had from the fact, that her capitalists were so enormously wealthy, they supplied the chief sovereigns of Europe with funds; her manufactures of wool, silk, and gold brocade were exported throughout the world; and besides home centers of commerce, she possessed great commercial establishments in all the countries of Europe. This wonderful prosperity the Florentines owed solely to their indomitable spirit of enterprise. Florence was for a time the capital of the new kingdom of Italy, but in 1871 had to yield the honor to Rome.—The province of F. or Firenze has an area of 2260 square miles, and a population of (1871) 766,326.

FLO'RÉS, as the name of various islands, occurs in Asia, North America, South America, and the Azores.—1. In the Malayan Archipelago, about half way between Java and the eastern extremity of the chain. It lies due south from Celebes, in 8°—9° S. lat., and 120°—123° E. long. Like most members of the group, it is of an oblong shape, measuring 200 m. in length by an average breadth of 35, and is of hilly character and volcanic origin. It produces cotton, sandal-wood, and bees-wax; and its principal trade is with Singapore.—2. The most westerly of the Azores, with a population of about 10,000—lat. 39° 25' N., and long. 31° 12' W.—3. In the Pacific Ocean, a little to the west of Vancouver Island—lat. 49° 20' N., and long. 126° W.—4. In the Plata, about 20 miles below Monte Video, in the republic of Uruguay, in lat. 34° 56' S., and long. 55° 55' W.

FLO'RET. See FLOWER.

FLORICULTURE, or CULTIVATION OF FLOWERS. From the earliest times, and wherever any considerable progress has been made in civilization, plants have been cultivated for the sake of their beautiful or fragrant flowers. Flowers have been very generally employed not only to afford gratification, and for the adornment of the person and of houses, particularly on festive

occasions, but in many countries also in connection with religious rites.

Flower-markets existed in ancient Athens, as in the richest capitals of the modern world. India, China, and Mexico have been famous for the cultivation of flowers, from the earliest periods to which their history can be accurately traced. Artificial means have been employed for the protection and cultivation of delicate exotics, prized only on account of their flowers, far more generally and assiduously than for the cultivation of any fruit-bearing, culinary, or otherwise useful plants. Those who cannot afford more than a very small green-house, almost always devote it to flowers; and those who cannot attain even this, have a few favored plants under a frame, or at least in a window.

Flowers are either cultivated in borders of a garden mainly appropriated to fruit-trees and culinary vegetables, or a separate flower-garden is formed, consisting generally of parterres cut out of a lawn. Of late years, the separate flower-garden has become much more common than formerly. There is much room for the display of taste in the forming and grouping of its parterres, and both in it and in the humbler flower-border, in the arrangement of the flowers themselves. A common rule has always been to place the plants of tallest growth generally at the greatest distance from the walks or alleys from which they are to be viewed, and those which scarcely rise above the ground, nearest to the spectator: it is also of evident importance, except in extensive gardens, that every border or parterre should be gay with flowers during all the spring, summer, and autumn, on which account attention must be paid to the intermixing of plants that flower at different seasons, and for this purpose annuals are often sown amongst perennial plants and shrubs; whilst it is always necessary to take care that the combination of colors be such as to please and not offend the eye, in order to which *complementary colors* are brought together—red and green, blue and orange, yellow and violet—whilst a judicious mixture of white blends and harmonizes those which would otherwise appear unpleasantly contrasted. This rule is equally applicable to the grouping of flowers in one border, or of parterres in which masses of the same color are exhibited, often produced by an extensive planting of the same flower, a practice which has recently become common, and by which the greatest splendor of general effect is produced.

The flower-garden requires the same attention to the habits of particular species, and the same assiduity in digging, cleaning, &c., which are requisite in other departments of horticulture. Perennial herbaceous plants generally require to be not unfrequently renewed by parting of the roots or otherwise, as the tuft extends and the flowering stems become more numerous, but weaker and less productive. Many plants are placed in the flower-garden in summer, which require the protection of the frame or green-house in winter.

In no department of horticulture have greater changes been effected by cultivation. Even the practised eye has often some difficulty in recognizing the splendid varieties which the florist has produced, as the progeny of the unpromising original form. One of the most common effects of cultivation is the production of double flowers, in which the stamens have been converted into petals, as in roses, so that if the flower is perfectly double, it can produce no seed of itself; or, in the case of composite flowers, the florets of the disc assume the same form with the florets of the ray, as in dahlias, asters, &c.

Much improvement has been effected by crossing, not so frequently by the real hybridization of different species, as by the intermixture of artificial varieties already obtained; and many of the finest varieties are the mere result of the careful selection and cultivation of the individual plants of superior beauty, and of their progeny.

The green-house, conservatory, stove, &c., in which exotic flowers are cultivated, are noticed in separate articles. But perhaps this article would not be complete without some notice of *window-gardening*, by which a charm is added even to the abodes of the wealthy, particularly in cities, and by which even the poor have the delight of tending a choice exotic or two, and becoming familiar with the beauty of their flowers. The care requisite in window-gardening is the same as for plants kept in flower-pots in the green-house; there must be the same re-potting, pruning of the roots, &c., from time to time, and at least as much attention in giving water and air. Of the former, the most common mistake is to give too much, and of the latter too little. It is a good rule, that except immediately after water is given, it should never be seen in the saucer; nor should the earth appear *very* moist. The situation, however, being in many respects less favorable, many plants, as heaths, which are frequent in green-houses, cannot be successfully cultivated in the windows of apartments. The common notion that the burning of gas in apartments injures window-plants, does not appear to be well founded. **WARDIAN CASES**, by means of which many delicate plants are produced in the greatest perfection in the windows of apartments, are noticed in a separate article.

Horticultural Societies (q. v.) have of late done much for the encouragement of the cultivation of flowers, and particularly among the humbler classes of society, with evident increase of amenity within and around their abodes, and an unquestionable tendency to refinement of habits and feelings.

FLORIDA, the name of the most southerly and most nearly tropical member of the United States of North America. Including its adjacent islands and its reef-like chain of keys on the south-west, it stretches in N. lat. between 25° and 31°, and in W. long. between 80° and 87° 44'. The greater portion of it forms a peninsula stretching south-south-east towards the Bahamas, having the Atlantic on the one side, and the Gulf of Mexico on the other. It adjoins, on the north, the states of Georgia and Alabama. Its greatest breadth, from the Atlantic to the river Perdido, is 360 miles; its greatest length about 400 miles; the average breadth of the peninsular portion upwards of 120 miles; area, 60,000 square miles. The principal rivers are the St. John's, running north-east through the peninsula, and entering the sea near Jacksonville after a course of 300 miles; the Suwanee, flowing south from Georgia into the Mexican Gulf at Vacassur Bay; the Apalachicola, the Choctawhatchee, Escambia, and Perdido. The principal towns are Tallahassee, the seat of government, situated near the middle of the northern boundary; Jacksonville; Key West; St. Mark's on the Gulf; St. Augustine on the Atlantic, the Spanish capital, and the oldest settlement in Anglo-Saxon America; and Pensacola, a port near the Perdido, in the extreme west of the state, which became conspicuous in the war of secession.

In physical character, the state, generally speaking, is part of the sandy and marshy belt which forms the immediate seaboard from the Potomac to the Mississippi. Nay, far beyond the average of the contiguous shores in either direction, it may, almost without a metaphor, be described as amphibious. To say nothing of inlets, which carry the tide within fifty miles of every point, the interior may literally be said to teem with fresh water, here and there welling up into considerable streams from springs ranging to 250 fathoms in depth. This is more emphatically true of the south, where an immense district known as Everglades, exhibits, as its normal condition, the ordinary phenomena of a casual inundation. Though the surface is thus better adapted to pasturage than to tillage, yet, in favorable localities, the soil, rather through the abundance of heat and moisture than from any inherent fertility, largely yields such productions as sugar, cotton, and rice. Considering that the state shares with the Bahamas the dominion of that grand highway of commerce, the Gulf Stream (q. v.), its inexhaustible growth of timber for ship-building is peculiarly valuable. Its coasts and rivers swarm with shoals of fish; while its dependent keys, periodically crusted with salt of the sun's making, furnish the means of curing them.—*Florida*, so called because of its exuberant vegetation, was first made known to Europeans by Ponce de Leon, who landed near St. Augustine in 1512. In 1539 it was explored by Fernando de Soto. Originally, the term *F.* vaguely indicated among the Spaniards the eastern side of the new continent to the north of Mexico, just as the term California received a similarly loose interpretation on the western coast. Gradually, however, it came to be circumscribed by the encroachments of rival powers—its first definite boundaries being established with reference to the claims of English Georgia and French Louisiana. Even within these limits, it embraced, in addition to the *F.* of the present day, the maritime borders of Alabama and Mississippi. Thus fixed in position and extent, the colony was ceded to England in 1763, and recovered by Spain in 1781. Louisiana having been bought by the U. S. from France in 1803, in 1821 *F.* was also annexed to the republic by a mixture of force and negotiation.

The same physical character of *F.* which impairs its economical worth, has added materially to the expense of its occupation. From about 1836 to 1842, the Seminole Indians, protected by their swamps, tasked the resources of the American Union more than any other domain of equal size ever tasked them. The population was 34,730 in 1830; 87,445 in 1850; 187,748 in 1870; and 269,193 (including 126,690 colored persons) in 1880. The amount of state receipts in the year 1878-79 was 312,046 dollars; the state debt in 1879 being 1,295,000 dollars. The amount of taxable property, real and personal, in *F.* is about 30,000,000 dollars.

The chief crops in 1879 were Indian corn, 1,945,650 bushels; oats, 180,800 bushels; cotton, 16,968,000 lbs. The cotton manufactures of the state employed in 1880, only 816 spindles and 33 persons. Of the children of school age, only about one-half are as yet at school. In 1880 there were but 480 miles of railway in the state. In 1868 the legislature of *F.* agreed to the fourteenth amendment of the constitution of the United States, and was recognized as one of the states in the Union. It sends two members to the House of Representatives, besides possessing the two senators belonging to every state.

FLORIDA, GULF OF, the name given to the channel between Florida and the Bahamas, traversed by the Gulf Stream (q. v.). Chambers' Cyclo. Vol. III.—37.

From Florida Reefs on the south, to Settlement Point, the most northern of the Bahamas in the channel, is 200 miles long; greatest breadth at the southern extremity, 150 miles; at the northern extremity, 65 miles.

FLORIDA BLANCA, DON JOSEFO MONINO, COUNT OF, prime minister under Charles III. of Spain, was born in 1728 at Murcia, where his father was a notary. Having studied at Salamanca, he gained soon after such distinction that he was appointed Spanish ambassador to Clement XIV. of Rome. In that office, he displayed great ability, especially in the abolition of the order of Jesuits and the election of Pius VI. Grimaldi, Spanish minister of Foreign Affairs, on being dismissed, was asked by the king to nominate a successor, and accordingly proposed Monino. Charles followed his advice, created Monino Count of Florida Blanca, and intrusted to him, besides, the department of matters of justice and mercy, as well as the superintendence of posts, highways, and public magazines. F. used this extensive authority in introducing post-coaches and good post-roads, in improving the capital, and attending to other important departments of general police, as likewise in actively promoting the arts and sciences. His effort to confirm the good understanding between Spain and Portugal by a double marriage, which would have secured the Portuguese throne to a Spanish prince, was unsuccessful. His military undertakings also, the attack upon Algiers in 1777, and the siege of Gibraltar in 1782, issued unfortunately. Before the king's death in October 1788, F. presented a defence of his administration, with a request for leave to resign. The defence was accepted, but the request refused. However, under Charles IV. in 1792, F.'s enemies obtained his disgrace. Imprisoned at first in the citadel of Pampeluna, he was afterwards released, and banished to his estates. He appeared again at the meeting of the Cortes in 1808, but died November 20 of the same year.

FLORIDEÆ. See CERAMIACEÆ.

FLORIDIA, a town of Sicily, in the province of Syracuse, seven miles W.N.W. from the city of Syracuse. It stands in a wide plain, amidst vineyards, olive-groves, and corn-fields. The houses are mostly low and small. Pop. 8500.

FLORIN was the name of a gold coin first struck in Florence (q. v.) in the 13th century. It was the size of a ducat, and had on one side a lily, and on the other the head of John the Baptist. Some derive the name from the city, and others from the flower. These coins were soon imitated all over Europe. It was out of them that the German gold guildens of the middle ages and the modern guildens arose. These last are still marked by the letters *FL*. The gulden or florin is the unit of account in Austria, and has a value of about 2s. Till 1875 a F. or gulden of 1s. 8d. was the unit in the South German States. The Dutch F. or guilder is also worth 1s. 8d. The English 2s. piece is called florin.

FLORINIANS, a Gnostic sect of the 2d c., so called from a Roman priest, Florinus, who, with his fellow-presbyter, Blastus, introduced doctrines resembling those of Valentinus, into Rome, in the pontificate of Eleutherius (176), and was excluded from communion by that pontiff. See Gnosticism VALENTINIANS.

FLO'RISTS' FLOWERS are those kinds of flowers which have been cultivated with peculiar care, and of which, consequently, there exist numerous varieties, differing very much in appearance from each other and from the original flower. Such are tulips, hyacinths, roses, auriculas, carnations, anemones, ranunculuses, dahlias, &c. The special cultivation of particular flowers was first prosecuted to a remarkable degree in Europe by the Dutch in the beginning of the 17th c., and from the Netherlands a passion for it extended to other countries, particularly to England and Scotland, when the religious persecutions drove many refugees to the British shores; and to this day it prevails most of all where the branches of manufacture introduced by the refugees are carried on. In the little gardens of operatives in some of the manufacturing towns may be seen many of the finest tulips and carnations in Britain. It is still, however, in Holland, and particularly at Haarlem, that this branch of gardening is carried on to the greatest extent, and it is from that quarter that the market of the world is chiefly supplied with bulbs, seeds, &c. Between Alenise and Leyden are more than twenty acres appropriated to hyacinths alone, which succeed best in a loose sandy soil. The cultivation of roses at Noordwyll, in South Holland, is carried on in considerable fields situated in the *dunes*, and affords support to many families. Berlin has of late years become the seat of a flower-trade, which partially rivals that of Holland. Some flowers, as dahlias and hollyhocks, are produced in greatest perfection by British cultivators. The Chinese have had their florists' flowers, camellias, hydrangeas, tree peonies, &c., from time immemorial.

In the years 1636 and 1637, an extraordinary flower-mania prevailed in Holland, chiefly with reference to tulips, in which men speculated as we have recently seen them do in railway shares. Bulbs were sold for enormous sums. For a single *Semper Augustus*

(a tulip), 13,000 florins were once paid, and for three such together, 30,000 florins. The ownership of a bulb was often divided into shares. Men sold bulbs, which they did not possess, on condition of delivering them to the buyers within a stipulated time; and of some varieties, far more bulbs were sold than actually existed. But these extravagances soon ceased, although not till they had involved many persons in ruin.—It was not till about the year 1776 that the real flower-trade of Holland reached its greatest importance; from which time it has rather declined. New varieties of tulips and hyacinths are sometimes marked in the Haarlem catalogues at prices from 25 to 150 florins.

FLO'RUS, generally, but on insufficient evidence, called L. Annaeus F., was a Roman historian who flourished in the reign of Trajan or Hadrian. Of his life we know absolutely nothing. He wrote an epitome of Roman history (*Epitome de Gestis Romanorum*), from the foundation of the city to the time of Augustus. This work, which is still extant, is carefully and intelligently composed, but is disfigured by an inflated and metaphorical style. Since the *editio princeps*—if, indeed, it be such—printed at the Sorbonne in 1471, F.'s epitome has been published times without number. The best modern editions are those of Jahn (Leip. 1852) and Halm (1854).

FLOTANT (Fr.), used in Heraldry to express that the object is flying in the air, as a banner-flotant.

FLOTOW, FRIEDRICH VON, a living operatic composer of Germany. Born at Tentendorf, in Mecklenburg, in 1812, he was at first intended for the diplomatic profession; but finding a musical career more congenial to him, he took lessons in composition from Reicha, in Paris. His earlier operas were refused by the managers of the Paris theaters; and his reputation was first established by his music to *Le Naufrage de la Méduse*, produced in 1839 at the Théâtre de la Renaissance, which was a great success. Since then, he has composed various light operas, including *Le Forestier*, *L'Esclave de Camoëns*, *Alessandro Stradella*, *L'Amie en Peine*, *Martha*, *Rübezahl*, and *Zilda*, which have attained considerable popularity in France and in Germany, and are characterized by easy and lively dramatic action, readiness of invention, pleasing melody, and graceful instrumentation. *Martha* has, since it was produced in London, become a great favorite in this country. F. was, in 1854, appointed intendant of the theater at Schwerin, and was elected a corresponding member of the French Institute in 1864.

FLO'TSAM. Wreck, in the legal acceptance of the word, is goods which, having been scattered by a shipwreck, have floated to land. From goods in the position of wreck are distinguished those known to the law of England by the uncouth expressions *flotsam*, *jetsam*, and *ligan*. The first is where the goods continue floating on the surface of the waves; the second is where, being cast into the sea, they sink and remain under water; the third is where they are sunk in the sea, but are tied to a cork, bladder, or buoy, in order that they may be recovered. If no owner appears to claim them, goods in these various positions go to the crown, so that by a royal grant to a man of *wrecks*, things *flotsam*, *jetsam*, or *rigan* will not pass. See *JETSAM*, and *JETTISON*, an important term in the law-merchant, from which jetsam must be carefully distinguished.

FLÖTZ (Ger. level), the name given by Werner to the secondary rocks of Lehmann, because, in the district in which he examined them, they were horizontal. He arranged the rocks which form the solid crust of the earth into four classes. 1. The primitive beds without organic remains, such as granite and gneiss; 2. The transition strata, which, from their more or less metamorphic condition, were related to the primitive rocks on the one side, and from their few contained organisms, to the flötz on the other; 3. The flötz containing all the sedimentary rocks, from the coal-measures up to and including the chalk; and 4. The newer strata, which he called the 'overflowed land' or alluvium. When the followers of Werner found that the horizontal position of the flötz was a local accident, they abandoned the term, and restored Lehmann's title of Secondary.

FLOUNDER (*Platessa*), a genus of fishes, of the Flatfish family (*Pleuronectide*), having one row of cutting teeth in each jaw, and generally pavement-like teeth on the pharynx; the dorsal and anal fins extending nearly the whole length of the body, the dorsal not coming further forward than the center of the upper eye; the tail-fin distinctly separated both from the dorsal and the anal. To this genus belong the Plaice, Flounder, Dab, &c., of the British shores. The species generally known as the F. (*P. Flesus*), is very common not only on the British shores, but on those of most parts of Europe. Its Swedish name is *Flundra*. Its Scottish name is *Fleuk* or *Fluke*, a name which, with additions, is extended to many other kinds of flat-fish. The F. is often a foot or more in length. Its greatest breadth, without the fins, is about one-third of the whole length, rather less than that of the plaice. It is easily distinguished from the plaice by a row of small tubercles on each side

of the lateral line. The color varies according to the ground from which the fish is taken. The F. is found chiefly in rather shallow water, with sandy or muddy bottom, and equally in the most perfectly salt water; and in the brackish water of estuaries. It ascends still rivers into perfectly fresh water, and may be kept in freshwater ponds. It lives long out of water, and is easily transferred to ponds.—The F., like the other fishes of this genus, generally swims on the left side, and has the eyes on the right side; but reversed specimens are of frequent occurrence.

FLOUR is a popular name given to the finer portions of meal or pulverized grain. Thus, *flour*, or *wheat-flour*, is the fine part of ground wheat; *pea-flour*, of pease, &c. See BREAD.

FLOUR, ST., a small town of France, in the department of Cantal, is finely situated on a steep basaltic plateau at an elevation of 3000 feet, 34 miles east-north-east of Aurillac. It is entirely built of lava and basalt. Its streets are narrow, and its houses in general have a miserable, dark, and dirty appearance. The principal building is the cathedral. A suburb lies at the foot of the rock, and communicates with the town by a winding road cut in the rock. F. has manufactures of hollow ironware, cloth, and table-linen. Pop. (1876) 4848.

FLOURENS, MARIE JEAN PIERRE, a celebrated French physiologist, who was born in 1794 at Mauressan Hérault. After having obtained his degree of Doctor of Medicine at Montpellier, at the early age of 19, he proceeded to Paris, where he soon became acquainted with the Cuviers, Geoffroy St. Hilaire, and other eminent naturalists. For more than forty years, F. was a voluminous writer on human and comparative anatomy and physiology, on natural history, and on various special departments of the history of the natural and physical sciences. Among his most important works we may mention his *Recherches Expérimentales sur les Propriétés et les Fonctions du Système Nerveux dans les Animaux Vertébrés* (1824); with a supplementary volume, entitled *Expériences sur le Système Nerveux* (1825); *Recherches sur le Développement des Os et des Dents* (1842); *Anatomie Générale de la Peau et des Membranes Muqueuses* (1843)—a work tending to demonstrate the unity of the human race, by showing that there are no essential differences between the structure of the skin in the negro and the European—and his *Théorie Expérimentale de la Formation des Os* (1847), perhaps the most celebrated of his works. Among his smaller and popular works, are his *Analyse Raisonnée des Travaux de Georges Cuvier* (1841); *Buffon, Histoire de ses Idées et de ses Travaux* (1844); *De l'Instinct et de l'Intelligence des Animaux* (1841); *Examen de la Phrénologie* (1842); *Histoire de la Découverte de la Circulation du Sang* (1854); *De la Longévité Humaine, et de la Quantité de Vie sur le Globe* (1854); and his *Eloges Historiques*—a beautifully written series of scientific biographies.

As early as 1821, F. delivered a course of lectures on 'The Physiological Theory of Sensations,' and presented some of his first scientific contributions to the Academy of Sciences, into which body he was admitted as a member in 1828. About this date he was appointed assistant to Cuvier; and in 1832, he succeeded to the full duties of the professorship of natural history in the Jardin du Roi. In 1833, he succeeded Dulong as perpetual secretary of the Academy of Sciences—an office which he continued to discharge until his death; and in 1840, the French Academy elected him a member. He was made a peer of France by Louis Philippe in 1846, and was appointed professor in the Collège de France in 1855. He died at Montgeron, near Paris, December 6, 1867.

FLOWER, or BLOSSOM, that part of a phanerogamous plant in which the organs of reproduction (*stamens* and *pistils*) are situated, and which consist essentially of a single group of these, generally surrounded by *floral envelopes* (the *calyx* and *corolla*). Both the organs of reproduction and the floral envelopes are metamorphosed leaves, and arise in successive whorls from a much shortened axis, called the *thalamus* (Gr. a nuptial-bed), or *torus* (Lat., a couch). Flowers are sometimes closely attached to the stem or branch from which they grow, and are then said to be *sessile* (Lat., sitting); but sometimes there intervenes a *flower-stalk* or *peduncle*, either simple or branched. The whole assemblage of flowers of a plant is called its *Inflorescence* (q. v.), and the different kinds of inflorescence, or modes in which the flowers are produced and grouped, are often as characteristic as the diversities in the flowers themselves, although the latter are in general more important with reference to botanical affinities.

In the very large natural order *Compositæ*, many small flowers are congregated on a common *receptacle*, and surrounded with *bracts* in the form of an *involucre*, as a single flower is surrounded by its calyx. The *head of flowers* is in this case popularly called a flower; and the individual flowers of which it is composed are by botanists styled *florets*. This term is also applied to the individual flowers in the *spikelets* of the Grasses (q. v.), of which the *glumes* are a common involucre.

The order of the whorls in flowers is invariable: the Calyx

(q. v.) is always exterior to the Corolla (q. v.); within the corolla are the *Stamens* (q. v.), or male organs of reproduction, and in the center of all is the *Pistil* (q. v.), the female organ of reproduction. An outer calyx, or whorl of metamorphosed leaves, exterior to the calyx, and usually smaller, is found in some flowers, as mallows, and is called the *epicalyx*. Within the corolla, there is sometimes an additional or supplementary corolla, called the *Corona* (q. v.), *coronet*, or *crocus*. When the calyx and corolla are not distinguishable, the term *Perianth* (q. v.) or *perigone*, is em-



Illustration of some of the Principal Parts of a Flower (from Balfour's Botany):

- 1, Section of the flower of *Ranunculus* showing sepals, petals, numerous stamens, with adnate anthers, placed below the carpels. 2, Anatomical seed of *Aconite*, cut vertically, showing abundant homogeneous albumen and a small embryo. 3, Diagram of the flower of *Ranunculus*, with five sepals, five petals, numerous stamens, and carpels. 4, Ripe follicle of *Columbine*. 5, Ripe achene of *Ranunculus*. 6, Numerous single-seeded carpels of *Ranunculus*. 7, Spurred petal of *Columbine*.

ployed, as in the lily, crocus, iris, and the greater number of endogenous plants, although even in these there are really two whorls closely united. In some flowers, there are several whorls of leaves forming one or each of the floral envelopes; and in like manner, some have several whorls of stamens, and sometimes there are several whorls of the carpels which form the pistil. In some flowers, certain whorls are entirely wanting; and thus not a few exogenous plants are destitute of the corolla, which is sometimes the case with plants—exceptional *apetalous* species—very nearly allied to others that have it. It is by a similar abortion of a whorl that flowers become unisexual. Both stamens and pistils are generally present in the same flower, which is called a *hermaphrodite* or *perfect* flower; but many flowers contain only the male organs of reproduction, and many contain only the female organs, and such flowers are described as *unisexual*, *diclinous* (q. v.), or *imperfect*; and respectively, as *male* or *stamiferous*, and *female* or *pistilliferous* flowers.

Male flowers are also called *barren* or *sterile*, and female flowers *fertile*, although their fertility depends on the communication of pollen from the stamiferous flowers. When both male and female flowers are produced on one plant, the species is said to be *monoecious* (Gr., having one house); but when they are on separate plants, it is *dioecious* (Gr., having two houses); those which produce male, female, and hermaphrodite flowers are called *polygamous*. Sometimes both stamens and pistils are wanting, and the flower is then said to be *neuter* or *empty*, as in the case of the florets of the ray in many composite flowers. Sometimes, on the contrary, both calyx and corolla are wanting, and then the flower is said to be *naked* or *achlamydeous* (Gr., without covering), as flowers having only one floral envelope are called *monochlamydeous*, and flowers having both calyx and corolla are called *dichlamydeous*. Achlamydeous flowers are often grouped in some peculiar manner, and protected by bracts or by a spathe.

Flowers are always regular in their rudimental state—whorls of elevated points or *papillæ*; some of these, however, are not unfrequently abortive, whilst more frequently some acquire a greater development than others of the same whorl, making the whorl and the flower *irregular*; and greater varieties of form are common in the metamorphosed leaves which compose the flower, than in true leaves themselves. The *internodes*, or portions of the axis between the whorls, are sometimes also peculiarly developed into *Disc* (q. v.), *Gynophore*, &c. The different whorls often differ in their *Estivation* (q. v.). But a beautiful symmetry may generally be traced in the arrangement of the parts of flowers, the whorls consisting of the same number of parts, and the parts of each whorl being placed opposite to the spaces of the whorl exterior to it; and this symmetrical plan of the flower remains manifest even when there is abortion or extraordinary development of particular parts. The number of parts in the pistil is, however, often smaller than in the exterior whorls; and sometimes particular parts appear to be divided, and so apparently multiplied, as the long stamens of the *Crucifera*, each pair of which is to be regarded as one stamen split into two, and has its place accordingly among the parts of the flower. The

symmetry of flowers may be illustrated by the following diagrams:

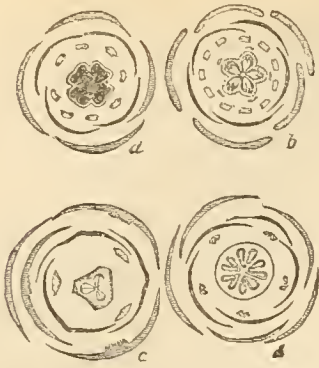


Illustration of the Symmetry of Flowers (from Balfour's *Botany*):

- a, Diagram of the flower of Heath (*Erica*), having four sepals, four divisions of the corolla, eight stamens in two rows, and four divisions of the pistil. The flower is tetramerous, complete, symmetrical, and regular. b, Diagrammatic section of a symmetrical pentamerous flower of Stone-crop (*Sedum*), consisting of five sepals externally, five petals alternating with the sepals, ten stamens in two rows, and five carpels containing seeds. The lines on the outside of the carpels are glands. c, Diagram of the trimerous symmetrical flower of *Iris*. There are three alternating divisions of each whorl. d, Diagram of the flower of Flax (*Linum*), consisting of five sepals, five petals, five stamens, and five carpels, each of which is partially divided into two. It is pentamerous, complete, symmetrical, and regular.

The development of flowers in most cases follows the complete formation of the stem-leaves, more rarely precedes or accompanies it. The unfolding of the parts of a flower is called its *flowering* or *blossoming*, and when their functions are performed, it fades; the floral envelopes, the stamens, and even the styles, sometimes falling off early, and some of them sometimes remaining in a withered state until the ripening of the fruit; the calyx not unfrequently undergoing such modifications as to convert it into a part of the fruit itself.

In the greater number of plants, flowering takes place, during the flowering season, indiscriminately, at all hours of the day; and the flowers once opened, remain open, even during night, till they fade. In many plants, however, a *sleep of flowers* takes place; they open and close with the returns of day and night. Thus, *sunflowers* open in the morning, and close at evening; whilst there are other flowers which open in the evening, and close in the morning. Others also open and close at certain hours of the day; thus the flowers of the common purslane open about 11 o'clock A.M., and close soon after midday; *Antirrhinum pomarinum* opens its flowers about 2 P.M., and closes them before night; the large fragrant blossoms of *Cereus grandiflorus* open between 7 and 8 P.M., and its sleep commences soon after midnight. In a few plants, the sleeping and waking of the flowers are regulated by the conditions of the weather. The waking and sleeping of flowers either continues for several days in succession, as in some species of *Mesembryanthemum*; or the brief life of the flower ends when it first sleeps, as in the Tiger-flower.

The odors of flowers, extremely various, often delightful, and sometimes very offensive, are in some cases equally powerful as long as the flower is open; in others, they vary in strength at different times of the day. Some flowers, as those of *Nesperis tristis* and *Pelargonium triste*, although remaining open during the day, diffuse their fragrance only when night comes on. The Oriental Hyacinth, so commonly cultivated in windows, is at all times perceptibly fragrant, but fills the atmosphere of the apartment with its perfume about 11 o'clock at night.

The colors of the different parts of flowers, the variety and beauty of which render many of them so attractive, generally remain unchanged, but sometimes undergo changes during the life of the flower. The flowers of *Nyctotris versicolor*—a small species of Forget-me-not, very common as a weed in gardens—are sulphur-yellow when they first open and afterwards change to blue. The petals of *Cheiranthus mutabilis*, when they first expand are yellow, and afterwards pass to orange, red, and finally purple. In *Hydrangea hortensis*, familiar as a window plant, the flowers are at first green, then rose-color, purplish red intermixed with green, and finally, when about to fade, they are of a sickly green. Some flowers undergo remarkable changes of color during the day, as those of the common pink *Phlox*, which, early in the morning, are light blue, and become bright pink as the day advances; and those of *Hibiscus variabilis*, which are white in the morning, pink at noon, and bright red at sunset.

The colors and odors of flowers are subjects in the investigation of which physiologists have not yet been able to go far. The chemical products on which they immediately depend are partially known; but how the chemical changes are wrought, and what

various purposes they all serve as to the plant itself, can scarcely be said to have even begun to be ascertained. Both colors and odors are more or less owing to the action of the sun's rays. They are also sometimes modified by soil; and diversities of colors have been obtained in cultivated flowers by changing the soil in which they grow.

A few flowers are edible, although none are of any importance on this account. Some, or parts of them, are used in dyeing; but notwithstanding the beauty and variety of the colors of flowers, a very small proportion of vegetable dye-stuffs is obtained from them; and a similar remark is applicable to their medicinal use. For dyeing and painting, the colors of flowers can seldom be obtained in considerable quantity, except at too great expense, and seldom of brilliancy at all corresponding with that which they exhibit in the flower itself. They are also in general fixed with great difficulty, some yellow colors being the only notable exceptions.

Flowers being subservient to the reproduction of the species, are, in all not unfavorable circumstances, followed by Fruit (q. v.). This, of course, in monœcious and dicecious plants, is the case only with the female flowers, the male flowers soon withering away when they have dispersed their pollen. See FECUNDATION and STAMEN. But even after the fecundation of the ovules, and when, in the language of gardeners, the fruit is *set*, unfavorable circumstances, such as excessive heat or cold, drought or moisture, want of due nutriment to the plant, or through excessive number of fruits set at once, to the individual fruit itself—often cause it to fall off early, long before it has attained its full size. See FRUIT.

FLOWER-DE-LUCE. See IRIS.

FLOWER-POTS are generally made of burnt clay, unglazed, tapering a little towards the bottom, and having the bottom perforated with one or more holes. Those of smallest size (*thumb-pots*) are only about two inches deep, and are used chiefly for seedlings to be soon again transplanted. For plants which require a pot of more than 12 inches deep and 18 inches wide, wooden boxes or tubs are generally provided. The flower-pot is usually placed in a saucer of the same material, when used in apartments or on the shelves of a green-house; but when plants growing in flower-pots are placed in the garden, the saucer is dispensed with. For ornamental use, flower-pots are sometimes glazed, or made in the shape of vases, &c.—In filling flower-pots, small stones or bits of broken pottery are placed in the bottom, to prevent water from lodging there, and *souring* the soil in which the plant is to grow. The roots of plants growing in pots are generally examined once or twice a year, by turning them out of the pot with the whole ball of earth attached, when the roots, which have often become matted round the outside of the ball of earth, are pruned, and the plant is either restored to the same pot or transferred to a larger one. The change of soil made at this time is, according to circumstances, either complete or partial.

FLOWERS, ARTIFICIAL. This elegant branch of manufacture, though not usually ranked among the fine arts, may be fairly regarded as holding an intermediate place between them and the mechanical arts. The Italians were the first to bring it to a high state of perfection, and it is now successfully carried out both in England and France. The value of artificial flowers annually exported from France exceeds £40,000.

The materials used are very various. Feathers have long been used by the South American Indians. In Italy, the cocoons of silk-worms are dyed, and extensively used. Beautiful imitations of flowers are made from shells, either in their natural colors or tinted. Paper, ribbons, velvet, thin laminae of whalebone, &c., are also used. The materials of which the artificial flowers commonly in use are made are French cambric, Scotch cambric, jaconet, and fine calico, besides muslin, crape, and gauze for particular flowers, and satin and velvet for thick petals, &c. Wax-flower-making is quite a distinct branch, and those who follow it claim with justice the title of artist. It will be treated under the head of WAX-FLOWERS.

The petals and sepals of the flowers, as well as the leaves of the plant, are stamped out by punches, or 'irons,' as they are technically termed. A large stock of these irons is necessary, as special forms and sizes are required for each flower. The next process in shaping is that of 'goffering,' or 'gauffering,' by means of which the hollow form is given to petals, and the mid-rib and veins of leaves imitated. For hollowing petals, the goffering-iron is simply a polished iron ball mounted on an iron wire in a handle. It is slightly warmed, and the petal is placed on a cushion, and the iron pressed against it. A variety of other forms of goffering-irons are used, such as prismatic rods, bent wires, &c. The venation of leaves is effected by dies made of iron or copper, which are nevertheless called goffering-irons.

The tinting of petals of the best flowers requires some amount of delicacy and skill. In nature, however, the tint of each petal of a flower is rarely uniform; and the best artificial flowers repre-

sent the natural variations with great accuracy. The petals of a rose, for example, are dyed by holding each separately by pincers, and then dipping it in a bath of carmine, and afterwards into pure water, to give delicacy of tint; but as the color is usually deepest in the center, a little more dye is added there while the petal is still moist, and this diffuses itself outwards in diminishing intensity. The whiteness at the insertion of the petal is produced by touching that part with pure water after the rest is dyed.

Leaves are cut and stamped in like manner from green taffeta, cambric, calico, &c. The glossy upper surface is represented by coating the taffeta, &c., from which they are stamped, with gum-arabic; and the soft tone of the under side is obtained by means of starch colored to the requisite shade, and brushed on when of the right consistence to dry with the proper effect. A velvety texture is given by dusting the powdered nap of cloth, which has been previously dyed of the required color, over the gummed leaf, the gum having been allowed to partly dry till it has become 'tacey.' The superfluous portion of nap is then shaken off.

Buds are made of taffeta, tinted, and stiffened, and stuffed with cotton. Stamens are made of short pieces of sewing silk stiffened with gelatine, and when dry, the ends are moistened with gum, and dipped in flour, colored yellow, to represent the pollen. Fine wire is sometimes used for the filament of the stamen.

The flower is built up from the center; the pistil and stamens are tied in a bunch to a piece of wire; the petals are arranged in order, and pasted; then the sepals of the calyx are pasted outside of these, and further secured by winding fine thread or silk round the lower parts. Other wires are enclosed with this thread, and form the stalk, which is bound round with green tissue paper; and at proper intervals the leaves are inserted by means of fine wires, to which they are bound, the ends of these wires being bound in and incorporated with the stalk, and concealed by the green paper.

Besides the flowers copied from nature, there is a considerable demand for what are called 'fancy flowers,' most of which are invented by the manufacturer to use up waste and spoiled fragments originally designed for better purposes.

Flowers suitable for mourning are prepared by coating leaves, flowers, &c., with strong gum, and then dusting upon them powdered galena. This substance, a sulphuret of lead, is formed naturally in lustrous cubic crystals of a dark-gray color, and however finely it is powdered, the fragments still tend to retain the same shape and surface, and thus present a number of flat glittering facets. It is used in like manner for cheap jewelry.

FLOWERS, in Chemistry, is a term originally given by the alchemists to the sublimes which rose, or appeared to grow from certain bodies capable of undergoing volatilization when subjected to heat. Thus, *flowers of antimony*, *flowers of arsenic*, *flowers of benjamin* or *benzoin*, *flowers of sulphur*, *flowers of zinc*, &c.

FLOXÆRIS is a term applied to the suboxide or red oxide of copper.

FLUE. See CHIMNEY.

FLUID. The mathematical definition of a fluid is, that it is a collection of material particles which can be moved among each other by an indefinitely small force. No fluid in nature strictly fulfils this definition, though very many do so sufficiently nearly to make the conclusions founded on the definition practically correct. Fluids are distinguished into elastic and inelastic—the former being those the volume of which is diminished by pressure, and increases when pressure is removed; the latter being those which have not this property, e. g., water and all those fluids termed Liquids (q. v.). Elastic fluids are also spoken of as compressible; and inelastic as incompressible—which, strictly speaking, no known fluid is, although all ordinary liquids are sufficiently nearly so to enable us to regard them as such without sensible error. See VAPOR, ELASTICITY and HEAT, COHESION and CAPILLARY ACTION.

FLUKE, the pointed triangular termination to each arm of an Anchor (q. v.).

FLUKE, or FLUKE-WORM (*Distoma hepaticum*), an entozoon common in the liver and biliary ducts of ruminants, particularly of sheep, in which it produces the disease called *Rot*, often causing great mortality in flocks during wet seasons and on ill-drained lands. It receives its common name from its resemblance in form to the flounder, of which *fluke* is a Scotch and old English name. For a similar reason, it is sometimes called *Plaice*. It is a Trematode (q. v.) worm, higher in organization than the cestoid worms, but not so high as the *Celmintha*. It is generally not quite an inch in length, often much less, but sometimes more; of an oval form, its breadth about half its length; flat, in color not very different from the liver in which it exists: it has no eyes nor other known organs of special sense; it is hermaphrodite, and

the organs of reproduction occupy great part of its body, the ovaries being ranged along the margin; its anterior extremity is furnished with a sucker, and another is situated at a small distance on the ventral surface, whence the name *Distoma* (Gr. two-mouthed), but the terminal sucker alone is perforated, and serves as a mouth, by which bile—the food of the creature—is imbibed; the tube which proceeds from it not, however, becoming a proper intestinal canal, but soon dividing into two large branches, and ending in minute ramifications in all parts of the body. Prodigious numbers of flukes are sometimes found in the liver of a single sheep, and of very different sizes, but they are now believed not to multiply there as was formerly supposed. Their eggs, indeed, are produced there in great quantity, but find their way into the outer world to begin a series of transformations not yet very accurately traced with regard to this particular species, but of which the general nature is known. See CERCARIA, TREMATODE WORMS, and GENERATIONS, ALTERNATION OF. It seems that the young flukes, having entered as *Cercaria* into the bodies of molluscs or aquatic insect larvæ, are conveyed into the stomachs of ruminants feeding on herbage to which these are attached, and finding their way to the liver, there attain their full development. See *ROT*; and *Nature* for 1882, p. 606.



Fluke-worm (*Distoma hepaticum*).

Instances have occurred of the presence of *Distoma hepaticum* in the human liver and *vena portæ*; as well as of a similar species, *D. lanceolatum*; a small species of the same genus, *D. heterophyes*, has been found in great numbers in the human intestines in Egypt, but its influence on the system is unknown; a species of much elongated form, *D. hamatobium*, is very common in Egypt, infesting the *vena portæ* of man, and the walls of the urinary bladder, and producing local, and afterwards general disease; a small species, *D. ophthalmobium*, has been found in the human eye, but probably through some such accident as in another case has led to the occurrence of the common fluke under the skin of the foot, where it caused a sore.

Of all the known species, the Egyptian, *D. hamatobium*, is by far the most hurtful, as infesting the human body. This species is also remarkably different from the others, in not being hermaphrodite, and in the extreme dissimilarity of the male and female; the female being a thread-like worm, for which a lodgment is provided in a furrow (*gynæceophorus*) on the ventral surface of the male. It is frequently known as *Bilharzia*.

The genus *Distoma* or Fluke contains a great number of species, infesting, in their mature state, different kinds of animals, and finding their appropriate place in very different parts of the animal frame. The wrinkled membrane around the eyes of birds is the place of some.

FLUOR SPAR, a mineral which has been often described as chemically *Fluate of Lime*, a compound of fluorine (hydrofluoric) acid and lime, but which is in reality *Fluoride of Calcium* (CaF), consisting of 48.14 fluorine and 51.86 calcium (the base of lime). It occurs both crystallized and massive; the massive varieties exhibiting a crystalline structure; the crystals usually in groups, sometimes of the primary form, which is a cube, but often of secondary forms, of which there is great variety, as the octahedron, rhombic dodecahedron, &c. F. S. is sometimes colorless, but often green, blue, yellow, or red, more rarely gray, or even black; different shades of color frequently appearing in the same specimen, and in the massive varieties beautifully intermixed. Its colors often rival those of the most beautiful gems; but it is of very inferior hardness, being scratched even by quartz. Its specific gravity is 3.14. It generally becomes phosphorescent when heated, although this is more remarkably the case with some varieties than with others; it is decomposed by heated sulphuric acid, with evolution of hydrofluoric acid as a pungent gas, which, having the property of acting upon and corroding glass, F. S. is used with sulphuric acid for etching on glass. F. S. is also used for ornamental purposes, being wrought into vases, &c., for which it was in high esteem among the ancients. But the greater abundance in which it is now obtained has diminished the value of ornaments made of it. It is very commonly associated with ores of tin, silver, lead, and copper, occurring chiefly in veins, but is also found by itself in drusy cavities in granite, greenstone, &c. It is found only in a few places in Scotland, and in insignificant quantity, but is nowhere more abundant than in England, particularly in Derbyshire and in Cornwall. In Cornwall, it is used as a flux for reducing copper ore. In Derbyshire, the blue massive variety is known to the miners as *Blue John*. The manufacture of ornaments of F. S. is carried on to some extent in Derbyshire. F. S. often called DERBYSHIRE SPAR.

FLUORESCENCE is the term applied to a peculiar blue appearance exhibited by certain substances exposed to sunlight, and especially observable in a dilute solution of sulphate of quinine.

FLUORINE is an elementary substance allied to chlorine. Its principal natural source is the mineral, fluor spar (CaF), although it is also found in minute quantities in the igneous rocks, natural waters, plants, the bones and teeth of animals, as also in milk, blood, &c. Many attempts have been made to isolate fluorine, but these have all failed, owing to the extremely energetic nature of the substance which causes it to unite with substances the moment it is liberated from a previous state of combination. Thus, if fluorine is evolved in glass, gold, platinum, or other metallic vessels, it immediately acts upon and unites with the material of the vessel, and ceases to be free and pure. It would appear, however, to be a gaseous substance, having the equivalent number 19, and with properties similar to chlorine, though differing in energy of action. The compounds of fluorine are not numerous, but are important. *Hydrofluoric acid* or *fluoric acid* (HF), is generally prepared by heating gently in a lead still a mixture of one part of fluor spar (CaF) with two parts of sulphuric acid (H_2SO_4), when the vapors of hydrofluoric acid (HF) are evolved, whilst sulphate of lime (CaSO_4) is left in the still. The dense acid vapors are conducted through a lead pipe into a lead receiver or bottle, surrounded by a freezing mixture of ice and common salt. The acid is generally mixed with water when desired to be kept for some time. When the most concentrated hydrofluoric acid is required, the still and receiving vessel must be made of platinum. The other metals are not suitable for such apparatus, as they are rapidly corroded by the acid. When prepared in its strongest form, hydrofluoric acid has the density of 1060 (water = 1000), and is a colorless, fuming liquid of great volatility, which boils at 60°F ., and does not freeze at -4°F . Not only does hydrofluoric acid corrode and dissolve the ordinary metals (excepting lead and platinum), but when placed on the skin, it produces a severe burn, owing to its caustic nature. The most important property which hydrofluoric acid possesses is its power of eating into and dissolving glass, which admits of its application in the etching of characters upon glass, as in thermometer tubes, and for eating away greater or less thicknesses of plates or sheets of colored glass, so as to produce a variety of shades. See GLASS and GLASS-PAINTING.

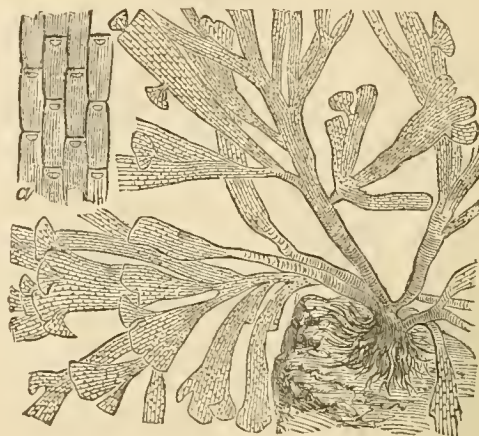
FLUOROTYPE, a process in which salts of fluorine acid are employed for the purpose of producing pictures by the agency of light. It was suggested by Robert Hunt in 1844. Two solutions are prepared: one containing 20 grains of bromide of potassium to an ounce of water; and the other, 5 grains of fluoride of sodium to an ounce of water. These are mixed together just previous to using, and applied uniformly over the whole surface of good paper, which is then allowed to dry, and afterwards rendered sensitive by brushing over it a solution of nitrate of silver, sixty grains to an ounce of water. Papers so prepared may be used for the production of pictures in the camera or printing-frame; they require, however to be intensified by development with protosulphate of iron, the reducing action of which should be regulated by the addition of acetic acid to the solution. The sensibility of the papers for camera-work may be much increased by brushing over them a weak solution of protochloride of tin previous to exposure.

FLUSH, a term used in the navy in reference to decks, which are said to be flush when extending without break on one level from the bow to the stern. Frigates and all smaller vessels of war (excepting a few steamers) are now constructed with flush upper-decks; but what are technically termed 'flush-decked ships,' are such as have all their guns on the upper-deck, as corvettes, sloops, brigs, and smaller vessels.

FLUSHING (Dutch *Vlissingen*), a strong fortress and seaport of the Netherlands, in the province of Zealand, is situated on the south coast of the island of Walcheren, on the northern shore of the Western Scheldt, in lat. $51^\circ 26' \text{N}$., and long. $3^\circ 36' \text{E}$. It was formerly an important naval station of the Netherlands, and had extensive dock-yards and arsenals. The harbor can receive large sea-going vessels, and a considerable trade is carried on between England, India, and other countries. A railway constructed through Zealand to join the main continental lines, has its terminus station close to the harbor, and a daily service by very superior steamers has been begun between F. and Queenborough, on the London, Chatham, and Dover Railway. F. is strongly fortified, and commands the entrance of the Scheldt. Pop. (1880) 10,080. F. is the birthplace of Admiral de Ruyter. It was stormed and taken by the English in the Walcheren expedition under Lord Chatham in 1809.

FLUSTRA, a genus of zoophytes, of the class *Polyzoa* (or *Bryozoa*), and order *Cheilostomata*, some of the species of which are very common on the British shores. The name is said to have been

derived by Linnæus from the Saxon *flustrian*, to weave, because of the mat-like structure of the polypidoms, which in this genus are extremely plant-like, and by unscientific observers are generally regarded as belonging to the vegetable, and not to the animal kingdom. In some species the polypidom assumes the appearance of a branching frond, with polype cells either on one side only, or on both sides; in others, it extends as an incrustation on rocks, shells, sea-weeds, &c. The polype cells are arranged quincuncially, and



Portion of *Flustra truncata* (from Johnston's *Zoophytes*):
a, a few cells magnified.

are in juxtaposition, more or less quadrangular, flat, and with a distinct border, which is sometimes furnished with teeth or short spines.

The polypes have the power of moving either the whole head at once, or the tentacles separately, and show no little activity, so that a living F., seen through a magnifying-glass, is a most beautiful and interesting object. One of the most common British species is *F. foliacea*, which grows on hard ground in a few fathoms' water, and is continually to be found torn up by the waves, and scattered on the shore. It is an interesting fact, that the same species occurs in the Pacific Ocean.—A single square inch of *F. carbasea*, another common British species, has been found to contain 1800 cells; and as there are about ten square inches in an average polypidom, a single specimen may ordinarily contain about 18,000 polype heads.

FLUTE, one of the oldest wind instruments, well known to the ancient Greeks, has a soft and pleasant quality of tone, is an important instrument in orchestral music, and, in consequence of its easy treatment, is, in modern times, much in favor with amateurs. The flute is commonly made of boxwood or ebony, but sometimes of ivory or silver. Its form is that of a taper tube, made in four pieces, with six holes for the fingers, and with from one to fourteen keys, which cover or open other holes. The sound is produced by blowing from the mouth into the embouchure, an oval kind of hole at one side of the thick end, which is done by the lips covering a part of the hole, so that the air in its passage from the mouth is broken against the opposite edge of the hole, which causes the column of air inside the tube to vibrate. The notes of the gamut are produced by the opening or shutting of the holes by the fingers of both hands. The compass of the flute is from D to A sharp, nineteen diatonic intervals. For solo-playing, a flute with a compass from G to C is sometimes used. For orchestral purposes, there are also the *tierce* flute, the octave flute, the E flat and F piccolo flute; and the highest of all, the C piccolo. Improvements on the flute have been made from time to time by Quantz, Riebeck, Trommlitz, and especially by Böhm in Germany, and by Rudell and Rose in London.

FLUTE-WORK, the name given to a particular class of stops in organ-building, in contradistinction to *reed-work*. There are also numerous stops in German organs, specially designated with the names of flutes of different kinds, of eight feet and four feet pitch, some of which have lately been introduced into English organs.

FLUTING, the mouldings in the form of hollows or channels cut vertically on the surface of columns. These were adopted by the Greeks as ornaments to their Doric, Ionic, and Corinthian columns, and were retained by the Romans in their architecture. The Tuscan is the only style without flutes.

In Doric (fig. 1), there are 20 flutes on the circumference, and the curves meet with a sharp edge. These curves are supposed, in Greek Doric, to be elliptical, and they are carried up across the necking to the base of the cap. In the other styles, there are 24 flutes on the circumference (fig. 2). These are semicircular, and

are separated by a small fillet; and, before reaching the necking and the base, are terminated with semicircular top and bottom.

Flutes are said to be cabled when they are filled in to about $\frac{1}{2}$ of their height from the base with a convex bead. This is done to strengthen the column and protect the flutes. In countries where Roman remains were abundant, as in the south of France,



Fig. 1.

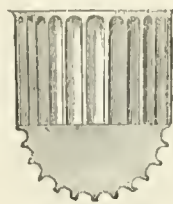


Fig. 2.

fluting was sometimes adopted by the early medieval architects, as at Arles and Autun. In Italy also, traces of this decoration are visible during the middle ages; but the flutes soon ceased to be vertical, and, in Romanesque Architecture (q. v.), assumed many varieties of forms, such as curves, zigzags, &c., twisting round the shafts.

FLUX (*flu*, I flow) is the term given to the substances employed in the arts which cause or facilitate the reduction of a metallic ore and the fusion of the metal. *White flux* is an intimate mixture of ten parts of dry carbonate of soda and thirteen parts of dry carbonate of potash, and is mainly instrumental in withdrawing the silica or combined sand from mineral substances; *black flux* is prepared by heating in close vessels ordinary cream of tartar (bitartrate of potash), when an intimate mixture of finely divided charcoal and carbonate of potash is obtained. The latter flux, when mixed with finely divided metallic ores, and the whole raised to a high temperature in a furnace, is not only useful in removing the silica, which the carbonate of potash which it contains enables it to do, but the charcoal withdraws the oxygen from the metallic oxide, and causes the separation of the pure metal. Limestone is employed as the flux in the smelting of iron ores. The other fluxes are fluor spar, borax, protoxide of lead, &c. See **IRON**, **COPPER**, &c.

FLUX (Lat. *flurus*, from *flu*, I flow), a discharge, generally from a mucous membrane. The term is applied more less frequently to all preternatural fluid evacuations from the body, but especially to those from the bowels, and from the uterine organs. Dysentery (q. v.) was long termed the bloody flux, to distinguish it from simple diarrhœa. Another scientific term for flux is *Profluvium*, which gives the name to a large order of diseases in Cullen's *Nosology*. See also **CATARH**, **MENSTRUATION**, and, with respect to etymology only, **RHEUMATISM**.

FLUXIONS, in Mathematics. The method of fluxions invented by Newton was intimately connected with the notion of velocity uniform and variable; and extended that notion, derived from the consideration of a moving point, to every species of magnitude and quantity. It proposed to determine, in all cases, the rate of increase or decrease of a magnitude or quantity whose value depends on that of another, which itself varies in value at a uniform and given rate. If x and y represent two such quantities, and $y = F(x)$ represent the law of their dependence, and if $\dot{x}$ be supposed to be the velocity with which x increases, and $\dot{y}$ that with which y changes value. Newton undertook by his method to express $\dot{y}$ in terms of $\dot{x}$ and of x , or to find $\dot{y} = F_1(x) \cdot \dot{x}$. The quantities x and y , which in modern language we call the variables, he called *flowing quantities* or *fluents*, and $\dot{x}$, $\dot{y}$, which we should represent by dx and dy , and call differentials, he called the *fluxions* of x and y . See **CALCULUS**. To illustrate this notation: suppose $y = x^n$, it may be shown that $\dot{y} = nx^{n-1} \cdot \dot{x}$. Regarding now $\dot{y}$ as a quantity depending on x and $\dot{x}$, and supposing x to increase uniformly, in which case $\dot{x}$ is constant, and $(\dot{x})$ its fluxion zero, we observe that $\dot{y}$ may have a fluxion, for it depends on the value assumed by $nx^{n-1} \cdot \dot{x}$, when x further changes. We find $(\dot{y}) = n \cdot (n-1) \cdot x^{n-2} \cdot (\dot{x})^2$. Thus, second fluxion or velocity of $\dot{y}$, or $(\dot{y})$, Newton wrote $\ddot{y}$. If x had a second fluxion, or did not change uniformly, then that fluxion he wrote $\ddot{x}$. The third fluxion of y he wrote $\dddot{y}$; and so on, pointing as many points over the fluent as

there are units in the order of the fluxion. For the fluent, he had no special symbol. Instead of $\int nx^{n-1} dx = x^n$, according to the modern notation, he wrote $\boxed{n x^{n-1} \cdot \dot{x}}$, putting the expression in an enclosure. For the principles on which Leibnitz founded his calculus and its notation, see **CALCULUS**.

FLY, a popular name often given to insects of the order *Diptera* (q. v.) generally, sometimes extended to insects of other orders, and sometimes limited to the *Muscides* (q. v.). It is often used with a prefix, as house-fly, blow-fly, &c., to designate particular kinds of insects.

FLY-CATCHER (*Muscicapa*, a genus of birds of the order *Insectores*, tribe *Dentirostres*, and family *Muscicapidae*, having a moderately long angular bill, broad and depressed at the base, compressed and slightly curved at the point; the base surrounded with hairs or bristles directed forwards, and which help to secure insect prey. The legs and feet are small; the outer toe the longest, and attached to the middle one as far as the first joint. The wings are not long; their first quill-feather is very short; the third is the longest. The birds of this genus, as now restricted, are exclusively confined to the Old World, and mostly to the warmer parts of it.

Of the numerous North American birds often called fly-catchers, some belong to nearly allied genera, and others to genera not now ranked even in the same family. The true fly-catchers all have the habit—characteristic of many of the *Muscicapidae* besides the genus—of remaining perched for a long time in the same spot, only leaving it to make a sudden dart at a passing insect, which is seized with a snap of the bill, and then returning. They are almost never to be seen running on the ground, or even on the branches of trees, and do not chase insects in the air like swallows. Only four species are European, two of which are British—the **SPOTTED F.** (*M. grisola*) and the **PIED F.** (*M. atricapilla*) or

Spotted and Pied Fly-catchers (*Muscicapa grisola* and *M. atricapilla*).

luctuosa); birds about the size of a sparrow, the former of which is common in most parts of England, as a summer bird of passage, but rare in Scotland; the latter is rare in Britain, although abundant in the south of Europe. The spotted F. is brownish gray above, white beneath, the head and breast marked with dusky spots. Its voice is a mere chirp. It is remarkable for the choice it makes of situations for its nest, often on a beam in an outhouse, on the side of a fagot-stack, on the branch of a tree trained against a building, and sometimes even on a lamp-post in a street. Mr. Durham Weir of Boghead, who was a diligent observer of the habits of birds, mentions that he witnessed a single pair of spotted fly-catchers feed their young no fewer than five hundred and thirty-seven times in one day, and that their motions were so rapid that he could not keep his eye off the nest for a moment.

The name F. is often extended to other genera, and is sometimes used as co-extensive in signification with that of the family *Muscicapidae*.

FLY-POWDER is the name given to a compound of metallic arsenic and arsenious acid, obtained by the partial oxidation of the metal, on exposure to air, and which is sold on the continent for the purpose of killing flies.

FLY-TRAP. See **DIONÆA**.

FLYING, or **FLIGHT**, is the locomotion of an animal in the air, by means of *wings*, organs specially adapted to that purpose. By means of these organs, the animal raises itself from the ground and sustains itself in the air, as well as moves forward in any direction it desires. Birds and bats are the only existing vertebrate animals possessing the power of true flight; the lateral

membranes of Flying Squirrels, Flying Lemurs, Flying Phalangers, and Flying Dragons, and probably even the great pectoral fins of Flying Fishes, serving only to sustain them in the air after the manner of a parachute, or at most to aid, on the principle of a boy's kite, in an oblique ascent.

The extinct reptiles called Pterodactyles (q. v.) possessed, however, the power of true flight, as their remains sufficiently testify; and their wings were constructed on a plan as different from those both of birds and of bats as these (see BIRDS and BATS) are from each other. The wings in all vertebrate animals are the anterior limbs, and are thus homologous to the arms of man and the forelegs of ordinary quadrupeds; in birds, the bones answering to those of the hand are much abbreviated and consolidated; in bats, they are prodigiously elongated; in pterodactyles, there was an elongation of a single finger. Among birds, although the power of flight is general, there are exceptions to the rule, the wings of some being merely rudimentary, and at most only helpful to them in running, those of others being adapted to swimming, not on the surface of, but under water.—The only invertebrate animals possessing the power of flight are insects; to the greater part of which vastly numerous class it belongs in their perfect state, although there are also many insects which are quite destitute of it, and this is sometimes the case with species very closely allied to others which possess it, nay, sometimes this great difference exists between the sexes of the same species. The wings of insects are not at all homologous to those of the flying vertebrata, although applied to the same use, and in structure are widely different from them all. See INSECTS.

In flying, the wings are made to beat or strike the air. The stroke in the one direction, however, must be very different from that in the other, or rather from that movement by which the wing is brought back to its place for another stroke. This difference is secured partly by greater force of muscular action, and consequent rapidity; the resistance of the air varying as the square of the velocity with which the wing moves in giving the stroke. But it is also secured partly by the conformation of the wing itself, the quill feathers of birds being so placed that they strike the air with their greatest extent of surface in the proper stroke of the wing, and *obliquely as it returns to its place*. An imitation of this is made in the rowing of a boat, and is called *feathering the oar*. The wings of bats, consisting of a membrane extended upon jointed bones, are probably in part folded up in order to the return from every stroke; and this is perhaps the case also with the wings of some insects, although those of others—as the Common Fly and the Bee—are certainly incapable of it; yet it is possible that even these may have a greater degree of rigidity communicated to them by the inflation of their air-tubes during the stroke than they have during the return.

Flying is analogous to swimming; but the difference of medium is very great, fresh water being about 800 times heavier than air, and the density of sea-water still greater. The bodies of animals intended for flight are therefore sometimes adapted to it partly by means which tend to diminish their proportionate weight, as the air-cavities in birds and insects; which, however, are still more important in relation to the increase of muscular power; and it is chiefly by the increase of muscular power that the power of flying is imparted.

The exercise of strength requisite for swimming is comparatively small, about $\frac{1}{1000}$ th part only of that which is requisite for flying. How wonderful, then, the muscular power of birds capable of long-sustained flight, far exceeding in rapidity the speed of the swiftest locomotive engine ever constructed by man! or of insects, which in respect at least of rapidity, is in some species not inferior to that of the swiftest birds! The muscular power exerted in flying evidently differs very much both among birds and among insects. The large wings of some require also much less frequent muscular action, either to sustain the body in the air, to elevate it, or to move it forward, than the comparatively small wings of others. The motion of the wings of humming-birds and of insects is too rapid for the eye to follow.

It is not to be wondered that projects of locomotion through the air have been much entertained by men, nor that, whilst the force of the objections already stated was unknown, artificial wings, and an imitation of the flight of birds, occupied the ingenuity of inventors. Grecian fable ascribes success to the mythic Dædalus (q. v.), who is said to have passed safely over the Ægean Sea on wings which he himself had made. More modern stories of similar success, although in far shorter flights, are numerous, but often resolve themselves, when carefully examined, into exaggerated accounts of feats performed on ropes, wings having been perhaps employed to render the exhibition more attractive, perhaps also to render the performance more easy by their extent of surface and resistance to the air. Other instances are on record of persons who, apparently by some parachute-like contrivance, descended obliquely from high towers to a considerable distance; as, in the 13th or 14th c., Elmerus, a monk, is said to have flown more than a furlong from the top of a tower in Spain, but the

distance is probably much exaggerated; and in the 17th c., Besnier, a locksmith of Sable, in France, who prudently began from windows one story high, ventured at last and safely to leap from very elevated positions, and so passed over houses or over rivers of considerable breadth. All these, however, were mere feats destitute of utility, although they encouraged the expectation of better results, which was cherished by some of the most scientific men of that period. Bishop Wilkins, in particular devoted much attention to this subject. Perceiving the inadequacy of the human arm and the muscles which move it to give sufficiently rapid motion to wings of sufficient size, he suggests that 'it were therefore worth the inquiry to consider whether this might not be more probably effected by the labor of the feet, which are naturally more strong and indefatigable.' So confident was he of success, that he anticipated the time when a man should as readily call for his wings to make a journey, as he then did for his boots and his horse. More recently, in the end of the 18th and beginning of the 19th c., Sir George Cayley occupied himself with speculations and experiments on this subject. Acknowledging the diffi-



Flying Machine, invented by Mr. Henson, 1843.

culty which arises from the want of muscular strength in man, he says: 'It is only necessary to have a first mover, which will generate more power in proportion to its weight, than the animal system of muscles.' But this first mover has not hitherto been found. The employment of steam for this purpose has been frequently proposed. Attempts of this kind, however, have rather for their object aerial navigation than artificial flying, properly so called; although the inventions have been variously designated aerial ships, flying machines, &c.

A great difficulty has been found in the weight of the steam-engine and its fuel; and experiments which have cost no small sums, and have excited not a little of public attention, have signally failed through miscalculation on this essential point. Not unfrequently, attempts have been made to combine some modification of the balloon with the steam-engine or other means of propulsion. In no instance, hitherto, has there been the least approach to success, although a *European Aëronautical Society* was formed, and issued its advertisements in 1835; and about eight years afterwards, an *Aërial Transit Company* not only amused the public for a considerable time, but obtained the assent of the British House of Commons to a bill for its constitution. Models have sometimes been exhibited of aerial machines capable of being guided at the pleasure of the aeronaut, in a perfectly still atmosphere, but nothing has yet been invented capable of serving any practical or useful purpose. There is, however, nothing evidently contrary to science or sound philosophy in proposals for aerial navigation, which, in this respect, differs widely from human or artificial flying.

Perhaps the *aëronautic fish*, on which Marshal Ney is said to have spent 100,000 francs, and which for a considerable time occupied the attention of some of the most ingenious and scientific men in France, deserves particular notice. It was a large balloon of a long fish-like figure, intended to swim in the air, as a fish in water, and to be propelled by wings or fins working by cranks. But when launched, although it floated and moved forward a little, it turned on one side, and this tendency could not be corrected so that the experiment proved a complete failure. Dr. Pettigrew's *Animal Locomotion*, and M. Marey's *Animal Mechanism* (both in the *International Science Series*), and the controversy regarding theories of flight, carried on in *Nature* (1874) and elsewhere, form important contributions to the literature of the subject.

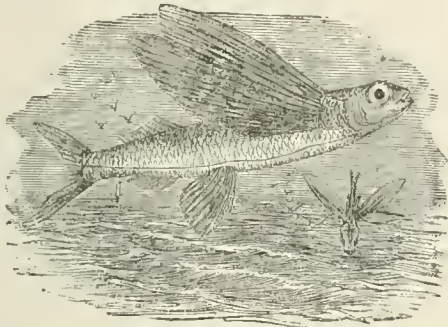
FLYING BRIDGE. See FERRY.

FLYING DRAGON, or FLYING LIZARD (*Draco*), a genus of crassilingual lizards, allied to the iguanas and stellions, but remarkably distinguished from them, and indeed from all other reptiles now existing, by lateral membranes which support them in a parachute-like manner in the air, and enable them to pass from tree to tree, even to considerable distances. These membranes are supported on the first six false ribs, which, instead of encircling the abdomen, stand out at right angles from the body for this purpose. They are incapable of the movements requisite for true flying; when not in use, they are folded close to the body.

There is also in the flying dragons an inflatable pouch under the chin, sustained partly by the hyoid bone and partly by two small bones. The tail is long. The scales are small and imbricated; those of the tail and limbs are keeled. The tongue is extensible, but not greatly so. All the species are of small size, live in trees, and feed on insects. They are natives of the East Indies. The genus is subdivided by some naturalists. See figure in the article DRAGON.

FLYING FISH, a name given to all those fishes which have the pectoral fins so very large that by means of them they are sustained in short seeming flights in the air. These fishes belong to two very different families—*Scomberesocidae* and *Sclerogenidae*; but the name F. F. is sometimes limited to those of the former family, the genus *Exocoetus*; those of the latter being known as *Flying Gurnards*. The genus *Exocoetus* has the pectoral fins nearly as long as the body, the dorsal fin placed over the anal, the tail forked, and its lower division considerably larger than the other. It is subdivided by some naturalists into several genera, characterized by the presence or absence of barbels, &c. Two species have occasionally been seen near the British shores, one of which (*E. volitans*) is very abundant in the warmer parts of the Atlantic Ocean, the other (*E. exilis*) is common in the Mediterranean. In the former, the ventral fins are situated far forward, and are short; in the latter, they are situated far back, and are considerably elongated. More than thirty species are known, all inhabiting the seas of the warmer parts of the world, and having their respective geographical limits pretty exactly defined.

They swim in shoals; and whole shoals—varying in number from a dozen to one hundred or more—often leave the water at once, darting in the same direction through the air, and after descending into the water at a distance of two hundred yards, or even more, from the place where they arose, quickly renewing their flight. These flights of flying-fishes form one of the most in-



Flying Fish (*Exocoetus volitans*).

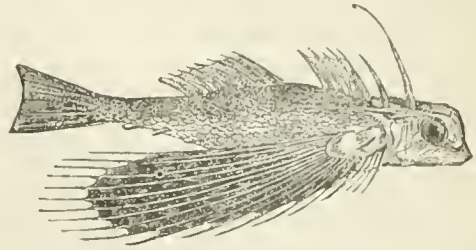
teresting and pleasing spectacles which relieve the monotony of a voyage in the tropical seas. Sometimes, the coryphæe (dolphin) may be seen in rapid pursuit, taking great leaps out of the water, and gaining upon his prey, which take shorter and shorter flights, vainly try to escape their persistent foe, until they sink at last exhausted: sometimes the larger sea-birds catch flying-fishes whilst they are in the air; but it does not seem to be at all true that these fishes leave the water, as has been very generally imagined, merely to escape from danger, nor is there any good reason for that sentimental pity which has been often expressed with regard to them, as creatures harassed and persecuted more than others, and peculiarly exposed to danger both in the sea and in the air.

They seem rather to exercise their powers, like other creatures, very often merely from the delight which they take in the exercise of them, and from the exuberance of their happiness.—The question, whether or not the flying fishes use their pectoral fins at all as wings, cannot yet perhaps be considered as completely decided; some observers, well entitled to respect, maintain that they do, although, of course, their power of flight is limited to the time that the fins remain quite moist; but a great preponderance of testimony is in favor of the opposite opinion, which regards the fins as acting merely after the manner of a parachute or of a kite. Flying fishes sometimes rise to a height of twenty feet above the water, although they more frequently skim along nearer to its surface. They often fall on the decks of ships. They are good food, and the natives, of the South Sea Islands take them by means of small nets attached to light poles, like those in which anglers catch minnows for bait. For this purpose, they go out at night in canoes, to the outer edge of the coral reefs, with a torch, which enables them to see the fishes, and perhaps both attracts and dazzles them.

FLYING FOX. See KALONG.

FLYING GURNARD (*Dactylopterus*), a genus of fishes of the family *Sclerogenidae* or Mailed Cheeks, nearly allied to the Gurnards (*Trigla*), but remarkably distinguished by the great size of

the pectoral fins, which they use for the same purpose and in the same way as the *Exocoeti*. See FLYING FISH. The pectoral fins are, however, of a very different appearance from those of the *Exocoeti*, widening almost to the end, which is rounded, and the tips of the rays extending considerably beyond the membrane. A very long spine rises from the back of the head. One species (*D. volitans*) is common in the Mediterranean, and is sometimes fifteen



Flying Gurnard (*Dactylopterus volitans*).

inches in length. Its flight is said not to extend to more than about forty yards, but it sometimes rises high enough to fall on the decks of large ships. 'At particular times, especially on the approach of rough weather, in the night, numbers of them may be seen, by the phosphoric light which they emit, making their arched passages in apparent streams of fire.'—Another species inhabits the Indian seas.—Some species of *Apistes*, belonging to the same family, have similarly large pectorals, and make similar flights.

FLYING LEMUR, or **COLUGO** (*Galeopithecus*), sometimes also called **FLYING CAT** and **FLYING FOX**, a genus of mammalia, generally regarded as constituting a distinct family, *Galeopithecidae*, which, by some naturalists is placed, as by Cuvier, among the *Cheiroptera* (see BAT), although it is now more commonly associated with the Lemurs (q. v.), as by Linnæus. There are, indeed, evident affinities both to lemurs and bats, but chiefly to the former, with which the osteological and other anatomical characters generally agree. Along the sides extends an ample membrane or fold of the skin, beginning behind the throat, and including both the fore and hind legs as far as the toes, but leaving them free, and further stretched along both sides of the tail to the tip. In the last particular, it differs from the lateral membrane of the flying squirrels and flying phalangers, and more resembles that of bats; but it widely differs from that of bats in being comparatively thick, and covered on both sides with short thick hair; and still more in leaving the fore-feet free, and not being stretched on lengthened finger-bones. Nor can it be used for true flight, but only to support the animal in the air like a parachute, enabling it to take enormous leaps of one hundred yards or thereby in an inclined plane. It is not yet satisfactorily determined whether the differences to be observed between the specimens of flying lemurs in collections, are to be regarded as differences of species or of variety. Attempts have been made to distinguish several species, but it is difficult on account of their great similarity. They are from twenty inches to two feet in total length, are natives of the Indian Archipelago, inhabiting lofty trees in dense forests, and feeding on small birds' eggs and fruits, as well as on insects. They are nocturnal in their habits. They are very inoffensive, and scarcely attempt to bite even when seized. Their voice resembles the low cackling of a goose. They produce generally two young ones at a birth. The Pelew Islanders greatly esteem them as food, but they have a rank unpleasant smell.

FLYING PHALANGER, or **FLYING OPO'SSUM** (*Petaurus*), a genus of marsupial quadrupeds, containing several species, natives of New Guinea and of Australia, where they are generally called Squirrels or Flying Squirrels. They are nearly allied to the Phalangers (q. v.), which they particularly resemble in dentition, but have not the tail so long and prehensile, whilst they are distinguished by a hairy membrane or fold of the skin extending along the flanks, and used as a parachute to enable them to leap to great distances. This membrane extends along both fore and hind legs almost to the toes, but does not appear behind the hind legs, nor include the tail, which is pretty long and bushy, but which in some of them has a *distichous* character, the hair spreading out to the sides, and so rendering it useful in supporting as well as in guiding the body in the air. They are capable of modifying their course in the air, although not of true flight; and their aerial evolutions are very graceful.

They repose during the day, and become active in the evening. They feed on fruits, leaves, insects, &c. A New Guinea species is about as large as a flying lemur; one of the Australian species is scarcely larger than a mouse. The fur of some of them is rich and beautiful.—**PETAURIST** has been proposed as an English name for this genus; but it is not much used.

FLYING SQUID (*Ommastrephes*), a genus of cephalopodous molluscs, allied to the Calamaries (q. v.) or squids, but differing from them in having the eyes exposed and not covered with skin, the fins united into one as a tail, and the *gladius* or bone furnished with three diverging ribs and a hollow conical appendage. The tail is large, and the power of locomotion great, so that these molluscs not only pass rapidly through the water, but leap out of it, and high enough sometimes to fall upon the decks of ships. They form a principal part of the food of many of the *Cetacea*, and are often the prey of albatrosses, petrels, and other marine birds. They are used as bait for cod in the Newfoundland fisheries.

FLYING SQUIRREL (*Pteromys*), the name given to a considerable number of species of the Squirrel family (*Sciuridæ*), which have a fold of the skin of the flanks extended between the fore and hind legs, and partly supported by bony processes of the feet, by means of which they are enabled to take extraordinary leaps, gliding for a great distance through the air. The tail also aids to support them in the air, as well as to direct their motion, its hairs extending laterally 'in a sort of feathery expansion.' The dentition is similar to that of true squirrels, with which also the habits generally correspond. One species (*P. Sibiricus*) is found in the north of Europe and of Asia; several species are natives of North America, and others inhabit the south-east of Asia and the Indian Archipelago. The European species is about the size of a rat, grayish-ash color above, white below, the tail only half the length of the body; it lives solitary in the forests. Its fur is of little value, but skins are sometimes mixed with those of the gray squirrel, to impose on the purchaser.

The most common North American species (*P. volucella*), abundant from the Gulf of Mexico to Upper Canada, is fully five inches long, with a tail of five inches additional, fur included. It is of a brownish-gray color above, white beneath; a black line sur-



Flying Squirrel (*Pteromys volucella*).

rounds the orbit of each eye. All the species inhabit woods, and the night is their time of activity. They feed not only on nuts and young shoots of trees, but also on small birds. They are extremely easy of domestication.

In gliding from tree to tree, the common American flying squirrel descends obliquely and with very rapid motion, until near the tree which it seeks to reach, when it wheels upwards, and alights at about a third of the height which it was from the ground on the tree which it left, the distance between the trees being perhaps fifty feet.

FLY-WHEEL, a large heavy wheel applied to a steam-engine or other machinery in order to equalize the effect of the moving power. Its action depends upon the principle, that a body once set in motion retains a certain amount of moving force or *momentum*. This increases with the weight of the body and the velocity of its motion, and may be expressed relatively by multiplying the weight by the velocity; or stated otherwise, the force required to destroy the motion of a body is equal to that which set it in motion. Thus, a heavy wheel becomes a sort of reservoir of force, when set in motion.

There are two principal cases in which the fly-wheel is commonly applied: first, when the motive power is intermittent or irregular; and second, when the resistance or work to be done is intermittent or irregular. The crank is a good example of the first case. If the force be applied only downwards, as in the common foot-lathe, it will be intermittent, and the crank must rise independently of the prime mover. This is effected by applying a fly-wheel, which is set in motion by the descending pressure of the foot acting upon it through the crank; and the momentum it

has thus acquired lifts the crank again to the point where it can be acted upon by the foot. It also carries the crank over the *dead points* (see **CRANK**), where even a double action of pulling and pressing would be ineffective. The case of a steam-engine turning a long shaft which passes through several workshops, and by means of bands drives a number of lathes, punching, drilling, planing machines, &c., is a common example of the second case, the resistance or work to be done being very variable from one moment to another.

In such work as that of a punching-machine, the engine need not be nearly of sufficient power to directly force the punch through the metal, and yet by the aid of the fly-wheel it may do it; for while the punch is rising, the engine is communicating momentum to the fly-wheel; and when the descending punch meets with the resistance it has to overcome, this reserved momentum is added to the direct power of the engine, the punch is forced through, and the speed of the fly-wheel slackened, in proportion to the resistance.

The principle of the fly-wheel is sometimes applied in other forms than that of a wheel, as in the hand-coining press, where a heavy ball is fixed at each end of a long lever, which is made to swing round with considerable velocity, and the accumulated momentum is concentrated upon the blow.

FO. See **BUDDHA**.

FO'CHABERS (of old, *Fochobyr*, and still locally styled *Fochaber*), a small, neat village and burgh of barony on the right bank of the Spey, in Morayshire. Pop. (1881) 1189. The parish church stood formerly at Bellie, in Banffshire, about two miles nearer Speymouth, and in the immediate neighborhood of an old encampment, which has been supposed to be the *Tuessis* of Ptolemy. Gordon Castle, the old 'Bog of Gight,' formerly the seat of the Duke of Gordon, now of the Duke of Richmond, stands between F. and the Spey. F. has a valuable system of free schools, founded by a bequest of about £20,000 by Alexander Mylne, a native of the town. The site of F. is peculiarly fine, lying as it does at the mouth of a picturesque ravine, watered by a mere rill falling into the rapid Spey, but swelling in times of flood into a wider stream than that which it feeds.

FOCI-METER. See **CLAUDET'S FOCIMETER**.

FOCUS. Certain points in the ellipse, hyperbola, and parabola are called foci. See **ELLIPSE**, **HYPERBOLA**, and **PARABOLA**. Focus, in Optics, is a point in which several rays meet and are collected after being reflected or refracted, while a *virtual focus* is a point from which rays tend after reflection or refraction. The principal focus is the focus of parallel rays after reflection or refraction. See **LENS**, **MIRROR**, and **CATOPTICS** and **DIOPTRICS**.

FODDER (Ger. *futter*, Anglo-Sax. *foddor*), the food collected by man for the use of the domestic herbivorous quadrupeds. In English, the term is commonly restricted to dried herbage, as hay and straw; but in other languages, it is more comprehensive, and includes all the food of cattle, except what they gather for themselves in the field.

The principal part of the food of all the domestic herbivora is furnished by grasses, almost all of which are eaten by them when fresh and green. Besides the supplies which they receive of all the kinds of corn cultivated for human food, they are also, to a considerable extent, dependent on the *straw* or dried herbage of the corn-plants for their winter provender; and that of many other grasses, cultivated on this account alone, is converted into *hay* for their use. Hay, being cut and rapidly dried whilst the plant is still full of sap, contains more nutritious matter than the ripened straw of the cereals. The most important fodder grass of Britain is **RYE GRASS**, next to which must be ranked **TIMOTHY GRASS**; but all the meadow grasses and larger pasture grasses also contribute to the supply of hay.

Next to the grasses must be ranked different kinds of *Leguminosæ*, affording food for cattle in their seeds—as beans, peas, lentils, lupines, &c.—and in their herbage, on account of which many of them are cultivated, as clover, medick, melilot, vetch, tare, sainfoin, &c., of some of which there are numerous species. Some of these also often enter pretty largely into the composition of hay, being cut and dried with the grasses along with which they are sown; which is the case also with some plants of other orders, as the Ribwort Plantain, &c. Some of the *Cruciferae* are cultivated to a considerable extent as forage-plants, cattle being fed on their green herbage, although they are not suitable for drying as fodder. Among these are kale and cabbage, rape, &c.

In some parts of the world, cattle are not unfrequently fed on the leaves of trees, as in the Himalaya, where the leaves of different species of *Aralia*, *Grewia*, Elm, and Oak, are chiefly employed for this purpose, and are collected, dried, and stacked for winter fodder.

Roots, although not fodder in the English sense, must here also be mentioned as constituting a large part of the food provided for

cattle, particularly those of the potato, turnip, mangold, and carrot, and to some extent also those of the parsnip and Jerusalem artichoke.

FODDER, in Law. It is generally considered to be implied in the rules of good husbandry that the hay and straw produced by the farm shall be consumed on it. In England, 'in the absence of any agreement respecting the removal of hay and straw, the right to do so is regulated by the custom of the country.'—Woodfall, p. 537. The custom differs not only in different counties, but in different parts of the same county. In the narrower sense of fodder, in which it is used to signify hay or straw that has been already used for bedding cattle, or the like purpose, there seems to be no question that it must be retained on the farm. 'Whatever question there may be with respect to hay and straw, as before noticed, all the litter, fodder, dung, manure, and compost, must invariably be consumed on the lands; indeed, if this is not expressly provided for by the terms of the contract, it is always implied, as a removal would clearly be a breach of good husbandry.'—*Ib.* Where the outgoing tenant leaves fodder on the premises, he is entitled to no compensation, except under an express stipulation. In Scotland, where the rules of good husbandry are more strictly attended to, the tenant must consume the whole of the fodder produced by his lands, except the hay and straw of his outgoing crop, and the same rule is applicable to assignees and sub-tenants. In some counties, fodder used for making dung is considered Steelbow (q. v.), and given to the incoming tenant; but this is usually regulated by express stipulation in the lease. 'At one time,' says Mr. Hunter, 'it was held that a tenant had a right to dispose of the straw of the away-going crop, although the lease bore a general clause, binding him to consume the straw on the farm during the lease. But the rule now is, that where there is an express stipulation that all the manure, hay or straw, shall be used or left, it is strictly interpreted, without control from local usage; and the tenant is not entitled to take away or sell, or have value for the straw of the last or away-going crop.'—*Landlord and Tenant*, ii. p. 461.

FŒTUS, the term applied in Medicine to the mammalian embryo, especially in its more advanced stages. In the human subject, we usually speak of the embryo at and after the end of the fourth month as a fœtus.

There are several points in relation to the fœtus which are of great interest both to the physiologist and to the medical jurist. It is frequently of great importance in medico-legal inquiries to be able to ascertain the age of the fœtus; and to facilitate such determination, the physical characters which it presents at different ages have been carefully noted and described.

In the fœtus of nine months—the full term—the length is from 17 to 21 inches; weight from 5 to 9 lb., the average being about 6½ lb. Even at birth, the average length and weight of the male infant slightly exceeds that of the female. From numerous observations made by Quetelet, it appears that there is an average excess of length of 4·8 lines, and of weight of twelve ounces, in the male infant.

The average weight of infants, without regard to sex, was found by a French observer, Chaussier (who noted the weight in more than 20,000 cases), to be about 6·7 lb.—the maximum being 11·3, and the minimum 3·2 lb. From the inquiries of Dr. Joseph Clark (*Philosophical Transactions*, vol. 76), which were made on 60 males and 60 females, the average in this country seems rather higher, the weight of males being 7 lb. 6 oz., and that of the females being nearly 6 lb. 12 oz.; and Sir James Y. Simpson arrived at very nearly the same result. Clark observes that if, at the full time, the weight of the infant is less than 5 lb., it rarely thrives. Various instances are recorded of infants in which the weight at birth has exceeded twice the average weight. Thus a case is recorded by Mr. Owen, in the *Lancet* for 1838, in which the child at delivery weighed 17 lb. 12 oz., and was 24 inches in length; and in the *Medico-Chir. Review*, October 1841, there is the mention of a case in which the weight was nearly 18 lb.

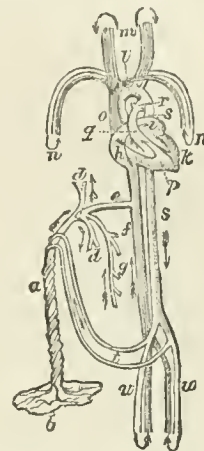
There are certain points in which the fœtus at the full period differs anatomically from the child shortly after birth. The bony skeleton is very incomplete, cartilage occurring in the place of many bones. Indeed, complete ossification (viz., of the vertebræ) is not finished until about the 25th year, and the only bones completely ossified at birth are the minute ossicles of the ear. The difference between the fœtus and the child in this respect is, however, only one of degree.

During pregnancy, a temporary organ, termed the placenta (popularly known as the after-birth, from its being thrown off shortly after the birth of the child), is developed on the inner wall of the uterus (see *b* in the figure). This organ is mainly composed of vessels, and there proceeds from it the structure known as the umbilical cord, *a*, in which lie the umbilical vein, which conveys arterial blood to the fœtus, and the two umbilical arteries, which return the blood to the placenta. This umbilical cord conveys these vessels to the umbilicus, or navel. Before tracing the course

of the blood through the fœtus, we must notice the chief anatomical peculiarities presented by the vascular or circulating system before birth.

1. In the heart, we find a communication between the two auricles by means of an opening termed the *foramen ovale*. 2. In the arterial system, we have to notice first, the *ductus arteriosus* (see *r* in the figure), which is a large communicating trunk between the pulmonary artery and the descending aorta; and, secondly, the branches given off by the internal iliac arteries, which go under the name of hypogastric as long as they are within the body of the fœtus, and of umbilical when they enter into the structure of the cord, are continued from the fœtus to the placenta, to which they return the blood which has circulated in the fetal system. 3. In the venous system there is a communication between the umbilical vein and the inferior vena cava, called the *ductus venosus*.

Pure blood is brought from the placenta by the umbilical vein, which passes through the umbilicus, and enters the liver, where it divides into several branches *d, d*, which are distributed to that viscus, the main trunk or *ductus venosus*, *e*, passing directly backwards, and entering the inferior vena cava, *f*. The pure blood



The Fœtal Circulation (from Wilson's *Anatomist's Vade Mecum* :

a, the umbilical cord proceeding from *b*, the placenta; *c*, the umbilical vein; *d, d*, its branches going to the liver; *e*, the *ductus venosus*; *f*, the inferior vena cava; *g*, the portal vein; *h*, the right auricle. The uppermost arrow indicates the course of the blood through the *foramen ovale*. *i*, the left auricle; *k*, the left ventricle. The arrow commencing in the left ventricle, and with its head on the ascending aorta, indicates the course of the blood to be distributed to the head and extremities; *l*, the arch of the aorta. The arrows *m* and *n* represent the return of the blood from the head and upper extremities, through the jugular and subclavian veins, to the superior vena cava. *o*, to the right auricle, *p*, and, as shown by the arrow, through the right ventricle, *k*, to the pulmonary artery, *q*; *r*, the *ductus arteriosus*; *s*, *s*, the descending aorta, *t*, the hypogastric or umbilical arteries; *u, u*, the external iliac arteries.

here becomes mixed with the impure blood which is returned from the lower extremities and abdominal viscera, and is carried into the right auricle, *h*, and from thence, guided by the Eustachian valve (which is situated between the anterior margin of the inferior cava, and the auriculo-ventricular orifice, and is of relatively large size in the fœtus), passes through the *foramen ovale* into the left auricle, *i*. From the left auricle, it passes into the left ventricle, and into the aorta, whence it is distributed by the carotid and subclavian arteries principally to the head and upper extremities, which thus receive comparatively pure blood. From the head and arms, the impure blood is returned by the superior vena cava to the right auricle; from the right auricle, it is propelled, as in the adult, into the right ventricle; and from the right ventricle, into the pulmonary artery. In the adult, it would now pass through the lungs, and be oxygenized; but in the fœtus, it passes through the *ductus arteriosus* into the commencement of the descending aorta, where it mixes with that portion of the pure blood which is not sent through the carotid and subclavian arteries. Some of this mixed blood is distributed by the external iliac arteries, *u, u*, to the lower extremities, while the remainder (probably the larger portion) is conveyed by the hypogastric or umbilical arteries, *t*, to the placenta.

From the above description we perceive—1. That a considerable quantity of the pure blood from the placenta is at once distributed to the liver, which accounts for its large size at birth as compared with the other viscera. 2. That a double current meets in the right auricle, one stream, guided by the Eustachian valve, passing through the *foramen ovale* into the left auricle, the other through the auriculo-ventricular opening into the right ventricle. 3. That the comparatively pure blood sent to the head and arms, as contrasted with the impure blood sent to the lower extremities, causes the relatively greater development of the former organs.

and prepares them for the functions they are called upon to perform; the development of the legs at birth being slight as compared with that of the head or arms.

Almost immediately after birth, the *foramen ovale* becomes closed by a membranous layer, and the *ductus arteriosus* and *ductus venosus* degenerate into impervious fibrous cords.

The lungs, previously to the act of inspiration, are dense and solid in structure, and of a deep-red color, and lie far back in the chest. Their specific gravity is greater than water, in which they (or portions of them) consequently sink, whereas lungs, or portions of lungs, that have respired, float in that fluid.

In the preceding remarks, we mentioned *nine months* as the full period of foetal existence. The period of gestation is, however, only constant between certain limits, and it is of the greatest importance in reference to questions of chastity and legitimacy to determine these limits.

The average duration of gestation in the human female is comprised between the 38th and 40th weeks after conception. It is comparatively seldom that the actual date of conception can be fixed with positive certainty; but amongst the few cases of this kind on record, Rigby mentions one in which natural labor came on in 260 days, and Reid mentions another in which it did not commence until the lapse of 293 days. Here, then, we have an unquestionable range of 33 days; and many apparently authentic cases are on record in which a longer period of gestation than in Reid's case has been observed.

Another important question in connection with this subject, is—What is the earliest period at which a child can be born, to enable it to live, and to continue in life after its birth? There is no doubt that children born at the seventh month of gestation are capable of living, although they usually require much care; and children may be born alive at any period between the sixth and seventh months, or even in some instances earlier than the sixth; but this is rare, and if born living, they commonly die soon after birth. Various cases of this nature are collected by Dr Taylor in his *Medical Jurisprudence*; amongst others, he mentions a case reported by Dr Barker of Dumfries, in which a child was born at the 158th day of gestation, and (though small) grew up. In the celebrated Kinghorn case, the child was born 174 days, or nearly six calendar months after marriage, and lived for more than eight months; and the majority of the medical witnesses who gave evidence on that occasion were strongly in favor of the view that the period of the gestation was circumscribed by the period of wedlock.

Again, questions connected with prolonged gestation have given rise to much discussion in legal medicine. No period has been fixed by law beyond which a child if born in wedlock is to be declared illegitimate. In the case of *Anderton v. Gibbs*, 1834, the vice-chancellor decided that a child born ten months or about forty-two weeks after intercourse with the husband, was legitimate. In the *Gardner Peerage* case, which came before the House of Lords in 1825, the question was, whether a child born 311 days (or 44 weeks and 3 days) after intercourse could be legitimate. Lord and Lady Gardner separated on the 30th of January 1832, and did not again meet till the 11th of July. A full-sized child was born on 8th of December of that year. The principal obstetric practitioners in the kingdom were examined on this point, and a large majority concurred in the opinion that natural gestation might be protracted to such a period. The decision, which was against the legitimacy, seems to have been mainly if not entirely based on the moral grounds that Lady Gardner, after separating from her husband, was living in open adultery. In the case of *Commonwealth v. Porter* (see *American Journal of Medical Science*, 1845), it was decided in the United States that a child born 317 days (or forty-five weeks and two days) after conception was legitimate. In the case of *Cotterall v. Cotterall*, decided in the Consistory Court in 1847, the husband had proceeded against his wife for a divorce on the ground of adultery. In this case, if it were the child of the husband, it must have been born after twelve months' gestation. Dr Lushington, without entering into the question of protracted gestation, at once pronounced for the divorce, such a duration of pregnancy not being supported by any known facts.

This article would be imperfect without a notice of the question—What constitutes live-birth? This is a point on which the most distinguished obstetric authorities have differed: some holding that where there is muscular movement, there is life; while others maintain that where respiration has not been proved to have taken place, the child was still-born. Amongst the most celebrated lawsuits bearing on this point, we may mention that of *Fish v. Palmer*, tried in 1806, and that of *Brook v. Kellock*, tried in 1861. In the last-named case it was decided by the Vice-Chancellor, Sir J. Stuart, that a child may live for some time after birth, and not breathe, the absence of signs of breathing being held to be of no proof of its being born dead. It was given in evidence that there was pulsation of the funis after separation of the cord, and the beating of the heart was regarded as proof of live-birth.

Hence we may regard it as now established in English law, that respiration is not required to establish live-birth. Nor do the laws of France or the United States require that the child shall have breathed. In Scotland, the law requires not only that the child shall have breathed, but that it shall have cried; and in conformity with this law, a child which lived, breathed, and died in convulsions at the end of half an hour, was declared to have been born dead (*Dyer's Reports*, 25).

FOG, or MIST, is the visible watery vapor sometimes hanging near the surface of the earth, and caused, as clouds are, by the precipitation of the moisture of the atmosphere. This takes place when a stratum of atmosphere comes in contact with a colder stratum, or with a portion of the earth's surface, as a hill, by which it is cooled, so that it can no longer hold in solution as much moisture as before. It takes place also when a cold stratum of atmosphere comes above a moist warm portion of the earth's surface, the exhalations from which are precipitated and become visible as they ascend into it. Thus, fogs are formed over lakes, rivers, and marshes in the evening, because the water is then warmer than the atmosphere above it. The fogs seen in the morning very often disappear by being dissolved in the atmosphere as the temperature increases. The fogs on the coasts of New England and Nova Scotia are caused by bodies of warm air wafted over cold water.

In the thick yellow fog notorious as London fog, the watery particles are largely mingled with smoke and other impurities. It has been found that these fogs are not merely a serious hindrance to traffic in London, but are distinctly detrimental to health. During the great fog of 1879–80, remarkable alike for its density and its long continuance, the death-rate for several kinds of disease was very markedly increased. The only remedies proposed for the diminution of the smoky elements of fog are more complete consumption of smoke in factory furnaces, and the use in dwelling-houses of smokeless grates or stoves.

In 1880, Dr. Aitken propounded to the Royal Society of Edinburgh a theory (partially anticipated by a Dutch investigator in 1876) that pure vapor is naturally invisible, and only becomes visible as cloud, mist, or fog, after condensation around the dusty particles in the atmosphere. The dust meant includes of course not merely the grosser kinds, but also many almost impalpable powders; such, for example, as the results of the combustion by a meteorite in the upper air. But for some kinds of dust present in the atmosphere, there would, according to this theory, be no visible fog at all, even when the air was charged with watery moisture.

FOGGIA, a town of Italy, capital of the province so named (formerly Capitanata), in Southern Italy, is situated between the rivers Cervaro and Celone, in a district abounding in plantations of olives, vines, and other fruit trees, 80 miles east-north-east of Naples. It is a handsome, well-built town, with spacious streets, good houses, and large shops. Among the chief buildings are the cathedral, a Gothic edifice originally, but partially destroyed by an earthquake in 1731, and afterwards rebuilt in a different style; numerous churches, some of them antique; the custom-house, a beautiful building; and the theater. It is the center of all the trade of the province, and has many large corn magazines. Pop. (1881) 36,852; of commune, 40,283.

F., supposed to have been built from the ruins of the ancient Arpi, was a favorite residence of the Emperor Frederick II., and here died his wife, Isabella, daughter of the English king, John. It was also for some time the residence of Ferdinand I. and his court, when ranked as the second city in the kingdom.

FOG-SIGNALS, audible warnings used on board ships, on the sea-coast, or on railways, during fogs and mists, or at any other time when lights or ordinary daylight-signals are not available.

The commonest fog-signal on shipboard is the continuous ringing of the ordinary time-bell, or striking the anchor with a hammer, together with the occasional discharge of musketry and heavy guns. These are adopted, to prevent collisions, when ships are overtaken by a fog in the British Channel, or other places where shipping is abundant. The blowing of a horn, the beating of a drum, and empty cask, a gong, and various other unusual sounds, are also adopted. Steam-vessels generally blow a whistle under these circumstances. These sounds, however, only indicate rudely the position of the ship, and not the direction in which she is sailing. Many plans have been devised for the code of signals, by which the directions north, south, &c., might be indicated by the varying length of each sound, or the intervals between the sounds of a fog-horn or whistle.

It is very desirable that some general code of signals of this kind should be adopted for the merchant service as well as the navy; and that its recognition by the marine of all other nations should be procured. The Admiralty have such a code for the direction of a fleet of ships of war in thick weather, but their application is limited to the navy. Some further remarks on fog-signals will appear under SIGNALS (q. v.).

Fog-signals from the shore are very desirable, especially on a dangerous coast. Bells and guns have both been used for the purpose, but when a strong wind is blowing in towards the shore, their sound is heard only at a very little distance out to sea. Consequently steam-whistles, and fog-horns sounded by compressed air, are being employed in their stead. Fog-sirens, producing a sound after the manner described in the article *SIRENS*, are now largely in use. In 1880, nearly 40 had been established on the coast of England and Wales (at a cost of £50,000). These were audible at a distance of from two to ten miles.

The fog-signals used on railways are small cases charged with detonating powder, and laid upon the rails. They explode loudly when the wheel of an advancing train comes upon them. They are not merely used in fogs, but in all cases of danger, from obstruction of the line, or in other cases of urgency when a train has to be stopped without delay. Station-masters and railway police are furnished with them.

FÖHR, an island in the North Sea, on the western coast of Schleswig. It has an area of about 28 square miles, has about 5000 inhabitants, and is divided into *Osterlandfohr*, which always belonged to Schleswig, and *Westerlandfohr*, ceded by Denmark to Schleswig in 1864. The inhabitants are mostly Frisians. The chief place is Wyk, with a population of 1009.

FOIL, a thin bar of elastic steel, mounted as a Rapier (q. v.), but without a point, and additionally blunted at the end by the presence of a button covered with leather. It is used in Fencing (q. v.).

FOIL (from *folium*, a leaf), a general name for thin metal intermediate in thickness between *leaf-metal*, such as gold, silver, and copper leaf, and *sheet-metal*.

There are two distinct kinds of foil in common use—the tin-foil used for silvering looking-glasses, lining tea-caddies, and other similar purposes, and for the conducting coatings of electrical apparatus; and the bright foils employed by the jewelers for backing real or artificial gems, and thereby increasing their lustre or modifying their color.

The former is made by rolling out tin, or more recently, by the method of Mr. Wilmshurst, who casts a cylinder of the metal, and then, by means of a knife or cutter, shaves it into a sheet as the cylinder rolls to the knife, which is gradually moved inwards towards the axis of the cylinder at a rate proportionate to the required thickness of the sheet.

The bright foil used by jewelers and for theatrical and other ornaments under the name of 'tinsel,' is made of copper, tin, tinned copper, or silvered copper. The last is now chiefly used by jewelers. The metal is rolled in a flattening mill, and the requisite brilliancy of surface is produced by finishing between burnished rollers and polishing. The various colors are produced by coating the white metal with transparent colors mixed in isinglass size. A similar varnish without color is laid over the white foil, to prevent tarnishing. The socket or setting in which the stone or paste is mounted is lined with the foil, and by reflecting from the internal facets the light which passes through the stone, adds considerably to its brilliancy. The natural colors of real stones are sometimes heightened or modified by colored foil, and factitious colors are thus given to the glass or 'paste,' as it is called, of which spurious gems are made.

There are two other methods of foiling gems, distinct from the above: one of them is to line the socket of the setting with tin-foil, then fill it whilst warm with mercury; after a few minutes, the fluid mercury is poured out, and there remains an amalgam of tin, precisely the same as is used for backing common mirrors; the gem is fitted into this, and thus its back has a mirror surface. The other method is to precipitate a film of pure metallic silver upon the back of the stone, by submitting a solution of the ammonia nitrate of silver in contact with the stone to the reducing action of the oils of cassia and cloves. The silvering of looking-glasses being the chief use to which the ordinary *tin-foil* is applied, its purity is a matter of great consideration; its employment also by chemists, as a ready means of forming some of the tin compounds, renders this absolutely necessary.

Nevertheless, the spirit of adulteration has extended to the tin-foil makers, and lead has been extensively alloyed with the tin. In some analyses recently made, it has been shown that as much as 85 per cent. of the adulterant metal has been used, the effect of which in the process of silvering mirrors is most injurious to the brilliancy of the amalgam, which should consist of perfectly pure tin and quicksilver. For chemical purposes, it is now absolutely necessary to test for lead before using *tin-foil*.

The foils used by jewelers for backing gems, consisting of small sheets of silvered copper rolled very thin, are colored with the following preparations, to suit the different gems under which they are to be placed, or for use as tinsel in the manufacture of theatrical ornaments, toys, &c. Lake and Prussian blue, and pale drying-oil finely ground with a slab and mullar—for *amethyst* color. Prussian blue, similarly prepared—for *sapphire* color.

Dragons' blood dissolved in pure alcohol—for *garnet* color. Sesquiferrocyanide of iron and bichromate of potash, equal parts very finely ground and sifted, then ground with a quantity of gum-mastic equal to the other two ingredients, until the whole forms an impalpable powder; gradually form this into a thin paste with pure wood-spirit (pyroxylic) and preserve in stoppered bottle; when used, a portion is diluted with wood-spirit to the necessary thinness—for *emerald* color. Various shades of *yellowish* or *bluish green* can be produced by varying the proportions of the two coloring materials. Lake or carmine ground in solution of isinglass—for *ruby* color. A weak solution of orange shell-lac, sometimes tinted with saffron, turmeric, or aloes—for *topaz* color. Several other color-varnishes are made by similar methods for various shades of tinsel and gem foils. See *SILVERING*.

FOIX, a small and unimportant town of France, in the department of Ariège, and on the left bank of the river of that name, 44 miles south-south-east of Toulouse. It has a picturesque old castle, with three well-preserved towers of whitish marble, all of different ages, and all dating from before the 15th century. It has some trade in iron, and in the vicinity are numerous iron-works. Pop. (1876) 5127. F. was capital of the old county of Foix.

FOIX, an old French family, which took the title of count from the district of Foix (now the department of Ariège), in the south of France. The first who bore the title was Roger, Comte de Foix, who flourished in the middle of the 11th century. Raymond, Comte de Foix, figures as one of the knights who accompanied King Philippe Auguste to Palestine; afterwards, being accused of heresy, his estates were seized by Comte de Montfort. He died in 1223. Several members of the family subsequently distinguished themselves in the wars against England. Gaston III., Comte de Foix, born 1331, and called on account of the beauty of his person, Phœbus, was noted for his knightly love of splendor and military prowess. For his services to the king, he was made governor of Languedoc and Gascony. When only 18, he married Agnes, daughter of Philip III., king of Navarre. In 1358, during the insurrection known as the *Jacquerie* (q. v.), he delivered the royal family from the power of the rebels. When Charles VI. wished to deprive him of the government of Languedoc, he maintained his position by force of arms, and defeated the Duc de Berri in the plain of Revel. He was inordinately attached to the chase, and is said to have kept 1600 dogs. He also wrote a work on the subject, entitled *Miroir de Phœbus des deduits de la Chasse des Bestes sauvages et des Ouseaulx de Proye*, which went through several editions in the 16th and 17th centuries, and whose bombastic style (*faire du Phœbus*) became a byword.

Froissart owed some of the choicest incidents in his history to having lived for some time in the castle of Orthes, Gaston's principal residence. After his death, in 1391, the estates and title went to a collateral branch of the family. Gaston IV., Comte de Foix, rendered good service to the king in the wars against England. In 1455, his father-in-law, John II., king of Navarre, named him his successor. In addition to this, Charles VII. created him a peer of France, and ceded to him his claims upon Roussillon and Cerdagne. He died in 1472, when the family possessions were again divided. The last, his grandson, Gaston de Foix, was probably the most heroic member of the family. Son of a Jean de Foix, Comte d'Estampes, and Marie d'Orléans, sister of Louis XII. of France, he was born in 1489, and in 1507 received from his uncle, the French king, the title of Duc de Nemours. In the Italian wars carried on by Louis, Gaston displayed the most brilliant and precocious genius. He twice overthrew the Swiss, at Como and Milan; chased Pope Julius II. from Bologna; seized Brescia out of the hands of the Venetians; and, to crown a series of splendid triumphs, which obtained for him the title of the *Thunderbolt of Italy*, won the great battle of Ravenna over the Spaniards, 11th April 1512, in which, however, he fell, at the early age of twenty-three. On his death, the estates and title of the House of Foix went to Henri, king of Navarre, whose daughter, Jeanne d'Albret, married Antoine de Bourbon, Duc de Vendôme, and became the mother of the great Henri Quatre, who thus attached the county of Foix to the French crown.

FOKTSCHANY, or FOKTSIHAN, a town of Walachia, on the Milkov, a branch of the Sereth, 105 miles north-north-east from Bucharest. The Milkov divides Walachia from Moldavia, and a large suburb of F. is in Moldavia. In 1789, F. was destroyed by the Russians. It was burned by the Turks in 1822. The inhabitants are mostly Greeks and Jews.

FO'LCLAND, or FOLKLAND, the land of the folk or people in England in Anglo-Saxon times. The folcland, according to Turner, was that portion of the kingdom which was retained in behalf of the public, and with a view to increasing population and the growing wants of the community, and not permitted to become allodial estate or absolute private property. Of this land, the usufruct or *dominium utile* was enjoyed by the freemen, for which certain rents were paid to the state, and did not become

hereditary. On the contrary, the rights which were held in it by individuals reverted to the community at the expiry of a particular term, when it was again given out by the folcgemot or court of the district, either in community or in severalty. Certain services to the public were commonly imposed on the holders of folc-land, such as the reparation of the royal villas and other public works; the exercise of hospitality to the king, and to other personages of distinction in their progresses through the country, by furnishing them and their messengers, huntsmen, hounds, hawks, and horses with food, and providing them, when necessary, with means of transport.

It does not seem that the folc-land was held exclusively by the common people, but rather that it was open to freemen of all ranks and conditions, and that the possession of it was much coveted even by those who had great estates on the hereditary title which was known as *Bockland* (q. v.). Folc-land was often given out as bockland to those who held performed great public services, just as Horatius was rewarded by a grant of the Roman *ager publicus*—

'They gave him of the corn-land
That was of public right,
As much as two strong oxen
Could plough from morn till night!'

It was also frequently given to the church, for the purpose of founding monasteries and the like, a practice of which Bede complains in his celebrated letter to Archbishop Egbert. 'It is disgraceful to say, persons who have not the least claim to the monastic character, as you yourself best know, have got so many of these spots into their power, under the name of monasteries, that there is really now no place at all where the sons of nobles or veteran soldiers can receive a grant.'—Kemble's *Saxons*, p. 291. Kemble gives examples of the dues paid by monasteries, for the folc-land which they held, which afford curious information as to the products of industry and modes of living of those times. In 883, a monastery is freed from all dues which the monks were still bound to pay to the king's hand, including bright ale, beer, honey, oxen, swine, and sheep. The dues of the monastery at Taunton were—a feorm (or entertainment) of one night to the king, and eight dogs and one dog-keeper; and nine nights' keep for the king's falconers, and carriage, with wagons and horses, for whatever he would have taken to Curry or Wilton; and if strangers came from other parts, they were to have guidance to the nearest royal vill upon the road.—*Ib.* 295, 296.

FÖLDVAR or **DUNA-FÖLDVAR**, a town of Hungary in the county of Tolna, is situated on the crest and slope of a hill on the right bank of the Danube, 48 m. south of Pesth. It has a Roman Catholic high school, is a steam-boat station, has an important sturgeon-fishery, and considerable trade in wines and agricultural produce. Pop. (1869) 12,382.

FOLIA MALABA'THRI, i. e., Malabar Leaves, formerly in much repute as a medicine; an aromatic tonic; the dried leaves of *Cinnamomum nitidum*, and partly of *C. Tamala*, species of cinnamon, small Indian trees or shrubs.

FOLIA'TION, a term restricted by Mr. Darwin, and subsequently by geologists, to the alternating layers or plates of different mineralogical nature, of which gneiss and some other metamorphic schists are composed. It differs from cleavage, which is applied to the divisional planes that render a rock fissile, although it may appear to the eye quite or nearly homogeneous; and from lamination, which is the easy splitting of a rock into its original layers of deposition.

It is difficult to determine the cause of foliation. Some hold that as gneiss is composed of the disintegrated ingredients of granite, the layers are identical with the original laminae, having been arranged according to their various densities. But it can scarcely be conceived that water would be able to deposit such materials in the same order over areas so immense as those occupied by gneiss strata. It seems more probable that the arrangement is owing to some widespread metamorphic and segregating force, which operated subsequently to the deposition of the beds.

FOLI'GNO, a town of Central Italy, in the province of Perugia, in the fruitful valley of the Topino, 18 miles north of Spoleto. It was formerly surrounded by walls, which have now been converted into promenades. It has regular streets, and some important buildings including the beautiful cathedral, the theater, the Palazzo Comunale, the hospital, and several churches. Raphael's Madonna di Foligno, now in the Vatican, formerly hung in a convent here. Soap and comfits are manufactured, and much silk is produced. Pop. 8500.

F., the ancient Umbrian *Fulginium*, was called in the middle ages Fulginum. In 1832 it suffered severely from an earthquake.

FOLKES, MARTIN, LL.D., an eminent English scholar and antiquary, born at Westminster in 1690, was educated at Clare Hall, Cambridge. In 1713, he was chosen a fellow of the Royal Society of London; and in 1741 he succeeded Sir Hans Sloane as president of that learned body. He was also a member of the

Antiquarian Society, and of the Royal Academy of Sciences at Paris. He died in 1754. F. was the author of *A Table of English Gold Coins from the 18th Edward III., when Gold was first coined in England* (Lond. 1736, 4to), with *A Table of English Silver Coins, from the Norman Conquest; to which he added an Appendix, answering the Coins minted in Scotland since the Union of the two Crowns* (Lond. 1745, folio), published under the care of the Antiquarian Society, superintended by Dr. Giffard (1763, 2 vols.). Besides these works, F. contributed a number of papers to the *Philosophical Transactions*.

FOLK-LORE, a term compounded after a German model, and of late used to designate what may be called a department of antiquities or archaeology—viz., that which relates to ancient observances and customs, and superstitions among the common people. In England, the literature of this subject may be said to have commenced with the *Miscellanies* of John Aubrey, published in 1696, in which we find chapters on Day Fatality, Omens, Dreams, Corpse Candles, Second Sight, and kindred matters, to which that learned but credulous author—an early member of the Royal Society—had given his attention. Here, however, the superstitions, rather than the ordinary observances and customs of the people, were detailed.

The first book addressed to the general subject of folk-lore was an octavo volume by the Rev. Henry Bourne, published at Newcastle in 1725, under the title of *Antiquitates Vulgares, or the Antiquities of the Common People*. It mainly consists of an account of the popular customs in connection with the feasts of the church. Fifty years after its publication, John Brand, M.A., a native of Newcastle, busied himself in extending the collections which originated with Bourne, and in 1777 he published at that city the first edition of his *Observations on the Popular Antiquities of Great Britain*, a work which was subsequently enlarged by himself, partly from the stores of folk-lore presented in the *Statistical Account of Scotland* (edited by Sinclair, 1791—1795), but was left to be re-issued, under a thoroughly revised form, in 1813 (2 vols. 4to), by Henry Ellis of the British Museum. This work, in which Bourne's was incorporated, has since been twice reprinted, with additions, and might have been regarded as an exhaustive work on the subject, if it had not been shown by Hone's *Every Day Book* and *Year Book*, Chambers's *Book of Days*, two vols., and *Notes and Queries*, that, after all, many curious particulars of English folk-lore remained to be gleaned. Through all these various channels, we now have tolerably ample information on popular festivals of every kind, both those which appear to have originated in pagan times, and those instituted by the Christian Church, on all observances connected with the important movements of domestic life, as marriages, sepulture, &c.; on fireside amusements, on superstitions and vulgar errors. What may be called a sub-action of folk-lore has at the same time been amply illustrated in the *Nursery Rhymes*, edited by J. O. Halliwell, and the *Popular Rhymes of Scotland*, edited by Robert Chambers. It is to be observed that, while folk-lore has thus been engaging the attention of literary men, and put beyond risk of oblivion by taking its place in solid books, it is everywhere declining among the people themselves. To this effect, the diffusion of scientific ideas, the disfavor of the clergy for everything connected with the supernatural except religion itself, and the great industrial changes and improvements of the last fifty years, including a greatly increased shifting of the people from one district to another, have all concurred. In Germany, as is well known, the learned brothers, Jacob and Wilhelm Grimm, have turned the ancient simple usages and traditions of the peasant's fireside to excellent account in illustrating remote periods of the national history.

Many popular superstitions have been recorded in the pages of *Notes and Queries*, and the publications of the Folk-lore Society, established in 1874, have done much to spread among English observers more adequate ideas as to the possible value of mere stray usages and beliefs in the reconstruction of a primitive civilization. Besides, the translation of collections of foreign folk-tales has widened the horizon for English students, and opened up further reaching and more important questions, by their points of identity or contrast. Among the most important of more recent books on this subject are Henderson's *F.-L. of the Northern Counties*; Swainson's *Handbook of Weather F.-L.*; Thistleton-Dyer's *English F.-L.*; Busk's *Roman F.-L.*; Calloway's *Nursery Tales of the Zulus*; Campbell's *Popular Tales of the West Highlands*; Dasent's *Popular Tales from the Norse*; Ralston's *Russian F.-L.*; and *Songs of the Russian People*.

FOLKESTONE is a municipal borough, seaport, and bathing-place on the coast of Kent, five miles from Dover. It stands on uneven ground at the foot of a range of hills. The oldest part lies in a narrow valley, crossed by a magnificent railway viaduct. It has rapidly extended and improved since the opening of the South-eastern Railway, and the establishment of steam-packets to Boulogne. Pop. (1881) 18,887. F. unites with Hythe in returning one member to parliament. The harbor is much used by boats

employed in the herring and mackerel fisheries. The view from the pier extends from Shakspeare Cliff, at Dover, to Fairlight Head, at Hastings; the Boulogne heights are also seen. In the vicinity are the remains of Roman intrenchments. Here Harvey, the discoverer of the circulation of the blood, was born.

FOMENTA'TION (Lat. *fomentatio*; also *folus*, from *foveo*, I bathe), an application of warmth and moisture to a part, by means of cloths wrung out of hot water, sometimes medicated with vegetable infusions of substances calculated to relieve pain or stimulate the surface. Thus, opium, belladonna, chamomile, turpentine, &c., are used in various forms in connection with fomentations, which are of very great service in the treatment of almost all painful local disorders.

FONBLANQUE, ALBANY, journalist, born in 1797, was intended for the bar, and became a pupil of Chitty, the eminent special pleader. Castlereagh's Six Acts made him a political writer. As editor of the *Examiner*, the then leading Liberal weekly journal, F. exhibited a singular keenness both of wit and intellect, and exercised no inconsiderable influence on public opinion between the years 1826 and 1836. Leigh Hunt, who was his predecessor in the editorship of the *Examiner*, says of him in his Autobiography, 'He was the genuine successor not of me, but of the Swifts and Addisons themselves; profuse of wit even beyond them, and superior in political knowledge.' The characteristics of his political writings may be gathered from his work, entitled *England under Seven Administrations* (1837), which is simply a reprint of the more historical leading articles published in the *Examiner* from the period of the Canning and Goderich ministries, to the return of the Melbourne ministry. F.'s services to the Whigs were rewarded by his appointment to the office of secretary to the Statistical Department of the Board of Trade in 1852. He afterwards became head of the same department, and comptroller of corn returns, which offices he held till his death on 14th October 1872.—See *Life and Labors of A. F.*, by his nephew (1874).

FOND DU LAC is a name of various application in that portion of the United States which originally belonged to French Canada. Primarily denoting the inner extremity of any great body of fresh water, it has, secondarily, been made to indicate adjacent localities of different kinds, chiefly in connection with Lake Superior, the grand reservoir of the St. Lawrence, and Lake Winnebago, which empties itself from the westward into Lake Michigan.—1. The Fond du Lac of Lake Superior has lent its appellation to a village in Minnesota, situated at a distance of about 20 miles, on its navigable tributary, the St. Louis.—2. The Fond du Lac of Lake Winnebago designates both a county and town of Wisconsin. The latter has sprung up mainly since 1845, has a pleasant situation on a wooded slope above the lake, an important trade in grain, provisions, and timber, a great number of Artesian wells, and a population in 1870 of 12,764.

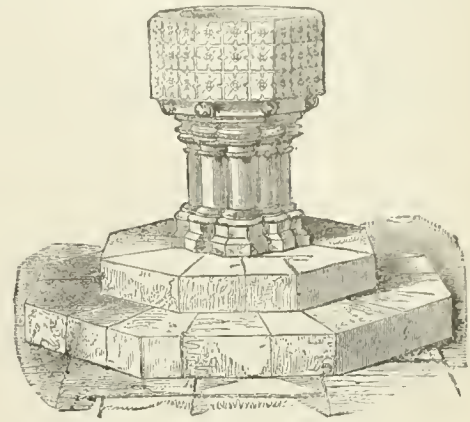
FO'NDI (anciently *Fundi*), a small town of Italy, in the north-west of the province of Caserta, is situated six miles from the coast, on the Appian Way, which now forms its principal street, 56 miles, north-west of Naples. It is an ill-built, dirty, and miserable town, in the neighborhood of a pestiferous lake (the ancient *Lacus Fundanus*); the surrounding plain, however (the ancient *Cæcubus Ager*, which produced the famous Cæcuban wine of classic times), is very fruitful. F. is surrounded in part by walls of cyclopean structure, and has a population of 6740. Its inhabitants were long notorious for brigandage and lawlessness.

FONSE'CA, a bay on the Pacific coast of Central America, lies between the two states San Salvador and Nicaragua. It claims notice principally as the proposed terminus of an interoceanic railway from the Puerto Caballos in Honduras. The intervening country has been surveyed, and reported as favorable.

FONT (*Fons Baptismalis*), the vessel used in churches as the repository of the baptismal water. In the early period, while immersion continued to be the ordinary rite of the administration of the sacrament of baptism, the baptistery (see BAPTISTERY), or other place set apart for the ceremony, was furnished with a basin sufficiently capacious to admit of the administration of the rite according to the then prevailing form. But when it became customary to baptize by affusion—that is, by pouring the water on the head of the person to be baptized—the size of the basin was naturally diminished, and eventually it assumed the dimensions and the form which are now familiar to us in most of the mediæval churches in Great Britain and upon the continent. The baptismal font, in its normal form, consists of a basin or eup, more or less capacious, hollowed out of a solid block, and supported upon a stem or pedestal. It is ordinarily of stone, but some ancient examples of leaden fonts also occur, and a few of copper or of bronze. In general, however, it may be said that the font, in its external form and character, followed the prevailing style of ecclesiastical architecture and ornamentation. From its connection with one of the most solemn rites of religion, it became very early a favorite subject for the exercise of the decorative skill of the

artist, and there are still preserved in different churches fonts which exhibit characteristics of each and all the successive fashions through which church architecture has passed since the introduction of the font in its present form. There is some doubt as to whether any existing specimen in England really belongs to the Saxon period, but examples are found of all the later styles, from the Early Norman down to the latest revival of Gothic architecture in our own day; the early English, the Decorated, of which a beautiful example occurs in the church of All Saints, Norwich; and the Perpendicular, which is seen in its highest perfection at East Dereham in the same county of Norfolk.

The annexed engraving exhibits a highly characteristic speci-



Font.

men of the fonts of the beginning of the 14th c., which stands in the church of Swaton, Lincolnshire, erected about 1310.

The external figure of the basin seems to have been originally circular or elliptical; but most of the later fonts are hexagonal, or even eight-sided. The basin was commonly supported on a single pillar or stem. Many cases, however, occur in which it rests on three, four, or five pillars, or, as in the engraving, on a group of pillars or pilasters united into a solid stem. The exterior, as well of the basin as of the pedestal, was often highly decorated, ordinarily with sculpture, but occasionally also in gold and colors; the designs on the basin commonly representing subjects connected with baptism, or its types and symbols. We frequently meet around the pedestal figures of the apostles, sometimes only eleven in number, Judas being omitted.

In the Roman Catholic Church, the service of Easter Saturday contains a solemn form for the blessing of the baptismal font. After a long series of prayers, and amid a very imposing ceremonial, the 'chrism,' or consecrated oil blessed by the bishop, and also the so-called 'oil of catechumens,' are mingled with the baptismal water, which is reserved for subsequent use. With a view to the preservation of the water thus reserved, the font, especially when it is of porous stone, is sometimes lined with lead; and from an early date, it is furnished with a lid, which is secured by a lock, and is often of a highly ornamental character.

The ordinary place of the font is at the western end of the nave, near the entrance of the church, but in many cases it stands in a separate chapel or baptistery, or at least in a compartment screened off for the purpose. Even when it stands in the open nave, it is properly enclosed by a rail.

The baptismal font is not to be confounded with the 'holy-water fount,' which usually stands near the entrance of Roman Catholic churches, and from which persons entering sprinkle their forehead, in recognition of the inward purity with which we ought to enter the house of God; nor with the *piscina* or *sacarium*, which is found in the chancel or the sacristy of ancient churches, and which was intended to receive and carry away the water used in cleansing the sacred vessels, the altar-linens, and the other furniture used in the administration of the eucharist. See Paley's *Illustrations of Baptismal Fonts*; Simpson's *Series of Baptismal Fonts*; Wetser's *Kirchen-Lexicon*; Binterim's *Denkwürdigkeiten*.

FONTAINEBLEAU, a town in France, in the department of Seine-et-Marne, is beautifully situated in the midst of an extensive forest, near the left bank of the Seine, 35 miles south-east of Paris, with which it is connected both by steamers on the Seine, and by railway. There are several fine public buildings, among others, two hospitals—one erected by Anne of Austria, the other by Madame de Montespan. It furnishes a great deal of wine and fruit for the capital, and has manufactures of porcelain. Its grapes are famed as *Chasselas de Fontainebleau*. Pop. (1876) 11,545.

F. is chiefly famous for its château, or pleasure-palace of the

kings of France, and the forest that surrounds it. The forest covers an extent of 64 square miles, and presents much fine scenery. The château is said to have originally been founded by Robert the Pious toward the end of the 10th century. It was rebuilt in the 12th c. by Louis VII., of whom, and of Philippe Auguste, it was a favorite residence, and was enlarged by Louis IX. and his successors. After being allowed to fall into decay, it was repaired and embellished by Francis I., who here received the Emperor Charles V. with lavish splendor, in 1539. Almost every succeeding king added something in the way of enlargement or embellishment, so that it bears the character and style of almost every century.

In the 17th c., it was the residence of Christina of Sweden after her abdication, and in the *Galerie des Cerfs* she caused her secretary Monaldeschi to be executed. Under Louis XIV. it was occupied by Madame de Montespan, and under Louis XV. by Du Barry; and here Pope Pius VII. was detained a prisoner for nearly two years by Napoleon. Many state transactions and treaties are dated from F.; among others, the act of abdication of Napoleon in 1814. Louis Philippe had all the paintings renovated, and the apartments restored in the taste of the 16th century.

FONTANA, DOMENICO, an eminent engineer and architect, born in 1543 at Mili, in the vicinity of Lake Como. At the age of twenty he joined his brother, also an architect in Rome, and in a brief period achieved a reputation sufficiently brilliant to attract the notice of the magnificent Cardinal Montalto, to whom he was appointed private architect. The pomp of this cardinal seems to have given umbrage to Pope Gregory XII., who, in consequence, discontinued the cardinal's private pensions, and thus disabled him from completing the splendid works he had intrusted to F.—viz., the Sistine Chapel in Santa Maria Maggiore, and an adjoining palace. In this emergency, the spirited architect, out of his own funds, carried on the noble designs of his patron, on the same scale of magnificence in which they were commenced, and for his disinterested devotion received later ample reward, when the cardinal, under the name of Sixtus V., was called to the papal chair. F., as papal architect, was employed in a variety of important works, amongst which stands conspicuously the wonderful removal and re-erection of the colossal Egyptian obelisk, to be seen now in the piazza of St. Peter's. He afterwards erected several other obelisks, and was intrusted by Sixtus with the construction of the Lateran Palace, and of the famous Vatican Library.

The restoration of the columns of Trajan and Antoninus, and the construction of the aqueduct known as the *Aqua Felice*, deserve mention amongst the many works of utility executed by Fontana. On the death of his friend and patron, Pope Sixtus, F., through the intrigues of invidious enemies, was stripped of his post as papal architect in 1592, but was immediately proffered a similar appointment in the name of the king of Naples. During his sojourn in Naples, he executed many imposing designs; the royal palace, and a noble promenade along the bay, being amongst the chief. His conception of a grander harbor was carried into effect by others, his death, in 1607, at Naples, preventing his personal superintendence benefiting the undertaking. F.'s son, Giuglio Cesare, heir to his father's great wealth, and some of his genius, was appointed royal architect on his decease.

FONTANA, FELICE, a celebrated physiologist, born at Pomarolo, in the Italian Tyrol, in 1730. At the termination of an elaborate course of study, carried on in the several universities of Verona, Parma, Padua, and Bologna, he was presented to the chair of philosophy in the university of Pisa by Francis I., Grand Duke of Tuscany. Leopold, on succeeding his father, appointed F. court physiologist, and charged him with the organization of a museum of natural history and physiology, which to this day is one of the scientific marvels of Florence. It comprises a superb collection of the phenomena of the animal, vegetable, and mineral kingdoms, besides an exquisitely elaborate series of wax models, representing the human body as a whole, and each minute separate organ. A similar collection was executed by F. for the museum of Vienna, by order of the Emperor Joseph II. He died 9th March 1803. F.'s chief writings consist of scientific considerations on the various phenomena of physical irritability, *Ricerche, Filosofiche sopra la Fisica Animale* (Florence, 1781), and *Dei Moti dell' Iride* (Lucca, 1765).

FONTANES, LOUIS, MARQUIS DE, was born 6th March 1757, at Niort, and was sprung from an old Protestant family of Languedoc. After the completion of his studies, he went to Paris, where he acquired a reputation by his poems, *Le Cri de mon Cœur* (Paris, 1778), and *Le Verger* (Paris, 1778), as also by his metrical translation of Pope's *Essay on Man*, and his imitation of Gray's *Elegy written in a Country Churchyard*. During the Revolution, F. conducted various journals in the popular interest. In 1802, he was made a member, and in 1804 president of the legislative body. His admiration of Napoleon was great; and his splendid oratorical talents were often employed in eulogizing the emperor's acts. Even when Napoleon was only consul, F. had ir-

ritated the republican party by speaking of the French people as *sujets* (subjects). In 1810, he entered the senate. After the fall of Napoleon, he passed into the service of the restored Bourbons, and was raised to the peerage by Louis XVIII. He died 17th March, 1821. His various writings, prose and poetic, have been collected and edited by Sainte-Beuve (2 vols., Paris, 1837), and are regarded as models of elegance and correctness.

FONTENAY-LE-COMTE, or FONTENAY-VEKDÉE, a town of France, in the department of Vendée, is situated in a pleasant valley on the right bank of the Vendée, 27 miles north-east of La Rochelle. The streets of the older portion of the town are narrow and tortuous. Its chief buildings are the beautiful Gothic church of Notre Dame, with a spire 311 feet high; the college, the theater, and the fountain from which the town is said to have derived its name. F. has linen manufactures, tanneries, and a trade in timber, and is an entrepôt for the victuals and commodities of the south. Pop. in 1876, 7369.

FONTENELLE, BERNARD LE BOYER DE, an eminent French author, was born at Rouen, 11th February 1657. His father was an advocate, and his mother a sister of the great Corneille. He began his studies in the college of the Jesuits at Rouen, and at the age of 13, obtained the prize for a Latin poem. During the next three years he professed to study law, but in reality busied himself with the more interesting subjects of history, poetry, and philosophy. After passing as an advocate, he commenced to practise, but lost the first cause which he conducted, and in consequence renounced the bar for ever. In 1674, he went to Paris, where he entered upon a literary career, and soon attained to celebrity and independence. He was a member of several learned societies; and from 1699 to 1741, held the office of Secretary of the Académie des Sciences, but declined the post of president. F. died at Paris 9th January 1757, having nearly finished his 100th year, wittily remarking to his friends, as he expired: 'Je ne souffre pas, mes amis; mais je sens une certaine difficulté d'être' ('I don't suffer, my friends; but I feel a sort of difficulty in living any longer'). The greater part of his numerous poetical, historical, oratorical, philosophical, and scientific writings, though much admired at the time of their publication, have now fallen into oblivion. He possessed, however, along with great skill in representation, a poetical turn of mind, and an acute intellect. He wrote a few operas, among others, *Psyché*, *Bellerophon*; a musical and dramatic pastoral entitled *Endymion*; several tragedies—*Brutus*, *Aspar*, *Idalie*; comedies, fables, fugitive pieces, epigrams, &c. Of his prose writings, we may mention the *Lettres du Chevalier d'Her*, the *Dialogues des Morts*, in the manner of Lucien; his *Entretiens sur la Pluralité des Mondes*, which, although much read once, has now become obsolete, in consequence of the advancement of science; and his treatises *Sur l'Existence de Dieu*, *Sur le Bonheur*, *Sur l'Origine des Fables*; and his *Histoire du Théâtre Français jusqu'à Pierre Corneille*, which is still consulted. F. was particularly celebrated for his *bon-mots*; and for the manner in which he edited the *Mémoires de l'Académie des Sciences*, and executed his *Eloges*. It is also perhaps worth mentioning, that at the age of 92 he still wrote madrigals! His *Œuvres Complètes* have been republished several times. The most complete edition is that published at Paris (3 vols. 1818).

FONTENOY, a village of Belgium, in the province of Hainaut, 5 miles south-west of Tornay, with a population of about 800, deserves mention as the scene of the battle of Fontenoy, one of the most famous contests in the war of the Austrian Succession. The battle was fought 11th May 1745, the opposing forces being the French, 60,000 strong, under Marshal Saxe, and the allies (English, Dutch, and Austrians), in nearly equal force, under the Duke of Cumberland. After a hard-fought fight, the allies were forced to retreat. The loss on both sides was stated at about 7000 men.

FONTEVRAULT (*Fons Ebrauld*), a small town of France, in the department of Maine-et-Loire, 8 miles south-east of Saumur, with a population of (1876) 2651, owes its origin to a wealthy and celebrated abbey, now converted into a prison for eleven departments. This abbey was founded by Robert d'Arrissel, a Breton monk, in 1099, as the residence of a monastic society composed of penitents of both sexes. This society took the name of the *Order of Fontevrault*. It followed the austere rule of Benedict, but had this peculiarity, that the monks were ruled by an abbess, and not by an abbot. The order of F. soon spread through France, and into Spain, and in the former country especially acquired great riches. The abbesses of F. belonged for the most part, to illustrious families, and were subject only to the popes. At a later period, the strictness of the monastic discipline was relaxed in favor of the nuns, whence, however, in the 14th c., sprung great disorders. Gradually, the order of F. fell into disrespect, but even at the outbreak of the French Revolution it possessed 57 priories in France, which, however, were then abolished along with the other monasteries. The town is of peculiar interest to Englishmen, from the fact that it contains the cemetery of several of the Plantagenet kings of England and of the counts of Anjou. Of these, however,

only the tombs of Henry II., of his queen Eleanor of Guienne, of Cœur-de-Lion, and of Isabella, the queen of John, have been preserved. The old monastic buildings and court-yards, surrounded by walls, and covering from forty to fifty acres, now form one of the larger prisons of France, in which about 2000 men and boys are confined, and kept at industrial occupations. See an account of this prison in *Chambers's Edinburgh Journal*, 2d series, vol. i. p. 104.

FONTINALIS, a genus of Mosses, allied to *Hypnum*, but having the fruit in the bosom of the leaves, almost without stalk. Several species are British; one of which, the Greater Water-moss (*F. antipyretica*), growing upon rocks and roots of trees in brooks and ponds, is remarkable for the difficulty with which it burns, even when completely dried; on which account it is used in some parts of the north of Europe for lining chimneys, to protect the adjacent wood-work from fire. Its shoots are a foot or more in length, and branched; they float in the water. The fruit is on the sides of the stems.

FOO-CHOO-FOO. See **FU-CHOW-FOO**.

FOOD. The food of man is derived entirely from the vegetable and animal kingdom.

Of animals used for food by man, the catalogue is very large. Savages, impelled by hunger, and unrestrained by any of those opposing considerations which are always powerful to civilized man, eagerly devour almost every animal on which they can lay their hands, vertebrate or invertebrate, and whether in a fresh state or far gone in putrefaction.

There is no vertebrate animal of which the flesh is known to be poisonous or positively unwholesome, except some species of fish chiefly found in tropical seas. Of vertebrate animals, every class—Mammals, Birds, Reptiles, and Fishes—affords common and much esteemed articles of food. Of mammals, those principally used for this purpose are the herbivorous quadrupeds, and most of all the ruminants, of some of which the milk also is much employed. The flesh of some of the pachyderms is also used, particularly that of the hog; and that of some of the rodents, as the hare, rabbit, capybara, &c.—although the idea of eating others of the rodents, as mice and rats, would be rejected with disgust by all except savages. The flesh of monkeys is eaten in some parts of the world, although a strong aversion to it is more generally entertained, at least by civilized nations, probably on the ground of the animal's resemblance to the human form; for travelers who have been compelled to eat monkey-flesh, declare it to be very good. The flesh of whales and other ordinary Cetacea is scarcely used except by rude tribes; although that of porpoises was formerly in great request in England, especially during Lent, the porpoise passing for a fish. The flesh of the herbivorous Cetacea, as the manati and dugong of tropical seas, is esteemed. The flesh of some of the herbivorous marsupial quadrupeds, as the kangaroo, is eaten; but that of the carnivorous marsupials and of carnivorous quadrupeds generally is rejected.

The same general remark applies to birds: the flesh of birds of prey is rank, coarse, and unfit for human food; but that of almost all birds which feed on leaves, seeds, and other vegetable substances, or on insects, worms, molluscs, &c., is good for eating. Web-footed birds, particularly the *Anatide*, and gallinaceous birds (including pigeons), are more extensively used than any others; but birds of other orders are also eaten; and some of the small *Insectivores*, as ortolans, bec-fins, larks, &c., are brought to market as delicacies.—Of reptiles, one order—that of Ophidian reptiles, or serpents—affords food only to savages; but some of the Chelonian reptiles—turtles—are in high esteem; the Batrachian order contains the frogs, which find a place on the most luxurious tables in some countries of Europe; and to the Saurian order, or lizard-like reptiles, belong species—as the iguanas of South America, creatures of sufficiently uncouth appearance—which, however disgusting to British readers in general may be the thought of eating them, many of their countrymen have learned to esteem as a delicacy. The eggs of turtles and iguanas are also used for food, as well as those of many kinds of birds. Of mammals, birds, and reptiles, the parts chiefly used for food are the muscles of flesh, and the fat; but other parts of some ani-

mals are also used, as the kidneys, the lungs, the livers, the stomachs of ruminants (*tripe*), the gizzards of birds, &c.—Very many kinds of fishes are excellent for food, both of cartilaginous and bony fishes; and they belong to many different families.

Of invertebrate animals, some of the molluscs are very generally used. It is unnecessary to do more than name oysters, mussels, and the snails of Italy as example. Comparatively few molluscs, however, form articles of human food. The same remark applies to crustaceans, although crabs, lobsters, cray-fish, prawns, and shrimps are well-known exceptions. It may almost be said that no articulated animals of any other class are used for food except by savages; the occasional use of locusts and of the larvae of some coleopterous insects (gru-gru worms, &c.), scarcely requiring a qualification of the statement. And of the radiated animals, the same general statement may be made; the *Bêche-de-mer*, or *Trepang*—of which, however, the use is almost confined to the Chinese—being the only considerable exception.

Honey, although collected and modified by insects, is rather a product of the vegetable than of the animal kingdom. The same remark applies to a very different substance, the sea-weed gelatine of which certain swallows of the East Indies make their edible nests.

All the great divisions of the vegetable kingdom yield food for man—the phanerogamous, however, much more largely than cryptogamous plants. Of the latter, the mosses and hepaticæ contain no species that is used for this purpose; the same may almost be said of lichens, notwithstanding the tripe-de-roche and Iceland moss; but numerous species of *Alga* and of *Fungi* are edible; and a few ferns supply unimportant articles of food. Of phanerogamous plants, it is perhaps impossible to say whether the endogenous or the exogenous are most important in this respect, notwithstanding the place of the cereal grasses among the former.

The plants yielding food are also distributed among many natural orders, although some, as *Gramineæ*, *Leguminosæ*, and *Crucifera*, contain a large number of the most useful species. The parts of plants which yield food are very various: the roots and tubers, bulbs, &c. of some; the stems of others; leaves; flowers; the fleshy part of fruits; the seed, &c. The part which man appropriates to himself is either used uncooked, or requires to be cooked in order to fit it for use. Sometimes, also, other previous preparations are necessary, as the grinding of corn, &c. Except in the case of ferns, when the cryptogamous or acotyledonous plants are used for food, the whole plant is used, e. g., mushrooms, carrageen, Iceland moss. Sometimes no part of the plant is itself fit for use, but it contains some substance which is, and which man extracts by suitable processes, as in the case of arrow-root, sago, and other kinds of starch, sugar, &c.

The first place among articles of vegetable food must be assigned to corn, the seeds of the *Cerealidæ* (q. v.). The next place, perhaps, belongs to the potato and yam, after which come the banana, cassava or mandioc, and the different kinds of pulse.

Regarded more botanically, the articles of food are—

1. Roots, properly so called, of which the turnip, carrot, parsnip, beet and mangold, cocoe, or eddoes, may be mentioned as among the most important; but the number of esculent roots and of roots yielding articles of food, is very great.
2. Tubers, of which the potato, yam, and batatas or sweet-potato, are the most important; with the cassava or mandioc and the arrow-root as yielding starch; but of which many others are also used, as the melloco (*ullacus*), the oca (*oralis*), the earth-nut, &c.
3. Rhizomes, or root-stocks, of which some are simply boiled, whilst others are chiefly valued for the starch (arrow-root, &c.) which they yield.
4. Bulbs, as those of the onion, garlic, shallot, &c. The most important are alliaceous.
5. Stems, which, in some cases, are eaten along with the leaves, whether as salads or boiled vegetables; but of which some are more important as yielding sago and other kinds of starch. The eatable part of asparagus is a stem in the beginning of its growth, and the same statement applies to some other plants; the eatable part of kohlrabi is a peculiar swelling of the stem.
6. Leaves and leaf-buds, as those of kale and cabbage, with other greens of all sorts, spinach, lettuce and all the other salads; the terminal buds of palms (palm-cabbage), &c.
7. Flowers and adjoining parts, as in cauliflower and artichoke.
8. Fruit (exclusive of seeds), used either as a principal article of food, as in the case of the banana, and, to some extent, of gourds, or more generally as an article of luxury. See **FRUIT**.
9. Seeds, of which the most important are those of the cereal grasses (see **CEREALIA**), along with which must be mentioned those of buckwheat, quinoa, the lotus of the Nile and other water-lilies, the nelumbo, the water-chestnut and other species of *Trapa*, many kinds of pulse, as peas, beans, lentils, kidney-beans, chick-peas, &c., and nuts of many kinds, some of which, as the chestnut and cocoa-nut, afford, in some countries, substantive and important articles of food, whilst the greater number are rather articles of occasional use and of luxury. There are also other seeds



Greater Water-Moss (*Fontinalis antipyretica*):

a, spore-case or capsule, divested of calyptra and lid, showing the peristome; b, spore-case, with its involucre of leaf-like scales.

which are capable of being used, and are occasionally used as food.

Sugar, which may well be reckoned among important articles of food, is obtained from the juice of stems, as of the sugar-cane, some palms, and the sugar-maple, and of roots, as of the beet, &c. Alcoholic beverages are obtained from vegetable substances and juices which contain sugar, or which, by some artificial process, are, in the first instance, converted into sugar; as the juices of fruits (the grape, apple, &c.), the juices of stems (the sugar-cane, palms, &c.), the juices of roots and tubers (beet-root, potatoes, &c.), and the seeds of the cereal plants (barley, rice, &c.).

Besides the substantive articles of food, and beverages more or less generally used, there are very many condiments, which are obtained from the vegetable kingdom, and of which the botanical sources are almost equal various, as mustard, pepper, ginger, cloves, capers, &c.

FOOD AND DRINK. Although nearly sixty elementary substances are known to chemists, only a comparatively small number of these take part in the formation of man and other animals; and it is only this small number of constituents which are essential elements of our food. These elements are carbon, hydrogen, nitrogen, oxygen, phosphorus, sulphur, chlorine, sodium, potassium, calcium, magnesium, iron, and fluorine.

Carbon, hydrogen, nitrogen, and oxygen are supplied to the system by the albuminous group of alimentary principles (see DIET)—viz., albumen, fibrine, and caseine, which occur both in the animal and vegetable kingdoms, and the gluten contained in vegetables. Animal flesh, eggs, milk, corn, and many other vegetable products contain one or more of these principles. The gelatinous group also introduces the same elements into the system, when such substances as preparations of isinglass, calves' feet, &c., are taken as food. Carbon, hydrogen, and oxygen are abundantly introduced into the system in the form of sugar, starch (which occurs in large quantity in the cereal grains, leguminous seeds, roots, tubers, &c., used as food), and organic acids (which, as citric, malic, tartaric acid, &c., occur in numerous vegetables employed as food). Carbon with a little hydrogen and oxygen occurs abundantly in the oleaginous group of alimentary principles, as, for instance, in all the fat, suet, butter, and oil that we eat; in the oily seeds, as nuts, walnuts, cocoa-nuts, &c.; and in fatty foods, as liver, brain, &c. Phosphorus is supplied to us by the flesh, blood, and bones used as food (the flesh of fishes is especially rich in phosphoric matter), and in the form of various phosphates, it is a constituent of many of the vegetables used as food.

The system derives its sulphur from the fibrine of flesh, the albumen of eggs, and the caseine of milk, from the vegetable fibrine of corn, &c., from the vegetable albumen of turnips, cauliflower, asparagus, &c., and from the vegetable caseine of peas and beans. Most of the culinary vegetables contain it, especially the *Cruciferae*. Chlorine and sodium, in the form of chloride of sodium, are more or less abundantly contained in all varieties of animal food, and are taken separately as common salt. Potassium is a constituent of both animal and vegetable food: it occurs in considerable quantity in milk, and in the juice that permeates animal flesh; and most inland plants contain it. We derive the calcium of our system from flesh, bones, eggs, milk, &c. (all of which contain salts of lime); most vegetables also contain lime-salts; and another source of our calcium is common water, which usually contains both bicarbonate and sulphate of lime. Magnesium in small quantity is generally found in those foods that contain calcium. Iron is a constituent of the blood found in meat; and it occurs in smaller quantity in milk, in the yoke of egg, and in the bones and teeth. This small quantity is accounted for by the traces of fluorine found by Dr. George Wilson in milk, blood, &c.

These simple bodies are not, however, capable of being assimilated and converted into tissue; they must be previously combined, and this combination is primarily conducted by the vegetable kingdom. The number of combined elements varies: thus water contains only two; sugar, starch, fat, and many organic acids, contains three; caseine contains five; and fibrine and albumen contain six.

It would be impossible, and it is quite unnecessary, to mention in this article the different animals and plants that are used as food by different nations. The subject is, however, an interesting one, and those who wish to study it may be referred to Moleschott's *Physiologie der Nahrungsmittel*, 1850, and especially to Reich's *Nahrungs- und Genussmittelkunde* (1860—1861), which is the most learned and elaborate work on the subject in any language.

DRINKS are merely liquid foods. They all pertain to the aqueous group noticed in the article DIET. They are arranged by Pereira in his *Treatise on Food and Diet* in the six following orders:

1. Mucilaginous, farinaceous, or saccharine drinks—as toast-

water, barley-water, gruel, &c. They are very slightly nutritive, and differ but little from common water.

2. Aromatic or astringent drinks—as tea, coffee, chocolate, and cocoa. The action of the first two is noticed in the article DIET. The last two drinks contain a considerable quantity of oil and starch.

3. Acidulous drinks—as lemonade, ginger-beer, raspberry-vinegar water, &c. They allay thirst both by the acid which they contain and the water, and form cooling antiscorbutic drinks.

4. Drinks containing gelatine and osmazome—the broths and soups. These, if properly prepared, should contain all the soluble constituents of their ingredients.

5. Emulsive or milky drinks—as animal milk, the milk of the cocoa-nut, and almond milk, a drink prepared from sweet almonds. Animal milk contains all the essential ingredients of food; the others are slightly nutritive.

6. Alcoholic and other intoxicating drinks—including malt liquor or beer in its various forms of ale, stout, and porter; wines; spirits in their various forms of brandy, rum, gin, whisky, &c.

'Considered dietetically,' says Pereira, 'beer possesses a three-fold property: it quenches thirst; it stimulates, cheers, and, if taken in sufficient quantity, intoxicates; and lastly, it nourishes or strengthens. The power of appeasing thirst depends on the aqueous ingredient which it contains, assisted somewhat by its acidulous constituents (carbonic and acetic acid); its stimulating, cheering, or intoxicating power is derived either wholly or principally from the alcohol which it contains (from 2 to 3 per cent.); lastly, its nutritive or strengthening quality is derived from the sugar, dextrine, and similar substances contained in it; moreover, the bitter principle of hops confers on beer tonic properties. From these combined qualities, beer proves a refreshing and salubrious drink (if taken in moderation), and an agreeable and valuable stimulus and support to those who have to undergo much bodily fatigue.'

Wine is our most valuable restorative when the powers of the body and mind have been overtaxed; but as the most perfect health is compatible with total abstinence from it, no possible benefit can accrue to a healthy person from commencing its use. The uses of wine as a tonic during convalescence after lingering diseases, and of either wine or spirits in some acute diseases (fevers, &c.), are too well known to require notice.

The action of spirituous drinks has been noticed in the article DIET, and will be further discussed in the article TEMPERANCE.

We shall conclude this part of the subject with a word or two on the condiments or seasoning agents which are taken with foods for the purpose of improving their flavor. Excluding salt, which must be considered as a saline alimentary principle, the most common condiments, such as mustard, capsicum (Cayenne pepper), pepper, the various spices, &c., owe their action to the presence of a volatile oil. Sauces are usually fluid mixtures of these condiments with alimentary substances. In a healthy state, condiments and sauces afford little or no nutrition; and although for a time they may stimulate a debilitated stomach to increased action, their continual use never fails to induce a subsequent increased weakness of that organ. Salt and vinegar are the only exceptions. When used in moderation, they assist in digestion; vinegar, by rendering muscular fibre more fluid; and both together, by producing, as Dr. Beaumont believes, a fluid having some analogy to the gastric juice (*Experiments and Observations on the Gastric Juice and the Physiology of Digestion*, p. 40, Edin. 1838).

The cookery of foods, although partially noticed in the articles BOILING, BROILING, COOKERY, DIET, &c., requires some general consideration in the present place.

All foods possessing an organized structure, as animal flesh and amylaceous substances, require to be cooked before being eaten, the only exceptions being the oyster and some ripe fruits. The processes of salting, pickling, and smoking harden the animal textures, and, as we shall presently see (at all events in the case of salting), induce chemical changes which render the meat less nutritious.

The ordinary operations of cookery are boiling, roasting, broiling, baking, and frying.

In the case of vegetables, boiling effects the solution of gummy and saccharine matters, the rupture and partial solution of starch grains, the coagulation of albuminous liquids, and the more or less complete expulsion of volatile oil. In the boiling of flesh, there takes place a more or less perfect separation of the soluble from the insoluble constituents, according to the duration of the boiling, the amount of water employed, and its temperature at the commencement of the operation. If we wish the boiled meat to contain the largest amount of nourishing matter, and disregard the soup or broth that is simultaneously formed, we introduce it into the boiler when the water is in a state of brisk ebullition. We keep up this boiling for a few minutes, in order to coagulate

the albumen near the surface, and thus to convert it into a crust or shell, which equally prevents the entrance of water into the interior, and the escape of the juice and soluble constituents of the flesh into the water. If cold water is then added, so as to reduce the temperature to about 160°, and this temperature is kept up for the necessary time—for which, in reference to the weight of the meat, see the article **BOILING**—all the conditions are, according to Liebig, united which give to the flesh the quality best adapted to its use as food.

If, on the other hand, we wish to obtain good soup from meat, we should place it in cold water, and bring this *very gradually* to the boiling-point. The interchange between the juices of the flesh and the external water, which was prevented by the former process, here takes place without hindrance. 'The soluble and sapid constituents of the flesh are dissolved in the water, and the water penetrates into the interior of the mass, which it extracts more or less completely. The flesh loses, while the soup gains, in sapid matters; and by the separation of albumen, which is commonly removed by skimming, as it rises to the surface of the water, when coagulated, the meat loses its tenderness, and becomes tough and hard; and if eaten without the soup, it not only loses much of its nutritive properties, but also of its digestibility.'—Liebig's *Researches on the Chemistry of Food*, p. 128.

Roasting is applied much more to meat than to vegetables. Both in roasting and broiling meat, the first application of heat should be considerable and rapid, so as to form an outer coating of coagulated albumen (just as in boiling), which retains the nutritive matters within the cooked meat. In roasted meat, nothing is removed but some of the superficial fat and the gravy, which is itself an article of food. The effect of roasting on such vegetables as apples and potatoes is to render them more nutritive and digestible than they would be in the raw state, by splitting their starch grains, and rendering them more soluble.

Baking (q. v.) acts in the same manner as roasting, but meat thus cooked is less wholesome, in consequence of its being more impregnated with empyreumatic oil.

Frying is the most objectionable of all kinds of cookery. In this operation, heat is usually applied by the intermedium of boiling fat or oil. Various products of the decomposition of the fat are set free, which are very obnoxious to the stomachs of invalids.

Liebig has shown that salted meat is, in so far as nutrition is concerned, in much the same state as meat from which good soup has been made. After flesh has been rubbed and sprinkled with dry salt, a brine is formed amounting in bulk to one-third of the fluid contained in the raw flesh. This brine is found to contain a large quantity of albumen, soluble phosphates, lactic acid, potash, creatine, and creatinine—substances which are essential to the constitution of the flesh, which therefore loses in nutritive value in proportion to their abstraction.

The preservation of food requires some notice. Three methods—viz., preservation by cold, preservation by the exclusion of air, and preservation by salting—are noticed in the article **ANTISEPTICS**. The first is only of comparatively limited application: the second, known as Appert's method, has been successfully used in the English navy for many years; the chief objection to it is its expense: the third method injures, as we have already seen, the character of the meat, and renders it both deficient in nutritive materials, and actually injurious if it forms a principal and continuous article of diet. To these methods we must add preservation by smoking, preservation with sugar, and with vinegar, and preservation by drying. It is well known that meat suspended in smoke loses its tendency to putrefy, the substance from which the smoke derives its antiseptic property being creasote, or some allied body. Smoked meat acquires a peculiar taste, a dark color, and a somewhat hard consistence; but it retains all its nutritive constituents, and is thus preferable to salted meat. Sugar and vinegar are chiefly employed in the preservation of vegetable products. The most important mode of preserving articles of food, whether animal or vegetable, is by direct drying. Meat is cut up into small slices about a quarter of an inch thick, and vegetables into smaller pieces; they are steamed at a high temperature, so as to coagulate the albumen; and they are then completely desiccated by exposure to a current of very hot dry air. At the conclusion of the process, the slices of meat are quite hard, and present a shrivelled appearance. Dr. Marcet (*On the Composition of Food*, 1856, p. 174) speaks in high terms of this method, which he had himself seen in operation in Paris. 'Food thus preserved,' he says, 'whether it be animal or vegetable, has the advantage (1) of remaining in a fresh condition, though freely exposed to the atmosphere for a great number of years, and (2) of being reduced to one-fifth of its original bulk from its having lost all its water.' He adds, that the preserved vegetables resume their bulk when boiled in water, and that they so completely retain their aroma, that it is often difficult to distinguish between soups made with them, and others prepared with fresh vegetables.

The adulteration of food of almost every kind is unfortunately so common a custom, that our limited space will merely allow of our noticing a few of the leading points in regard to it.

Wheat-flour is not unfrequently adulterated with one or more of the following substances—flour of beans, Indian corn, rye, or rice, potato-starch, alum, chalk, carbonate of magnesia, bone-dust, plaster of Paris, sand, clay, &c. The organic matters—the inferior flours and starch—do little or no serious harm; most of the inorganic matters are positively injurious, and of these, alum (one of the commonest adulterations) is the worst. The beneficial action of wheat-flour on the system is in part due to the large quantity of soluble phosphates which it contains. When alum is added, these phosphates are decomposed in the process of making bread, the phosphoric acid of the phosphates uniting with the alumina of the alum, and forming an insoluble compound; the beneficial effect of the soluble phosphates is thus lost.

Arrow-root is adulterated with potato-flour, sago, starch, &c. Out of 50 samples examined by Dr. Hassall, 22 were adulterated, and in 10 of the samples there was scarcely a particle of the genuine article.

Sugar of the inferior kinds is occasionally adulterated with flour, gum, starch-sugar, &c. It is oftener, however, impure than intentionally adulterated.

Pepper is adulterated with linseed, mustard-seed, wheat-flour, &c.

Cayenne Pepper is adulterated with red lead, vermilion, red ochre, brick-dust, common salt, turmeric, &c.

Mustard is largely adulterated with ordinary and pea flour, linseed meal, and turmeric; and a little chromate of lead is sometimes added to improve the color. Dr. Hassall submitted 42 specimens of mustard to examination; the whole of them contained wheat-flour and turmeric.

Ginger is frequently adulterated. Out of 21 samples, Dr. Hassall found 15 contained various kinds of flour, ground rice, Cayenne pepper, mustard husks, and turmeric, which in most cases formed most of the so-called ginger.

Out of 26 samples of *mixed spices*, 16 were found by Dr. Hassall to contain sago-meal, ground rice, wheat-flour, &c.

Curry powder (q. v.) was found by Dr. Hassall to be very commonly adulterated, only 7 specimens out of 26 being genuine. In 8 of the samples red lead was detected. The frequent use of curries may thus often give rise to the disease known as lead-palsy.

The adulterations of *tea*, both by the Chinese and in this country, are too numerous for us to mention. See Hassall's *Adulterations Detected*, pp. 65—104.

Coffee, in its powdered form, is not merely largely adulterated with chicory, but additionally with roasted grain, roots, saw-dust, exhausted tan (termed *croats*), coffina (the seeds of a Turkish plant), burnt sugar, and (worst of all) baked horses' and bullocks' liver. In the *Quarterly Journal of the Chemical Society* for April 1856, there is an excellent Report by Messrs. Graham, Stenhouse, and Campbell on the mode of detecting vegetable substances mixed with coffee. Even whole roasted coffee is not safe from adulteration, a patent having been actually taken out to mould chicory into the form of coffee-berries.

Cocoa and Chocolate are adulterated with flour, potato-starch, sugar, clarified mutton-suet, and various mineral substances, such as chalk, plaster of Paris, red earth, red ochre, and Venetian earth, the last three being used as coloring matters.

The adulterations of *beer*, *wine*, and *spirits* are noticed in the articles devoted to those subjects.

Vinegar is adulterated with water, sulphuric acid, burnt sugar, and sometimes with chillies, grains of paradise, and pyroligenous acid. The English law allows one part of sulphuric acid to 1000 of vinegar, with the view of preserving it from decomposition, but Dr. Hassall found that in many cases three or four times the legal amount was present. It appears from evidence taken before the parliamentary committee on adulterations, that arsenic and corrosive sublimate are no uncommon ingredients in vinegar. In connection with vinegar we may place *Pickles*. Dr. Hassall analyzed 16 different pickles for copper, and discovered that poisonous metal more or less abundantly in all of them; 'in three, in a very considerable quantity; in one, in highly deleterious amount; and in two, in poisonous amount.' Preserved fruits and vegetables (especially gooseberries, rhubarb, greengages, and olives) are often also contaminated largely with copper. In these cases, the copper, if in considerable quantity, may be easily detected by placing a piece of polished iron or steel in the suspected liquid for 24 hours, to which we previously add a few drops of nitric acid. The copper will be deposited on the iron. Or ammonia may be added to the fluid in which the pickles or fruit were lying, when, if copper is present, a blue tint is developed. We should be suspicious of all pickles, olives, preserved gooseberries, &c., with a particularly green tint.

Milk is usually believed to be liable to numerous adulterations, such as flour, chalk, mashed brains, &c. It appears, however,

from Dr. Hassall's researches on London milk, that, as a general rule, water is the only adulteration. The results of the examinations of 26 samples were, that 12 were genuine, and that 14 were adulterated, the adulteration consisting principally in the addition of water, the percentages of which varied from 10 to 50 per cent., or one-half water. In the article MILK we shall describe the means of testing the purity of this fluid.

If space permitted, we might extend the list of alimentary substances liable to adulteration to a much greater length. In conclusion, we may remark, that, as a general rule, adulterations of an organic nature, such as flours and starches of various kinds, are best detected by the microscope; while chemical analysis is usually necessary for the detection of mineral adulterations. Dr. Hassall's *Adulterations Detected* is a perfect cyclopædia on this subject. See FOOD.

FOOL. See COURT-FOOL.

FOOLS, FEAST OF. The Romans kept the festival of Saturn, in December, as a time of general license and revelry. During the brief season of the Saturnalia (q. v.), the slave reclined on his master's seat at table, the master waited upon his slave, and society, for the moment, seemed to be turned upside down. The grotesque masquerade survived the pagan creed which gave it birth, and not only kept its place among the Christians, but, in the face of solemn anathemas of fathers and councils, found its way into the ceremonial of the Christian Church. It was called, at different times and places, by many different names, but has latterly come to be best known as the Feast of Fools (*Festum Futuorum*, *Festum Stultorum*).

The circumstances of the observance were almost infinitely varied, but it was everywhere marked by the same spirit of broad boisterous drollery, and coarse but not ill-natured caricature. The donkey played such a frequent part in the pageant that it was often called the Feast of Asses (*Festum Asinorum*). In some places, the ass of Balaam was figured; in others, the ass which stood beside the manger in which the infant Saviour was laid; elsewhere, the ass on which the Virgin and Child fled to Egypt, or the ass on which Jesus rode into Jerusalem. In every instance, there was more or less attempt at dramatic representation, the theater being generally the chief church of the place, and the words and action of the drama being often ordered by its book of ceremonies. Several rituals of this sort are still preserved. That which was in use at Beauvais, in France, has a rubric ordering the priest when he dismisses the congregation to bray three times, and ordering the people to bray three times in answer. As the ass was led towards the altar, he was greeted with a hymn of nine stanzas, of which the first runs thus:

Orientis partibus,
Adventavit Asinus,
Pulcher et fortissimus,
Sarcinis aptissimus
Hé, sire Ane, hé!

[From the regions of the East—
Blessings on the bonny beast!—
Came the Donkey, stout and strong,
With our packs to pace along,
Bray, Sir Donkey, Bray.]

Where the ass did not come upon the stage, the chief point of the farce lay in the election of a mock pope, patriarch, cardinal archbishop, bishop, or abbot. These mimic dignitaries took such titles as 'Pope of Fools,' 'Archbishop of Dolts,' 'Cardinal of Numskulls,' 'Boy Bishop,' 'Patriarch of Sots,' 'Abbot of Unreason,' and the like. On the day of their election, they often took possession of the churches, and even occasionally travestied the performance of the church's highest office, the mass, in the church's holiest place, the altar. In some convents, the nuns disguised themselves in men's clothes, chanted mock services, and elected a 'little abbeys,' who for that day took the place of the real abbeys.

The Feast of Fools maintained itself in many places till the Reformation in the 16th century. At Antibes, in the south of France, it survived till the year 1644, when we have it described by an eyewitness in a letter to the philosopher Gassendi. The scene was, as usual, a church; and the actors, dressing themselves in priests' robes turned inside out, read prayers from books turned upside down, through spectacles of orange-peel, using coal or flour for incense, and a babblement of confused cries, and the mimic bellows of cattle, and grunting of pigs.

The history of the Feast of Fools has been treated in several works; the best is the *Mémoire pour servir à l'Histoire de la Fête des Fous*, by Du Tillot, published at Lausanne in 1741; reprinted at Paris in 1751, and again in the *Recueil des Cérémonies et Coutumes Religieuses de Tous les Peuples*, tome viii. (edit Prudhomme, 1809.)

FOOL'S PARSLEY (*Aethusa Cynapium*), an umbelliferous plant, very common as a weed in gardens and fields in Britain, and in most parts of Europe, somewhat resembling parsley in its foliage and general appearance, so that serious accidents have oc-

curred from its being mistaken for that herb; it being a poisonous plant, somewhat resembling hemlock in its properties. With the curled variety of parsley it cannot easily be confounded, which is even on other accounts to be preferred; and when in flower it is



1, Fool's Parsley, general umbel; 2, Common Parsley, leaf and general umbel;
a, partial umbel of fool's parsley; b, fruit of common parsley;
c, flower of common parsley.

readily known from every other plant in British gardens by its umbels wanting general involucre, and having partial involucre of three slender leaves hanging down on one side.

FOOT is the most common unit of lineal measure all over the world. It has been evidently taken originally from the length of the human foot, and as that varies in length, so does the measure; each country, and at one time each town, having a foot of its own. The three foot-measures that occur most frequently are the Paris foot, or *pied de roi*, the (German) Rhenish foot, and the English. Compared with the French *mètre* = 3 28090 feet Eng.), they stand thus:

	Metre.	Inches English.
English foot	= 0.30479	Paris foot = 12.78912
Paris "	= 0.32484	Rhenish " = 12.35652
Rhenish "	= 0.31385	

In round numbers, 46 French feet = 49 English feet, 34 Rhen. or Germ. feet = 35 English, and 57 French feet = 59 Rhen. The Russian foot is equal to the English. Almost every German state has or had a different foot. The Rhenish foot is that used in Prussia. The longest foot occurring is the old Turin foot = 20 inches English. Many local feet are only about 10 inches. The foot has almost uniformly been divided into 12 inches; the inch into 12 lines, often into tenths. The French *pied usuel* is the third part of the *mètre*. See YARD, MÈTRE.

FOOT, in Verse. See METRE, VERSE.

FOOT, STRUCTURE OF THE. In describing the structure of the foot, it is expedient to commence with a brief notice of the bones which occur in it. In man, these are 26 in number, and are arranged in three natural groups—viz., the tarsal bones, which are the hindmost; the metatarsal bones, which occupy the middle portion; and the phalanges of the toes anteriorly. The tarsal bones, seven in number, are short and thick, and form the heel and the hinder part of the instep. The uppermost (see fig. 1) is called the *astragalus*, from its supposed resemblance to the dice used by the Romans. Above, it is articulated or is jointed with the two bones of the leg, the *tibia* and *fibula*, and through these bones the whole weight of the body is thrown upon the two *astragali*. Behind, it is connected with and rests upon the *os calcis*, or heel-bone, which is the largest bone of the foot. Immediately in front of it, and supporting it in this direction, is the *scaphoid* or boat-like bone. In front of the scaphoid bone are the three *cuneiform* or wedge bones; and on the outer side of the cuneiform bones, and in front of the *os calcis*, is the *euoid* bone. We see from the figure that the front row of tarsal bones is composed of the three cuneiform bones on the inner side of the foot, and of the euoid bone externally. There are five metatarsal bones passing forward, one for each toe. Each cuneiform bone is connected with one, and the euoid bone with two, of these metatarsal bones. Behind, they are close together, but as they run forwards, they diverge slightly from one another, and their anterior ends rest upon the ground, and form the *balls* of the toes. They constitute the forepart of the instep. The remaining bones are those of the toes, and are named the *phalanges*, each toe having three of

these bones, excepting the great toe, which has only two. (A similar law holds for the bones of the hand, each finger having three phalanges, but the thumb only two.)

The instep is composed of the seven tarsal and the five metatarsal bones, which are so arranged and connected (see fig. 2) as to form an arch from the extremity of the heel-bone to the balls



Fig. 1.

The dorsal surface of the left foot.

1, the astragalus, its upper articular surface; 2, its anterior extremity, which articulates with (4) the scaphoid bone; 3, the os calcis, or heel-bone; 4, the scaphoid bone; 5, the internal cuneiform bone; 6, the middle cuneiform bone; 7, the external cuneiform bone; 8, the cuboid bone; 9, the metatarsal bone of the first and second toes; 10 and 11, the first and second phalanges of the great toe; 12, 13, 14, the first, second, and third phalanges of the second toe.

of the toes. This is called the plantar arch, from *planta*, the sole of the foot. The astragalus forms the summit or keystone of this arch, and transmits the weight which it receives posteriorly to the heel, and anteriorly to the balls of the toes. This figure exhibits the arrangement of the fibres and laminae in the interior of the bones, and shows that the greater number of them, in each bone, follow the directions of the two pillars of the arch, and thus give the greatest strength to the bones in the directions in which it is most required.

The bones, where they articulate with one another, are covered with a tolerably thick layer of highly elastic cartilage, and by this means, together with the very slight movements of which each bone is capable, a degree of elasticity is given to the foot, and con-

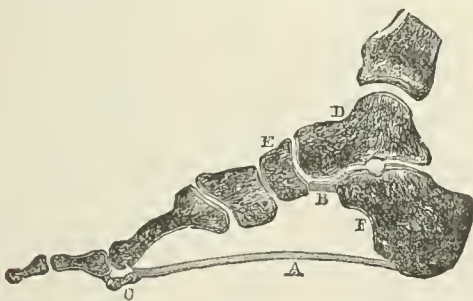


Fig. 2.*

This figure represents a section through the lower end of the tibia, and through the astragalus D, the heel-bone F, the scaphoid bone E, the internal cuneiform bone, and the bones of the great toe; A represents the plantar ligament, and B the interior calcaneo-scapoid ligament passing from the heel-bone, F, to the scaphoid, E; C is one of two small bones called sesamoid bones, usually found at the ball of the great toe. The lines show the disposition of the laminae or plates of which the various bones are composed. The clear line along the contiguous edges of the bones represents the cartilage.

sequently to the step, which would be altogether wanting if the plantar arch were composed of one single mass of bone. This elasticity is far greater in the anterior pillar of the arch, which is composed of five comparatively long bones sloping gradually to the ground, than in the posterior pillar, which is short, narrow, and composed of a single bone, which descends almost vertically from the ankle to the ground. Hence, in jumping from a height, we always endeavor to alight upon the balls of the toes, and thus

break the shock which we should feel if, by accident, we descended upon the heels.

A reference to any standard work on anatomy (see, for example, Gray's *Anatomy*, pp. 178—184) will show that the ligaments which unite these bones to one another, and by which the movements of each bone upon the others are limited, are very numerous. We shall merely notice two of these ligaments, selecting those whose action is especially obvious in maintaining the shape of the plantar arch. One, the *plantar ligament* (A, fig. 2), of great strength, passes from the under surface of the heel-bone near its extremity, forwards to the ends of the metatarsal bones, according to Dr. Humphry (*The Human Foot and the Human Hand*, 1861, p. 25). Most anatomists do not trace it quite so far forwards. 'In other words' (we quote from Dr. Humphry's volume), 'it extends between the lowest points of the two pillars of the arch, girding or holding them in their places, and preventing their being thrust asunder when pressure is made upon the key-bone (D), just as the "tie-beam" of a roof resists the tendency to outward yielding of the sides when weight is laid upon the summit.

The ligament, however, has an advantage which no tie-beam can ever possess, inasmuch as a quantity of muscular fibres are attached along the hinder part of its upper surface. These instantly respond to any demand that is made upon them, being thrown into contraction directly the foot touches the ground; and the force of their contraction is proportionate to the degree of pressure which is made upon the foot. In addition to its office of binding the bones in their places, the ligament serves the further purpose of protecting from pressure the tender structures—the blood-vessels, nerves, and muscles—that lie above it in the hollow of the foot. Another very strong ligament (B, in the figure) passes from the under and fore part of the heel-bone (F) to the under parts of the scaphoid bone (E). It underlies and supports the round head of the astragalus, and has to bear a great deal of the weight which is transmitted from that bone to the leg. It possesses a quality which the ligament just described, and most ligaments have not—viz., elasticity. This is very important, for it allows the head of the keybone (D) to descend a little, when pressure is made upon it, and forces it up again when the pressure is removed, and so gives very material assistance to the other provisions for preventing jars, and for giving ease and elasticity to the step.'—Humphry, *op. cit.*, pp. 25, 26.

The spot over which the ligament B extends is the weakest in the foot, the astragalus being there unsupported by any bones; additional support is, however, afforded when it is most required by the tendon of a strong muscle, the *posterior tibial* (fig. 3, B), which passes from the back of the tibia (the chief bone of the leg) round the inner ankle, to be inserted into the lower part of the inner surface of the scaphoid bone. It not unfrequently happens that the astragalus, being either insufficiently supported, or from its being overweighted, descends slightly below its proper level, causing a lowering of the arch, and a flattening of the sole of the foot. The defect, when slight, is known as 'weak ankle;' when more decided, it is termed 'flat-foot;' and in extreme cases, the bone may descend to such an extent as even to render the inner side of the foot convex, when it naturally should be concave.

The deformity of which we are speaking is of such great practical importance, that we shall add a few words about its most common causes.

There are two periods of life at which *flat-foot* is especially liable to occur: 1st, in infancy, if the child be put upon its feet before the bones and ligaments—especially the latter—are strong enough to bear its weight; and 2dly, about the age of fourteen—a period at which growth is very quick, and the body consequently attains a considerable and rapid augmentation of weight. If young persons of this age are obliged to be a great deal on their feet, and perhaps additionally to carry weights (as, for example, butchers' and bakers' boys, and young nursemaids), the chances that flat-foot will occur are increased.

We now come to the movements of the foot upon the leg. We see here a striking combination of variety of movement with general security. This combination is effected by the harmonious action of three joints, each of which acts in a direction different from the others.

The first of these joints is the ankle-joint, which is formed by the bones of the leg—the tibia and fibula—above, and the astragalus below. By this joint, the foot is bent or straightened on the leg. The second joint is between the astragalus and the heel-bone, and it permits the foot to be rolled inwards and outwards; while the third joint is between the first and second row of tarsal bones—namely, between the astragalus and heel-bone behind, and the scaphoid and cuboid bones in front, and allows the degree of curvature of the plantar arch to be increased or diminished within certain limits. The following is the order in which the movements of these three joints occur: the raising of the *heel* (by the first joint) is accompanied by a rolling of the foot *inwards* (by the second joint), and by an increased *flexure* of the plantar arch (by the third joint); and the raising of the *toes* is accompanied by a

* This, and several of the following diagrams, have been copied, with Dr. Humphry's permission, from *The Human Foot and the Human Hand*.

rolling of the foot *outwards* and a *straightening* of the sole. See Humphry, *op. cit.*, p. 42.

The joints, however, merely allow of movements; they do not effect them: this is the special function of the muscles; and each of the three movements we have indicated is effected by special groups of muscles. The first series of movements is mainly ef-

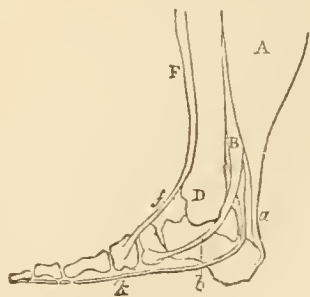


Fig. 3.

This figure represents some of the muscles and tendons seen on the inner side of the leg and foot.

A, the gastrocnemius and soleus muscles, forming the muscles of the calf; *a*, the Tendo Achillis; B, the posterior tibial muscle; *b*, its tendon; D, the inner ankle; F, the anterior tibial muscle, attached above to the front of the tibia, below to the internal cuneiform bone; *k*, the flexor tendon of the great toe.

ected by three muscles: viz., (1) the *muscles of the calf* (fig. 3, A), attached above to the bones of the thigh and leg, and below by the *Tendo Achillis* to the heel-bone; (2) the *posterior tibial* (fig. 3, B), attached above to the tibia, and below by its tendon to the scaphoid bone, and (3) the *short fibular* (fig. 4, C), attached above

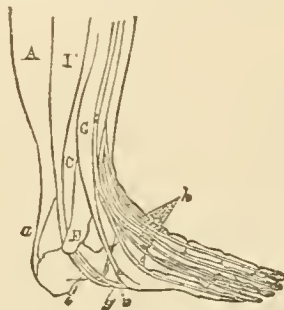


Fig. 4.

This figure represents some of the muscles and tendons on the outer side of the leg and foot.

E, lower end of fibula, forming the outer ankle; C, the short fibular muscle, attached above to the fibula, and below by its tendon (*c*) to the outer metatarsal bone; I, the long fibular muscle, its tendon (*i*) running behind the outer ankle and under the instep to the metatarsal bone of the great toe; B, the anterior or third fibular muscle, attached above to the fibula and below by its tendon (*g*) to the outer metatarsal bone; *h*, the extensor tendons of the toes.

to the fibula, and below by its tendon to the outer metatarsal bone.

The calf-muscles, whose tendon is inserted into the heel-bone, are large and very powerful, for in raising the heel, they have to raise the weight of the body. The other two muscles, the posterior tibial and the short fibular, turn round the inner and the outer ankle respectively, and are inserted into the inner and the outer edges of the instep; the former being attached to the scaphoid, and the latter to the outer metatarsal bone. They not only assist to raise the ankle, but support it laterally. The muscle whose tendon is on the inner side of the foot (the posterior tibial), effects the two movements which are associated with the raising of the heel-bone, namely, the turning of the foot inwards, and the increased flexure of the arch.

The second series of movements—the raising of the toes, the turning of the foot outwards, and the straightening of the sole—are effected by two muscles, the *anterior tibial* (fig. 3, F) and the *third fibular* (fig. 4, G), whose tendons pass, one in front of the inner ankle, and the other in front of the outer ankle, to the corresponding edges of the instep, and are inserted into the internal cuneiform and the outer metatarsal bones. These muscles are direct flexors of the tarsus upon the leg; the former raising the inner, and the latter the outer border of the foot.

Another point in the anatomy of the foot that requires notice, is the mode of union of the metatarsal with the tarsal bones. In these joints in the fourth and fifth toes a slight revolving motion can take place, which probably enables the outer metatarsals to adapt themselves to inequalities of the ground, and to equalize the distribution of the weight which is thrown upon the foot; while, in the corresponding joints of the three inner toes, scarcely any motion can occur—a provision by which additional strength

is given to the inner side of the foot upon which the weight of the body most directly falls.

The skin of the sole is very tough and strong; and intervening between it and the bones and long plantar ligament is a thick pad of fat, which acts the part of an air or water cushion in defending the adjacent parts from injurious pressure, and in deadening the jars and shocks that would otherwise be felt in leaping, &c.

A few remarks on the subject of shoes may here be added. The shape of the sole of the natural foot is shown in fig. 5, while the shape after the prolonged use of a badly made shoe is given in

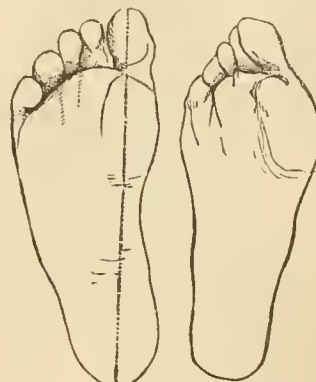


Fig. 5.

Fig. 6.

fig. 6. In the foot in its normal state, the great toe is seen to be free from the others, and the line of its axis prolonged backwards, passes through the center of the heel; while in the foot distorted by the use of the shoe, the line of the great toe is quite altered, and the toes generally—not being able to find room side by side—overlap each other, and lose their separate and individual actions; corns, bunions, and ingrowing toe-nails being the natural consequence of this maltreatment.

Professor Meyer of Zurich, has drawn attention to the bad treatment which the foot receives from ordinary shoemakers, in a pamphlet, translated by Mr. Craig, and entitled *Why the Shoe Pinches; a Contribution to Applied Anatomy*. He especially points



Fig. 7.

A shoe designed by Dr. Meyer, the dotted outline being the usual shape.



Fig. 8.

Foot of Gorilla.

out that the great toe should be allowed to have its normal position, and this can be done by making the inner edge of the sole incline inwards, instead of outwards, from the balls of the toes. The accompanying figure (7) gives the outline of a shoe designed under Dr. Meyer's superintendence, and shows the difference between it and the usual shape, the latter being indicated by the dotted outline. Dr. Humphry, from whose admirable work we have drawn much of this article, while fully according in Meyer's views, additionally protests against high heel-pieces, as tending to make the step less steady and secure, to shorten it, and to impair the action of the calf-muscles; a high heel-piece, moreover, places the forepart of the foot at a lower level than the heel; the weight is thus thrown too much in the direction of the toes, and they are thrust forwards and cramped against the upper leather of the shoe.

The subjects of WALKING, RUNNING, and JUMPING are noticed in the article GYMNASTICS.

If we compare the human foot with the feet of other mammals, we find that it presents certain peculiarities, all of which have reference to man's erect posture. The chief peculiarities are—1.

The great relative size of the tarsal bones, as compared with the other bones of the foot, and the more perfect formation of the plantar arch, which is higher and stronger than in any of the lower animals. Strength and elasticity are thus combined in the human foot in the highest degree. 2. The great toe is remarkable in man for its size and strength, and for the firm manner in which its metatarsal bone is joined to the other bones, so as to render it the main support to the foot. 3. If we compare the human foot with that of the gorilla, or any other anthropomorphous ape, we see that the toes are short and small in man in relation to the other parts of the foot, while in the gorilla the toes form the greater part of the foot. Indeed, a reference to fig. 8 shows that in this animal (and the same is the case in all the genera of apes and monkeys), the organ in question is rather a *hand* than a *foot*, and hence the term *quadrumanous*, as applied to this class of animals.

There is scarcely any plantar arch, and the weight of the body bears chiefly on the inner edge of the foot; the digits are long and strong, and the inner one diverges so as to form a thumb rather than a great toe.

It remains to notice some of the most marked varieties of form which the bones of the foot present in mammals. In the following group of figures, the same letters are attached to the same bones. Thus, *a* marks the astragalus; *cl*, the calcaneum or heel-bone (the posterior projection of which forms the hock of the horse); *s*, the scaphoid; *b*, the cuboid; *ce*, the ecto-, or outer, *cm*, the meso-, or middle, and *ci*, the ento-, or internal cuneiform.



Fig. 9.—Horse.



Fig. 10.—Ox.

Fig. 11.
Rhinoceros.Fig. 12.
Hippopotamus.Fig. 13.
Elephant.

Now, as a general rule in all mammalia, the ecto-cuneiform supports the third or middle of the five toes when they are all present, the meso-cuneiform the second, and the cuboid the fourth and fifth. Bearing in mind this law, we see that the large bone in the horse, known as the cannon-bone, which is articulated to the ecto-cuneiform, *ce*, is the metatarsal of the third toe, to which are articulated the three phalanges of that toe, the last phalanx, 3, being expanded to form the hoof.

The small bone,* popularly known as the splint-bone, and articulated to the meso-cuneiform, is the rudimentary or stunted metatarsal of the second toe, 2; and the other splint-bone articulated to the cuboid, is the rudimentary metatarsal of the fourth toe, 4; so that in the horse we have only one toe, the third, sufficiently developed to reach the ground, with mere traces of a second and fourth toe on either side.

In the foot of the ox, the cuboid *b*, is relatively larger than in the horse, and is equal in size to the ecto-cuneiform, *ce*. The cannon-bone articulates with both these tarsal bones, and hence

* The bone is not shown in the figure.

answers to the metatarsal bones of both the *third* and *fourth* digits; it is accordingly found to consist of two distinct bones in the fetus; and in the adult it is divided internally into two cavities, and its original separation is marked out by an external elongated ridge. At the lower end are two distinct joints for the phalanges of the third and fourth toes. While in the horse we had the rudiments of the *upper* parts of two toes (the second and fourth), in the ox we have the rudiments of the *lower* parts or phalanges of two toes (the second and fifth), forming the 'spurious hoofs,' and marked 2 and 5 in the figure. In the rhinoceros there is one principal toe (the third), as in the horse, with the second and fourth toes in a less developed state; while in the hippopotamus there are two principal toes (the third and fourth), as in the ox, with the second and fifth toes not fully developed. In the elephant, there is a fifth digit added, answering to our great toe, and articulating with an ento-cuneiform bone, so that in the foot of this animal we have all the bones occurring in the human foot.

Professor Owen, to whose works we are indebted for these remarks, concludes from these and similar observations that the course of the simplification of the five-toed foot is, first, a diminution and removal of the innermost toe; next of the outermost; then, of the second; and lastly, of the fourth; the third or middle toe being the most constant and (in the lower animals) the most important of the five.

FOOT, in Music, is a term made use of in the same way as in poetry, denoting a short melodic figure of notes with only one accent. Foot is also now beginning to be used in speaking of the pitch of sounds. The Germans have always used the word *Fusston* in representing the pitch of the different stops of an organ, such as *Principal* 16 F., 8 F., or 4 F., &c., which convenient practice has been introduced into English organs. The pitch of the stop is fixed according to the length of the lowest C. pipe. See ORGAN.

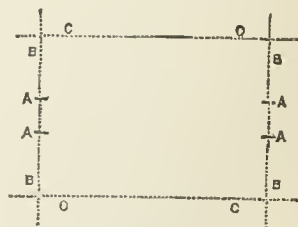
FOOT AND MOUTH DISEASE. See MURRAIN.

FOOTBALL. This game has long been a favorite throughout the British Isles; and as a winter game is far more popular than any other, especially in our universities and public schools. A large park or common is best suited for the game, one of the most attractive features of which is, that it may be simultaneously enjoyed by great numbers of players.

There are at present two distinct styles of football, the one known as 'the Rugby game,' the other as 'the Association game,' from its introduction and patronage by the Football Association, instituted in 1863. In both games the object is to drive the ball between certain bounds, placed at opposite ends of the ground—the game being played in the intervening space—and called *goals*. The goal is formed of two upright posts (AA in fig.), which in the Rugby game, are joined by a cross bar at a height of 10 feet, and in the Association game by a tape at the height of 8 feet. The aim in the Rugby game is to drive the ball between the posts and *over* the cross-bar of the enemy's goal; in the Association game, to drive it through the posts *below* the tape. Two side-lines, called *goal-lines* (BB in fig.), are drawn from each of the goals, and the boundary of the playing-ground on each side is marked by a line called the *touch-line* (CC in fig.). The opposing players take their positions opposite each other at different ends of the field. The game is decided by the number of goals won in a certain space of time, which is divided into equal parts, after each of which the players change ends.

The ball used is made of an india-rubber bladder covered with strong leather.

In the Rugby game, the game is commenced by a *place-kick* (made by kicking the ball when placed on the ground) from the middle of the field. A goal may be won by a *drop-kick* over the adversary's goal, or by a *place-kick* resulting from a *touch-down* or a *fair-catch*. A drop-kick is made by dropping the ball from the hands, and kicking it as it rises. The touch-down is accomplished in the following manner: any player who catches the ball, either before it has touched the ground or on the bound, may run with it, if he can, till he gets behind the adversary's line of goal, where he will touch it down as near as he can to the goal, if possible between the posts. This feat is called *running in*, and secures the right of a place-kick at goal from any spot outside the goal-line in a straight line from where the touch-down was made. When the ball is touched down behind the goal-line, but not near the goal, a different mode of procedure, called the *punt-out*, is adopted. A fair-catch is a catch from a kick or from the hand, when the catcher makes a mark with his heel, and gets a free kick. When the ball crosses the touch-line at the side of the field, it is lifted and thrown out in a straight line to be secured by either side. The player who has the ball may be



hacked or kicked on the shins by those of the opposite side, so as to trip him over.

Under the Association rules the main idea is to adhere as closely as possible to the literal meaning of the word football. Consequently, holding or carrying the ball is prohibited, and no one is allowed to use his hands at all, except the goal-keepers, who are allowed to protect the goal with their hands. Neither tripping nor hacking is allowed, and altogether the game is much less rough. The Rugby game is often played now without hacking.

FOOTE, SAMUEL, actor and writer of comedy, was born of a good family at Truro, in Cornwall, 1720. He was educated at Worcester College, Oxford, and about 1740 entered the Temple; but after a career of 'pleasure,' in the course of which he managed to dissipate two fortunes which had been left him, he turned to the stage as a means of support, and in 1744 made an unsuccessful debut in the character of Othello. In 1747, he opened the Haymarket Theatre—where he was at once director, actor, and dramatic author—with a piece entitled *Diversions of the Morning*. In this and other pieces, he introduced well-known living characters, and, by his admirable powers of mimicry, succeeded in drawing large audiences, till the theater was closed by order of the magistrates. After 1752, he continued to perform alternately in London and Dublin. In 1766, he broke his leg by a fall from his horse, and amputation was found necessary. He, however, recovered his health and spirits, and even turned the incident to account on the stage, composing parts expressly adapted to his own state. He died in 1777. Many comic anecdotes of F. are given in Cooke's *Memoirs of Samuel Foote* (1805). His conversation must have been inimitably comical. Dr. Johnson, who had a power of refusing to be pleased against his will greater than most men, met F. for the first time at Fitzherbert's, and assumed his most ursine manner; but it was no use: 'I was obliged,' he says, 'to lay down my knife and fork, throw myself back in my chair, and fairly laugh it out. Sir, he was irresistible.' His plays, four of the best of which are *An Auction of Pictures*, *The Minor*, *The Liar*, and *The Mayor of Garratt*, have been frequently published, but never in a complete form. See Forster's essay in the *Quart. Rev.*, 1854.

FOOT-GUARDS, the flower of the British infantry, and the garrison ordinarily of the metropolis, comprise three regiments, the Grenadier, Coldstream, and Scots Guards, in all 7 battalions, and 6307 officers and men. See GUARDS.

FOOT-POUND is the unit by which the *work done* by a force is estimated; thus (taking 1 lb. and 1 foot as the units of weight and distance), if 1 lb. be raised through 1 foot, the *work done* is equal to 1 foot-pound; if 10 lb. be raised 9 feet, the *work done* is 90 foot-pounds; and generally, if *W* represent the *work done*, *P* the *weight in pounds*, and *h* the *height in feet*, then *W* (in foot-pounds) = *P**h*.

FOOT-PRINTS. See ICHNOLOGY.

FOOT-ROT amongst sheep is of two varieties, the commoner consisting of an inordinate growth of hoof, which, at the toe, or round the margin, becomes turned down, cracked, or torn, and thus affords lodgment for sand and dirt. Insufficient wearing of the hoof is the obvious cause, and hence the prevalence of foot-rot in soft rich pastures, and especially amongst sheep previously accustomed to bare, rough, or upland walks, where the hoof is naturally worn down by the greater amount of walking necessary to procure sustenance. Taken in time, when lameness is first apparent, and before the hoof is cracked, and the foot inflamed, a cure rapidly follows the careful paring of the superfluous and diseased hoof; indeed, further treatment is scarcely necessary, unless any of the vascular parts have been laid bare, when a little tar may be applied as a mild astringent and protection from flies.

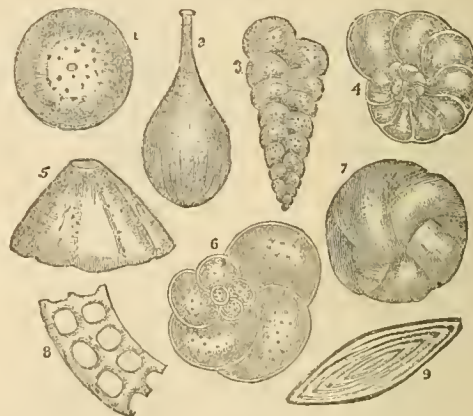
When, from inattention or neglect, the hoof is separated from the sensitive parts beneath, when ulcers appear on the sole, or proud-flesh springs up, active astringents or mild caustics are necessary. The shepherd's old favorite butter of antimony, diluted with an equal quantity of tincture of myrrh, is a good remedy when cautiously and temperately used. A convenient paste, which in inexperienced hands is safer than a fluid caustic, may be made with equal weights of flowers of sulphur and finely powdered sulphate of copper, rubbed up to the needful consistency with lard or oil. Many have great faith in a mixture of the salt of copper with gunpowder and lard.—The second and more troublesome variety is allied to what is termed *foul* in the foot; instead of commencing at the ground surface, it begins in the interdigital space, appears to depend upon constitutional rather than local causes, and frequently occurs along with the other variety, but, unlike it, occasionally becomes contagious. The foot is hot, tender, and swelled around and immediately above the coronet. There are ulcerations in the interdigital space, and the swelling, and subsequently the sprouting of proud-flesh, cause a separation of the toes. When the tenderness and heat are great, poultices are advisable; but in the milder cases and earlier stages,

the parts should be well washed with a solution containing to the pint of water half an ounce each of sulphuric acid and oil of turpentine. When ulcers appear, they must be touched with lunar caustic, or dressed with the paste already recommended.

FORAGE (from Fr. *fouage*, a contraction of the barbarous Latin *fodderagium*, taken in its turn from the Gothic *fo-dur*, fodder), hay, straw, and oats supplied to horses of officers and soldiers in the army. Where troops are together, the provision of forage devolves on the commissariat: officers of the staff, &c., who are entitled to horses, but whose duties are at stations where bodies of horse are not collected, receive a money allowance, in lieu of forage in kind, varying according to the place and price of provender, but usually about 1s. 10d. to 2s. per horse per day. When a soldier is *en route* away from his regiment, the innkeeper with whom he stops is bound, under the Mutiny Act, to provide his horse with the specified ration of forage—viz., 10 lbs. oats, 12 lbs. hay, and 8 lbs. straw, for the payment of 1s. 9d. a day, which must also include stabling.

FORAMINIFERA, a group of mostly marine Protozoa (q. v.), consisting of a mass of homogeneous granular protoplasm, in which a nucleus has recently been shown to exist, and which fills and envelops a shell, sometimes chitinous or sandy, but most frequently calcareous, which may be one or many chambered, one or many minute apertures (Lat. *foramina*, whence the name). Long, delicate, granular and anastomosing protoplasmic processes are protruded for the prehension of food. Most of the species are minute, although one of more than two inches in diameter has been found in Borneo, and fossil forms approaching to this size are well known under the name of Nummulites (q. v.), from their resemblance to coins.

The existing species are very numerous, and have been distributed into many genera. They are found among sea-sand, and among all the dredgings of deep water. The fossil species are



Foraminifera:

- 1, *Orbulina univversa*; 2, *Lagena striata*; 3, *Textularia*; 4, *Operculina*;
5, *Faujasina*; 6, *Rosalina globularis*; 7, *Cassidulina*; 8, Part of two chambers of an *Orbulina*; 9, Vertical Section of fossil Nummulite.

still more numerous, and constitute great part of some calcareous rocks, as of chalk. The F. are of very beautiful forms. Some of the simple ones are orbicular, some curiously flask-shaped; those in which the animal is divided into segments, and the shell consequently chambered, sometimes have the segments arranged in a straight line, sometimes spirally, sometimes alternately, &c. Linnaeus and many naturalists ranked the F. with the genus *Nautilus*, and they were reckoned among the most highly organized molluscs, a place from which comparatively recent discoveries have completely removed them. They may be regarded as modifications of the simple Rhizopod (q. v.) type, and may be thus classified:

A. IMPERFORATA.—One terminal aperture.

1. Shell one-chambered, chitinous, *Gromida*.
2. Shell many-chambered, porcellaneous, *Miliolida*.
3. Shell arenaceous, *Lituolida*.

B. PERFORATA.—Many minute apertures. Vitreous.

1. One-chambered, *Lagenida*.
2. Many-chambered, *Globigerinida*.
3. Many-chambered, with internal canals, *Nummulitida*.

See Carpenter for *Foraminifera*; Huxley, *Anat. of Invert Animals*.

Fossil Foraminifera. The earliest records of this order yet observed are in sandstones near St. Petersburg, belonging to the Lower Silurian measures. Scattered through these sandstone are numerous green grains, which have been shown by Ehrenberg to contain, in their interior, silicious casts of shells similar to the recent genera *Guttulina* and *Textularia*. Forms, apparently referrible to the last genus and to *Fusulina*, constitute a large por-

tion of some beds of carboniferous limestone in Russia, and also in the United States. Among the Secondary rocks, and especially in the Chalk, foraminifera are very abundant. Chalk indeed, is composed almost entirely of the perfect or broken shells of *Rotalia*, *Spirulina*, *Textularia*, &c. (see CHALK). They are not more numerous in the Tertiary strata, but here they attain an enormous size—gigantic compared with any that preceded them, or with recent forms. Vast beds of limestone occur on the borders of the Mediterranean, composed almost entirely of these large forms. See NUMMULITES and NUMMULITE LIMESTONE.

FORBES, DUNCAN, of Culloden, a celebrated Scottish politician of the 18th c., and Lord President of the Court of Session, was born either at Culloden or at Buncrevy—for the family possessed both estates—in the neighborhood of Inverness, on the 10th November 1685. In 1704, the year that his father died, F., then a lad of 19, commenced his legal studies in Edinburgh; but the following year he removed to Leyden, then the great school for Scottish lawyers of revolution principles, where he studied for two years with the greatest diligence. In addition to the knowledge of the civil law, which was no doubt the principal object of his residence at Leyden, we are told that he made considerable progress in Hebrew and several other Oriental languages. On his return from Leyden, F. was called to the bar, and almost immediately after appointed sheriff of Midlothian—a promotion the rapidity of which is somewhat inconsistent with modern usages. He rose rapidly into practice and into political influence through his connection with the Great Duke of Argyle, then in the zenith of his power, to whom he was united by family ties, and of whose estates he acted as a sort of manager. He married Mary Rose, the daughter of the Laird of Kilravock, a woman of beauty and accomplishment, to whom he is said to have been devotedly attached. She died shortly after his marriage, leaving him an only son, John, who eventually succeeded to his estate, but did not inherit his abilities. During both of the rebellions, Duncan F. acted a prominent part on the side of the Hanoverian government. In 1715, he was in the north, actively engaged in opposing the rebels, along with his elder brother John, who is said to have expended £3000 on the royal cause, not one shilling of which was ever repaid him. But on this, as on all other occasions, Duncan's partisanship was of the most moderate kind. After the suppression of the rebellion, he was opposed to the project of carrying the prisoners out of Scotland, to be tried by English juries, and he wrote to Lord Islay, when he heard that it was proposed to appoint him lord advocate, that he should certainly decline that office. He wrote to his brother, proposing a subscription for the comfort of the prisoners. 'It is certainly Christian,' he said, and by no means disloyal, to sustain them in their indigent state till they are found guilty.' To the forfeitures also he was opposed, on grounds of policy as well as of humanity. The only effect of his moderation was to bring suspicion on his own loyalty. But he was too important for his promotion to be arrested. In 1716, he was appointed depute to the lord advocate; in 1722, he was returned to sit in parliament for the Inverness district of burghs; and in 1725, he was lord advocate. He was not distinguished as a debater, but he was largely employed at this period of his career in appeal cases, and he enjoyed the friendship of Sir Robert Walpole, Lyttleton, Mansfield, and Hardwick. He seems even to have penetrated the literary circles in which Swift, Pope, and Arbuthnot were the ruling stars. In 1734, his brother John—Bumper John, as he was called—died, and he succeeded to the estates of the family.

In earlier life, Duncan partook of the convivial habits for which his family was distinguished, in an age that was famous for deep potations. Mr. Burton records various anecdotes illustrative of his powers in this direction, but he abandoned the practice when his health began to suffer, and devoted himself to more serious if not more onerous duties. During many subsequent years, he in no insignificant degree ruled the destinies, and contributed to the dawning prosperity of Scotland by fostering and developing her internal resources. His policy was to extinguish the rebellion by gaining over the Jacobites to the government. The purity and uprightness of F.'s character were subjected to a severe test. His whole correspondence during these troubled times came to light some seventy years after his death; and though few men ever wrote or were written to with less idea of publication, 'we have not been able,' says Mr. Chambers (*Biographical Dictionary of Eminent Scotsmen*), 'to detect a single one of his advices or proceedings, by the exposure of which even a private gentleman of the most delicate honor, and the most reasonable views, would have cause to feel a moment's uneasiness. Having freed himself from the shackles of party, his great object was to improve the trade and agriculture of the kingdom. But his views of political economy were not greatly in advance of his time; for in order to encourage the use of malt, he presented to the government a long and detailed scheme for preventing, or rather for punishing the use of tea. F. was appointed President of the Court of Session in

1737; but he still continued his interest in the general improvement of the country. Though he was aware of the character, and, in general, of the designs of the Jacobites, the rebellion of 1745 took the President by surprise. But he was no sooner aware of the danger than he hastened to the north, as he had done on the occasion of the former outbreak, and by his presence and the influence which he possessed in his own district, did much to counteract the proceedings of the rebels. Lovat, as is well known, betrayed both him and the government and actually made an attack on Culloden House, from which he was beaten off with great spirit by the President and his people. When the rebellion spread, he was forced to abandon his house, and take refuge in the island of Skye, where he remained till after the battle of Culloden. On his return, in place of reaping the fruits of his services, he was regarded with jealousy and aversion by the government. Even the large sums of money which he had advanced were never repaid him; and it is said that the ingratitude of the government, coupled with the perfidy of many of his friends and neighbors, who had changed sides more than once during this miserable affair, weighed so heavily on his spirits as to shorten his life. He discharged his judicial duties, however, with great zeal and ability till within a month of his death, which took place on December 10, 1747. The Parliament House in Edinburgh contains a beautiful portrait and a fine statue of the Lord President F., who was a man of great elegance of person and manner. The most complete biography of Forbes is that of Mr. Burton in his *Lives of Simon Lord Lovat and Duncan Forbes*, 1848.

FORBES, EDWARD, an eminent naturalist, was born at Douglas Isle of Man, February 12, 1815, and died in Edinburgh, November 18, 1854. He received a desultory and imperfect education in early life, in consequence of ill health; but when he left home at the age of 16, he had already possessed himself of a very considerable amount of knowledge in the departments of botany, zoology, and geology. In 1831, F. went to London, with the intention of becoming a student at the Royal Academy; but although he evinced much readiness in drawing, his artistic talents were not sufficiently marked to hold out any prospect of success in the event of his making art his profession; and he therefore determined to turn his attention to medicine, and, with this view, entered the university of Edinburgh. In 1836, he finally relinquished his special medical studies, to devote himself exclusively to the natural sciences. In 1836—1837, he attended lectures at Paris, where he studied under Geoffroy St. Hilaire, Jussieu, and De Blainville, while he at the same time availed himself with diligence of all the advantages afforded to students by the museums and libraries of Paris. From the first year of his college life, F. had spent his summer vacations in rambles over various parts of Great Britain, or excursions on the continent, and the results of the observations which he made during these tours, which were published by him either in the form of separate works, or in the pages of current scientific journals, sufficiently attest his diligence as an observer, and his exact appreciation of analogies and differences of forms. F. may also be regarded as the originator of the use of the dredge, which he employed with equal success in investigating the marine fauna of our own seas, and of the Mediterranean and the Ægean. In 1841, he joined the surveying ship *Beacon*, as naturalist, and accompanied that vessel during the survey of a part of Asia Minor, and co-operated in the exploration of many of the Xanthian cities. On his return to England in 1843, he found that he had, during his absence, been elected to the chair of botany, King's College, London. He was soon afterwards named curator of the Geological Society; and from that period till his removal to Edinburgh, he remained in London, living in a vortex of scientific labors and literary work. In 1844, he was appointed palæontologist to the Museum of Geology in connection with the Ordnance Geological Survey; and in 1851, on the opening of the new buildings in Jermyn Street, London, he was named professor of natural history in the School of Mines. In 1852, he was chosen president of the Geological Society, an honor never before conferred on so young a man; and in 1853, on the death of Professor Jameson, he was elected to the vacant chair of Natural History in the university of Edinburgh. In the summer of 1854, he delivered a short course of lectures—the only one he was destined to give—for at the commencement of the winter session he was seized with a severe illness, which speedily proved fatal, and terminated his life in the 39th year of his age, in the very zenith of his fame, and in the full vigor of his intellectual powers.

F. had been a voluminous writer and a diligent observer of nature from his earliest youth, and had collected an immense mass of materials, many of which were, however, left at his death in a disorganized condition. He did much to advance and systematize special departments of natural history, both by his own labors and by the stimulus which he imparted to his associates and pupils; and it would be difficult to instance any naturalist who has exercised a greater influence on the thought and line of inquiry

pursued by those who have cultivated the same branches of knowledge. His classification of the British *Star-fishes* opened a new era in that branch of zoology; and his discovery that air-breathing molluscs lived at the period of the Purbeck beds, has been the means of rectifying many erroneous hypotheses, and throwing unexpected light on several hitherto obscure points of geology, while the inferences which he drew from the presence of those animals have been fully corroborated. His Report on the *Ægean Sea*, and his observations of the tertiary of Cos, which have proved of great value to geology, raised him to the highest rank among living naturalists. From an early period, he had directed his attention to the distribution of animal and vegetable life in different zones of the sea and land, and his observations in this path of inquiry have opened many new fields of research. F. was a diligent contributor to the current scientific literature of the day, and many of his best papers were written for the meetings of the British Association, of which he was an active member, and for the various societies with which he was connected; while he also took a most efficient share in the labors of the Ordnance Survey during his connection with its staff. His separate works, papers, and monographs, of which upwards of 200 are published, and many of which are copiously illustrated by his own beautiful drawings, cannot be individually specified; but among them we may instance the following: *On the Distrib. of Pulmonif. Mollusca in Europe* (1838); *Malacol. Monensis* (1838); *Star Fishes* (1841); *The Radiata and Mollusca of the Ægean* (1843); *Travels in Lycia* (written in conjunction with Lieutenant Spratt, 1846); *Naked-eyed Medusæ* (1847); *British Mollusca* (1853, 4 vols. 8vo, conjointly with S. Hanley); the Map of *Homoiozoic Belts* (Johnston's *Phys. Atlas*, 1854); *Collection of Literary Papers by E. Forbes* (1855); &c. See *Memoir* by G. Wilson and A. Geikie, 1861.

FORBES, SIR WILLIAM, of Pitsligo, Bart., an eminent Scottish banker, son of Sir William Forbes, Bart., advocate, was born in Edinburgh, April 5, 1739. He succeeded his father when only four years old, and received his education at Aberdeen. In his 15th year, he was introduced into the bank at Edinburgh of Messrs. John Coutts & Co.; and in 1761, was admitted a partner. In 1763, one of the brothers Coutts having died, while another retired on account of ill health, and two others were settled as bankers in London, a new company was formed, consisting of Sir William Forbes; Mr. Hunter, afterwards Sir James Hunter Blair; Mr., afterwards Sir Robert Herries; and Messrs. Stephen and Cochrane. They at first carried on business in the name of the old firm. On 1st January, 1773, however, on some changes in the partnership taking place, the name was changed to that of Sir W. Forbes, J. Hunter, & Co., and of this firm Sir William continued to be the head till his death.

In 1781, he purchased the estate of Pitsligo, Aberdeenshire, which had been forfeited by Lord Forbes of Pitsligo for taking part in the rebellion of 1745. Animated by genuine patriotism and public spirit, he introduced the most extensive improvements on it, and laid out and built the village of New Pitsligo. He was a member, with Johnson, Burke, Garrick, Reynolds, and others, of the celebrated Literary Club of London, and the author of a Life of his friend, Dr. Beattie, the poet, published, with his works, in 2 vols. 4to, in 1805; also of *Memoirs of a Banking House*, being the history of his own, edited by Mr. Robert Chambers (Edinburgh, 1860). He died at his seat near Edinburgh, November 12, 1806, aged 68. By his wife, Elizabeth, eldest daughter of Sir James Hay of Hayston, Bart., he had three sons and five daughters. Universally esteemed and respected, his character is well described by Sir Walter Scott in the introductory address of one of the cantos of *Marmion*. His bank became, in 1830, the Union Bank of Scotland.

FORBES, JAMES DAVID, Principal of the United College in the university of St. Andrews, a grandson of Sir W. Forbes, the banker, was born at Colinton, near Edinburgh, April 20, 1809. He studied in the university of Edinburgh from 1825 until 1830, when he was admitted to the Scottish bar. On the death of Sir John Leslie (q. v.), he was appointed, in 1833, to the chair of natural philosophy in the university of Edinburgh, after a contest in which, among other competitors, he was opposed by Dr. (afterwards Sir David) Brewster and Mr. Galloway. In 1842, the Institute of France enrolled him among its corresponding members. He was, besides, a member of numerous other scientific societies at home and abroad, received the Royal and the Rumford medals from the Royal Society of London, and two Keith medals from the Royal Society of Edinburgh, and was D.C.L. of Oxford. In 1860, F. resigned his chair in Edinburgh, to become Principal of the United College in the university of St. Andrews. Among his contributions to science are—the polarization of radiant heat by the tourmaline, and also by reflection (1836), and its circular polarization—discoveries forming some of the strongest proofs of the identity of calorific and luminous rays; the unequal polarization of heat from different sources (1844); the refrangibility of heat; the depolarization of heat, &c. This whole series of

experimental results is of a very high order of importance. He is, however, best known to the world in general by his researches on the motion of glaciers. See *Travels in the Alps* (1843); *Norway and its Glaciers* (1853); *Tour of Mont Blanc and Monte Rosa* (1855); and *Occasional Papers on the Theory of Glaciers* (1859). He was undoubtedly the first to establish the great fact, that glacier ice moves in its channel like a viscous fluid, the middle moving faster than the sides, and the upper portions faster than the lower. See GLACIERS. In meteorology, F., among other things, improved Wollaston's application of the thermometer to the determination of heights, and verified with great care Fourier's theoretical results concerning the temperature of the ground at different depths and in different kinds of soil and rock. F. also contributed numerous valuable papers to the *Transactions of the Royal Societies of London and Edinburgh*, to the *Edinburgh Philosophical Journal*, and other periodicals. He died Dec. 31, 1868. His *Life and Letters*, edited by Principal Shairp, of St. Andrews, Professor Tait of Edinburgh, and Mr. Adams Reilly the Alpine traveler, was published in London 1873.

FORBES, SIR JOHN, an eminent physician, was born October 18, 1787, at Cattlebrae, Banffshire, and died November 13, 1861. After studying at Aberdeen and Edinburgh, he entered the navy in 1807 as assistant-surgeon, and continued on active duty till 1816, when he finally left the service. In 1817, he took the degree of M.D. at Edinburgh, and soon afterwards settled as a physician at Penzance, from whence he removed in the course of a few years to Chichester. In 1840, F. went to London, where he speedily obtained a large practice. He was knighted in 1853 by the Queen, to whose household he held the appointment of Physician in Ordinary, while he was at the same time Physician Extraordinary to Prince Albert. He was a Fellow of the College of Physicians, and the Royal Society of London; D.C.L. of Oxford, and a member of numerous foreign societies. F., conjointly with Drs. Tweedie and Conolly, was the editor of the *Cyclopædia of Practical Medicine*, which, in addition to the numerous contributions of the editors, included the labors of more than sixty British physicians, of the first rank. This work, which has exercised a most beneficial influence both on the theory and practice of medicine, was completed in 4 vols. 8vo, in 1835. In 1836, F. founded the *British and Foreign Medical Review*, which he carried on with great success for twelve years. The services which he thus rendered to his brother-practitioners placed him deservedly among the foremost of his profession. To F. in a great measure belongs the merit of having introduced the use of the stethoscope in England, and of having successfully directed the attention of British practitioners to the art and practice of physical diagnosis. In 1831, he published the first edition of his translation of Laënnec's *Treatise on Auscultation*; and in 1838, when the fifth edition appeared, the new method was already extensively used. F. was a ready and pleasant writer, as is amply shown by the various records of his summer rambles; among which we may instance his *Physician's Holiday* (1849), and his *Sight-seeing in Germany and the Tyrol* (1856). His last professional work, entitled *Nature and Art in the Cure of Diseases* (1857), contains a systematic exposition of his medical opinions and doctrines.

FORBES MACKENZIE ACT. The statute, popularly known by the name of the gentleman (Mr. Forbes Mackenzie, M.P. for Peeblesshire) who introduced the bill, is the 16 and 17 Vict. c. 67 (1853), entitled 'An Act for the better Regulation of Public-houses in Scotland.' This act retained in general the provisions of 9 Geo. IV. c. 58, by which the granting of certificates by justices of the peace and magistrates, authorizing persons to keep common inns, ale-houses, and victualling-houses in Scotland was regulated. But it prohibited the granting of certificates for excisable liquors to be 'drunk on the premises,' unless on the express condition that no groceries or other provisions to be consumed elsewhere should be sold in the house or premises with respect to which such certificate is granted. The object of this portion of the enactment being to prevent grocers from becoming in reality the keepers of tipping-houses, those persons continued to be permitted to sell liquors by retail, provided that they were not consumed in their shops.

In accordance with the principle of distinguishing between the different classes of houses in which the trade of a spirit-dealer should be carried on, three different grades of licenses were introduced: those applicable, viz., 1, to inn or hotel keepers; 2, to public-house keepers; and 3, to grocers and provision-dealers. As regards the first class, it is enacted that they shall not 'keep open house, or permit or suffer any drinking in any part of the premises belonging thereto, or sell or give out therefrom any liquors before eight o'clock in the morning, or after eleven o'clock at night of any day, with the exception of refreshments to travellers, or persons requiring to lodge in the said house or premises; and further, that they shall not open their houses for the sale of any liquors, or sell or give out the same on Sunday, except for the accommodation of lodgers and *bonâ-fide* travelers. The same

restrictions are imposed on the second class of persons—viz., the keepers of public-houses, with this addition, that no exception is made in their case in favor of travelers or lodgers; whilst grocers and provision-dealers, in addition to the prohibition to open on Sundays, and that already mentioned with reference to the consumption of spirits on the premises, are forbidden 'to sell or give out any liquors before six o'clock in the morning, or after eleven o'clock at night.' Separate licenses were also introduced for the sale of malt liquors from those applicable to the sale of wine and spirits, all of which had formerly been included under one license. By this statute, also, for the first time in Scotland, the very formidable power was conferred on the police of entering at any time any public-house, or house where refreshments are sold to be consumed on the premises, and penalties were awarded against those who refused to admit them, or who obstructed their entrance. These provisions having given rise to much discussion, a Royal Commission to inquire into the working of the act was issued on the 25th April 1859. The result of the commission was the issue, as usual, of two enormous volumes of printed evidence, and of a report, more distinguished for its length than for the value of the suggestions which it contains. The commissioners arrived at the conclusion, that 'although intemperance still prevails to a lamentable extent, it would seem that this vice has been for some time gradually descending in the scale of society, and that it is now chiefly confined to the lowest class of the population.' This effect the commissioners ascribe to several causes, of which the first and most important is the increase of the duty on excisable liquors from 2s. 4d. per imperial gallon, at which it stood in 1823, to 8s., to which it had been raised in 1855. Nor do they deny to the Forbes Mackenzie Act its share of merit. 'The beneficial effect of the act,' they say, 'is proved by the evidence which we received as to the diminution of crime, and the change for the better in the habits of the people, immediately after the passing of the act, when its provisions were strictly enforced, and by the tendency in an opposite direction which in some places has followed its less rigorous enforcement. Whilst thus generally approving of the act, the commissioners suggest a number of alterations, mostly with the view of enabling the police to carry out its provisions with greater efficiency.

In reference to the difficulty experienced by hotel-keepers in ascertaining what persons come under the description of *bona-fide* travelers, the commissioners recommend that 'persons inducing hotel-keepers to sell or give out excisable liquors to them on Sunday, by falsely representing themselves as travelers, should be guilty of an offence, and be liable, on conviction, to a fine.' This recommendation was given effect to in the Public-Houses Amendment Scotland Act 1862, which imposes a penalty of £5 or thirty days' imprisonment on persons obtaining excisable liquor on false representations on Sunday, or before opening or after closing hours. In these circumstances, it becomes important to know that it has been decided in England that to constitute a 'traveler' within the meaning of the corresponding Act 18 and 19 Vict. c. 118, s. 2, it is a matter of indifference whether the parties be traveling for business or pleasure, and that a walk, ride, or drive, for exercise and amusement of such length as to render refreshments desirable, is a sufficient journey. In *Atkinson v. Sellers* (5 C. B. N. S. 442), Chief Justice Cockburn remarked, that 'a man could not be said to be a traveler who goes to a place merely for the purpose of taking refreshment. But if he goes to an inn for refreshment in the course of a journey, whether of business or of pleasure, he is entitled to demand refreshment, and the innkeeper is justified in supplying it.' See also *Taylor v. Humphreys*, C. P. 705; 4 L. T. N. S. 314. The first was in the case of a drive from Liverpool of 5½ miles, the second of a walk from Birmingham of 4 miles.

FORBIDDEN FRUIT, a name fancifully given to the fruit of different species of *Citrus*. In the shops of Britain, it is a small variety of the Shaddock (q. v.) which generally receives this name. But on the continent of Europe, a different fruit, regarded by some as a variety of the orange, and by some as a distinct species (*Citrus Paradisi*), is known as the Forbidden Fruit, or Adam's Apple. Like some other fruits of the same genus, it was recently introduced into the south of Europe from China. The tree has broad, tapering, and pointed leaves, the leaf-stalks winged; the fruit is large, somewhat pear-shaped, greenish-yellow, of very uneven surface, having around its base a circle of deeper depressions, not unlike the marks of teeth, to which it probably owes its name. It is chiefly the rind which is the edible part; the rind is very thick, tender, melting, and pleasant; there is very little pulp; the pulp is acid.

The name Forbidden Fruit has also been given to the fruit of *Tabernaemontana dichotoma*, a tree of Ceylon, of the natural order *Apocynaceae*. The shape of the fruit—which is foliaceous, containing pulp—suggests the idea of a piece having been bitten off, and the legend runs that it was good before Eve ate of it, although it has been poisonous ever since.

FORCE; ENERGY. Till we know what Matter (q. v.) is, if there be matter, in the ordinary sense of the word, at all, we cannot hope to have any idea of the absolute nature of force. Any speculations on the subject could only lead us into a train of hypotheses entirely metaphysical, since utterly beyond the present powers of experimental science. If we content ourselves with a definition of force based on experience, such a definition will say nothing of its nature, but will confine itself to the effects which are said to be due to force, and in the present state of our knowledge it is almost preposterous to aim at more.

Our first ideas of force are evidently derived from the exertion required to roll, or lift, bend or compress, &c., some mass of matter; and it is easy to see that in all such cases where muscular contraction is employed, matter is moved, or tends to move. Force, then, we may say generally, is *any cause which produces, or tends to produce, a change in a body's state of rest or motion.* See **MOTION, LAWS OF.** The amount or magnitude of a force may be measured in one of two ways: 1. By the pressure it can produce, or the weight it can support; 2. By the amount of motion it can produce in a given time. These are called respectively the *Statical* and *Dynamical* measures of force. The latter is, as it stands, somewhat ambiguous. What shall we take as the quantity of motion produced? Does it depend merely on the velocity produced? or does it take account of the amount of matter to which that velocity is given? Again, is it proportioned to the velocity itself, or to its square? This last question was very fiercely discussed between Leibnitz, Huyghens, Euler, Maclaurin, the Bernouillis, &c.; Leibnitz being, as usual with him in physical questions, on the wrong side. Newton, to whom we owe the third law of motion, had long before given the true measure of a force in terms of the motion produced. This law is an experimental result—that when pressure produces motion, the *momentum* produced (see **MOMENTUM**) is proportional to the pressure, and can be made (numerically) equal to it by employing proper units. Hence momentum is the true dynamical measure of force, which, therefore, is proportional to the *first* power only of the velocity produced. What is properly measured in terms of the *square* of the velocity, we shall presently see. For various properties of force, statical and dynamical, see the following articles: **COMPOSITION OF FORCES, COUPLES, CENTER OF GRAVITY, CENTRAL FORCES, FALLING BODIES, MECHANICAL POWERS, VIRTUAL VELOCITIES.**

It is obvious that in order to produce any effect at all, or to do **WORK**, as it is technically called, a force must produce *motion* i. e., must move its point of application. A weight laid on a table produces no effect whatever, unless the table yields to the pressure, i. e., unless the weight descends, be it ever so little. We do no work, however much we may fatigue ourselves, if we try to lift a ton from the floor; if it be a hundredweight only, we may lift it a few feet, and then we shall have done work—and it is evident that the latter may be measured as so many pounds raised so many feet—introducing a new unit, the **FOOT-POUND**, which is of great importance, as we shall shortly see, in modern physics. See **WORK.** This is evidently, however, a statical measure of work, since no account is taken of velocity. Have we then for work, as we had for force, a *dynamical* measure?

Let us take a simple case, where the mathematical investigation is comparatively very easy, and we shall find we have. We know (see **VELOCITY; MOTION, LAWS OF**) that if a particle be moving along a line (straight or not), and the distance moved (in the time t) along the line from the point where its motion commenced be

called s , its velocity is $v = \frac{ds}{dt}$. Also we know that the force acting

on it (in the direction of its motion) is to be measured by the increase of momentum in a given time—this gives (just as the last

equation was obtained) $F = m \frac{dv}{dt}$. From these two equations, we

have, immediately, $mdv = Fds$, or as the rudiments of the differential calculus give at once, $\frac{mv^2}{2} = \int Fds = F.s$ if the force be uniform.

The quantity on the right-hand side is the sum of the products of each value of F , by the corresponding space ds , through which the particle moved under its action. It is therefore the whole work done by the force. On the left hand, we find half the product of the mass, and the square of the velocity it has acquired; in other words, the *vis-viva*. Hence, in this case, the *vis-viva* acquired equals the amount of work (q. v.) expended by the force.

It appears from a general demonstration (founded on the experimental laws of motion, and therefore true, if they are), but which is not suited to the present work, that if, in any system of bodies, each be made up of particles or atoms, and if the forces these mutually exert be in the line joining each two, and depend merely on the distance between them, then we can express the required proposition in the following form:

Any change of vis-viva in the system corresponds to an equal amount of work gained or lost by the attractions of the particles on each other.

What is spent, then, in work, is stored up in vis-viva; and conversely the system, by losing some of its vis-viva, will recover so much work-producing power. If we call the former, as is now generally done, *Kinetic*, and the latter *Potential Energy*, we may express the above by saying, that in any system of bodies where the before-mentioned restrictions are complied with, *the sum of the kinetic and potential energies cannot be altered by the mutual action of the bodies*. The most simple and evident illustrations of this proposition are to be found in the case of the force known as gravitation. The potential energy of a mass on the earth's surface is zero, because, not being able to descend, it has, in common language, no work-producing power. If it be raised above the surface, and then dropped, it is easy to see that the work expended in raising it will be exactly recovered as vis-viva after its fall. For (see FALLING BODIES) a mass falling through a space, h , to the earth acquires a velocity v , such that $v^2 = 2gh$, or if m be the mass, $\frac{mv^2}{2} = mgh$. The left-hand side gives the vis-viva acquired by the fall—the right is the product of the weight (mg) and the height fallen through—or is the work required to elevate the mass to its original altitude.

Hence we may calculate the amount of work which can be obtained from a head of water in driving water-wheels, &c., remembering, however, that there is always a *loss* (as it is usually called) due to friction, &c., in the machinery. That there is a loss in useful power, is true, but we shall find presently that in energy there is none, as indeed our general result has already shown. Where the apparently lost energy goes, is another question.

Another good example of potential energy is that of the weights in an ordinary clock. It is the gradual conversion of potential into kinetic energy in the driving weight which maintains the motion of the clock, in spite of friction, resistance of the air, &c.; and we have in the kinetic energy of sound (which depends on vibrations in the air) a considerable portion of the expended potential energy of the striking weight. A coiled watch-spring, a drawn bow, the charged receiver of an air gun, are good examples of stores of potential energy, which can be directly used for mechanical purposes.

The chemical arrangement of the different components of gun-powder, or gun-cotton, is such as corresponds to enormous potential energy, which a single spark converts into the equivalent active amount. But here, *heat* has a considerable share in the effects produced; it may then be as well, before proceeding further, to consider how we can take account of it, and other (so-called) physical forces, as forms of energy.

Correlation of Physical Forces.—So far as we yet know, the physical forces may be thus classified: I. GRAVITATION (q. v.); II. MOLECULAR FORCES—COHESION (including CAPILLARITY); ELASTICITY, CHEMICAL AFFINITY; III. HEAT AND LIGHT; IV. ELECTRICITY (including MAGNETISM); V. ANIMAL FORCE; VI. VITAL FORCE, having, as some most irrationally suppose, an analogue in inorganic masses, which may be called Crystalline Force. (This idea is examined further on). Of these, I., II., and some forms of III., are more immediately connected with *matter* than the others—that is to say, that the remainder almost necessitate the hypothesis of the existence of some medium unlike ordinary matter, or, in popular language, an *imponderable*. The almost universal opinion of physicists, however, seem to be, that even the former must be accounted for in such a way. Newton, in his second letter to Bentley, says, with respect to gravitation (and it is obvious that similar language is applicable to molecular forces generally): 'You sometimes speak of gravity as essential and inherent to matter. Pray, do not ascribe that notion to me, for the cause of gravity is what I do not pretend to know.' And again in the third letter: 'It is inconceivable that inanimate brute matter should, without the mediation of something else, which is not material, operate on, and affect other matter without mutual contact, as it must do, if gravitation, in the sense of Epicurus, be essential and inherent in it; and this is one reason why I desired you would not ascribe innate gravity to me. That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a vacuum, without the mediation of anything else, by, and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it.'

'Gravity must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers.' Of what that medium may consist, we cannot, of course, hazard even a conjecture; but if it be composed of separate atoms—i. e., not continuous—it is evident that a second medium will be required to help the particles of the first to act on each other (for without this, the first medium would be merely obstructive), and so on.

This must stop somewhere; why not, then, at the first? But in the present state of our knowledge of mechanics, a continuous medium is barely conceivable, and its motions, &c., present considerable difficulties to even plausible mathematical treatment. If we take the view opposed to Newton's, as Mosotti and others have done (their ideas are considered further on), we can, in a very artificial manner, however, account for gravitation and molecular action; but, as before said, the foundations of this attempt at explanation are hardly tenable.

Just as sound depends on the elasticity of the air and vibrations thereby maintained and propagated, light and radiant heat, which are certainly identical, most probably consist in the vibrations of some very elastic fluid. This has been provisionally named Ether (q. v.). If it be continuous, it may help us to account for the first two categories of force, also, as we have already seen; if not so, as is more likely, fresh difficulties arise. Light and heat, however, undoubtedly depend on motion, and correspond, therefore, to so much vis-viva or actual energy. Even heat in a liquid or solid body must correspond to some vis-viva in the material particles, since a hot body can give out both light and heat, and a body may be heated by luminous or calorific rays which are vibratory, as we have seen.

Class IV. contains perhaps the most puzzling of all these forces. That there is something in common in all the forms of electricity, and that magnetism is nearly related to them, is certain; it is probable, also, that frictional electricity, when statical, consists in something analogous to a coiled spring, or is a form of potential energy—the others being forms of kinetic energy. Some have supposed magnetism to be also a form of potential energy, but Ampere's discoveries have materially lessened the probability of the truth of this hypothesis. We shall consider this again.

Class V. may be deferred for the present.

As to Class VI., it seems, from the observations of physiologists as to the formation of cellular matter, and the production in living organisms of compounds which have not yet been made by ordinary chemical processes, that the vital force, if there be such, is not a force which does work, in the mechanical sense of the term, but merely *directs*, as it were, the other natural forces *how to apply* their energies. Were a railway train running on a smooth horizontal line of rails, it would retain for ever its original velocity; but on turning a curve it would be acted on by deflecting forces, without which its path would be straight. These forces *do not work*, as is evident, since this would be shown in alteration, of the vis-viva, and none takes place. They modify however, the direction in which the train moves.

When gangs of laborers and masons are at work building an edifice, the former are employed raising stones, mortar, &c., the latter in laying them; but there is present an overseer with a plan, who, doing no (mechanical) work himself, guides and directs the proper application of force by the working body. In this view of the case, the laborers are the physical forces, and the overseer the vital force. It is quite certain that the so-called crystalline force cannot properly be put in this category, as presenting even an analogy, however slight; it is probably an effect, not a cause, and due to the different forms of simple or compound particles of matter, and the consequent variations in their molecular forces in different directions.

So far, then, for the possible nature of the forces, which, with the probable exception of VI., certainly depend on various forms of energy. Can these be transformed one into another, as the different kinds of mechanical energy can? Take the potential energy of gravitation to begin with. We can employ it to drive a water-wheel. This turns a shaft, to which, if a tight brake be applied, heat will be produced by friction, and light also, if a rough wheel on the shaft be made to rotate against a piece of flint or pyrites; or electricity may be produced by employing the moving power to turn an ordinary electrical machine, or a magneto-electric one; and from the electricity so produced, electrical charges and currents may be derived; from them heat and light again. Or the currents may be employed to magnetize a needle or a piece of soft iron, or to produce chemical decomposition.

Again, heat may be employed by means of a steam-engine as a substitute for the water-power or potential energy of gravitation, and the above effects be produced. It may also be employed in raising weights, and therefore in producing the potential energy in question; or it may be employed to produce Thermo-electric Currents, and thence all the ordinary effects of electricity, including the motion of a magnetic needle.

Light may be employed to produce chemical combination or decomposition, as we see in photography; it may also by the same means be made to produce electric currents, and consequent *motion* of a needle. It is not yet proved that light can produce magnetism *directly*, though there can be little doubt that, if properly applied, it is capable of doing so.

Chemical action in a voltaic battery can be made to produce motion, heat, light, electricity, electrical charges and magnetism, and to overcome other chemical affinity.

Capillary action has been employed to produce electricity, and mechanical effects, &c., but we need not go through the whole category.

In these experimental results, then, consists what is called the Correlation of the Physical Forces—i. e., the transmutability of one of the latter into another or others. The idea is old, but the proofs of its truth have only become numerous within the last half-century. Grove has published an excellent treatise with the above title; to this we refer the curious reader for further detail on this interesting subject.

Conservation of Energy.—But a far more important principle, being, in fact, the precise statement of the preceding—which is somewhat vague—is that of the Conservation of Energy. It is simply the extension (to all physics) of the principle which we have given in full, and proved in a particular case, at the beginning of this article—i. e., that the sum of the potential and kinetic energies of any set of moving bodies cannot be altered by their mutual action. Let us now suppose heat, light, &c., to consist in the energy of vibratory movements of particles, and in their relative states of distortion, &c., and make the supposition that these particles act on each other—no matter by what means—in the line joining each two, and with forces which depend on their distance, and we have at once the theorem, that the sum of the potential and kinetic energies is a quality unalterable in any system, save by external influences. Hence, when mechanical power is said to be lost, as it is by the unavoidable friction in machinery, &c., it is really only changed to a new form of energy—in general, heat. Thus, when a savage lights his fire, he expends animal energy in rubbing two pieces of dry wood together. If these pieces of wood were not in contact, no force would be required to move them past each other—more and more is required as they are more strongly pressed together. The equivalent of the energy so expended is found in the heat produced. Davy showed that two pieces of ice might be melted by rubbing them together. A skilful smith can heat a mass of iron to redness by mere hammering. Here the energy actually employed is partly given out in the shape of heat, and partly stored up in the iron as potential energy due to the compression of the mass, or the forcible approximation of its particles. Amongst the earliest, and certainly the best experiments on this subject, are those of Joule (q. v.). He determined the relation between the units of heat and potential energy of gravitation, by various methods, which gave very nearly coincident results. One of these we may mention. A paddle-wheel is so fixed as to revolve in a closed vessel full of water. The wheel is driven by the descent of a known weight through a measured space, and precautions are taken against losses of energy of all kinds. The water agitated by the paddle-wheel comes soon to rest, as we know; but this is due to friction between its particles; and the final result is the heating of the water. The quantity of water, and also the number of degrees by which its temperature is raised, being measured, a simple proportion enables us to find how many foot-pounds (see FOOT-POUND) of mechanical energy correspond to the raising by one degree the temperature of a pound of water. The result is, that the heating a pound of water one degree Fahrenheit is effected by 772 foot-pounds—and this number is called Joule's Equivalent. In other words, if a pound of water fall to the ground through 772 feet, and be then suddenly arrested, its temperature will be raised one degree; and, conversely, the heat that would raise the temperature of a pound of water one degree, would, if applied by a steam-engine or otherwise, raise 772 pounds one foot high. Now (see the article HEAT), we know the amount of heat which is produced by the burning (in air) of any material whose composition is known.

It follows then, that from the mere quantity and composition of a substance, we can tell the amount of mechanical work due to its combustion; that is, supposing it all to be effective. As we have been led to the mention of heat of combustion, let us consider what this is due to. Combustion (in air) is merely a chemical combination of the constituents of the burning body with oxygen—the heat and light which are developed are therefore, by the conservation of energy, equivalent to the excess of potential energy of the uncombined, over the combined, oxygen and combustible.

That this is the real state of the case—and that the original setting fire to the combustible has nothing to do with the matter, as is frequently imagined—will be made evident by considering any spontaneous combination, say that of chlorine and copper filings, or of mercury and sodium, &c., in which cases the potential energy lost by the compound appears as heat, light, and sometimes sound.

The equivalents of the other forms of energy have not been even approximated to, with the exception of that of light. Thomson has determined the energy of a cubic mile of sunlight at the earth to be somewhere about 12,000 foot-pounds, giving about 10,000 as the Horse-power (q. v.) of each square foot of the sun's surface. There are some additional difficulties in the way when we seek the equivalent of electric energy, for here the question

arises: 'Is there a special substance which is, or the energy of whose motions is, electricity, or does it depend upon motions and distortions of the luminiferous ether?' for we can scarcely suppose it to be due to motions of the particles of matter. If the first, we have as yet no means of estimating its energy; if the latter, we may consider it as within the reach of experiment. It may merely be remarked here, that Weber's exquisite theoretical statement of electric laws—resting on the fundamental assumption that there are two *electric fluids*—requires the admission of mutual forces, which vary with the relative velocity of its particles, and for which, therefore, the conservation of energy does not necessarily hold.

Helmholtz, in an admirable paper (*Ueber die Erhaltung der Kraft*, translated in Taylor's *Scientific Memoirs*, New Series, i.), starting from the assumptions above explained, has applied the principle of conservations of energy to the investigation of many recondite problems connected with the physical energies. We cannot, of course, enter into his work in detail, as it is somewhat analytical, but we may freely borrow such of its contents, as we have not already alluded to, at least such as will suit the plan of this article.

A very good example of the conservation of energy is found in the increasing velocity of a planet or comet as it approaches the sun, and thus loses potential energy; and also in the fact, that in the case of these bodies the mere distance from the sun, and the velocity at that distance, enable us to tell at once the nature of the orbit described—i. e., which of the conic sections it is.

Latent heat has probably a form of potential energy, depending on the physical state of the substance in which it is stored up. The same may be said of those substances which, when mixed, produce heat or cold, as water and sulphuric acid, or nitrate of ammonia. It is easily seen that here the heat or cold depends upon a change of molecular arrangement of some kind; that is, a change of the potential energy.

In magnetism and statical electricity, of course, the conservation of energy holds, as we know that all the phenomena can be explained by attractions and repulsions, following the law of gravitation. In the discharge of a Leyden battery, the potential energy lost is reproduced as heat in the connecting wires, and as light, heat, and sound with the disruptive spark. In charging a Leyden jar by means of the electrophorus, the charge is directly produced by the expenditure of mechanical work in overcoming the attraction of the negative electricity of the resinous plate for the positive electricity of the cover.

In the ordinary voltaic battery, the excess of loss of potential energy in the cells by the chemical union, say of zinc and oxygen, and of sulphuric acid and oxide of zinc, over that gained by the decomposition of water, produces the kinetic energy of the current, which may be transformed into heat, light, magnetism, or motion, or two or more. Or it may be employed to reproduce potential energy by chemical decomposition, say that of water. This again, by a spark, can be reconverted into kinetic energy as an explosion accompanied by heat, light, and sound. While an electric current causes the motion of a magnetized needle, our general principle should lead us to infer that the current itself will be weakened. This is found to be the case, but, as it should be, *only during the motion* of the needle. The needle in a permanent state of deflection produces no effect whatever. Now, the diminution of an electric current is simply equivalent to the addition of a weaker current passing in the opposite direction. We should expect, then, that the motion of a magnet near a conducting wire will in general produce a current in the latter, and this is, in fact, Faraday's great discovery of magneto-electric induction. In this case, the current ceases so soon as the magnet ceases to move relatively to the wire.

If a mass of copper or other good conductor be set in rapid rotation near a powerful magnet, the motion produces electric currents in the copper, which, being attracted by the magnet, soon bring the mass to rest. It is not so clear in this case into what the mechanical energy of the rotation has been transformed, especially as the electric currents cease with the motion; but if we keep up the rotation forcibly, we find in a short time the copper growing warm; in other words, the energy has been transformed into electric currents, and the latter into heat. This very beautiful experiment is due to Joule, and has been repeated in a striking popular form by Foucault.

Advantage has been taken by Faraday of the phenomena of induction, to produce electric currents by aid of the earth's magnetism. His apparatus is simply a revolving disc of metal, and the terminal wires touch, one its axes, the other its edge. The energy which is here transformed into electric currents is the additional effort requisite to turn a *conducting* disc, instead of an equal *non-conducting* one. It is a curious consequence that in all metallic machinery a portion of the energy of the prime mover is lost in producing electric currents, and finally heat, in the moving parts, so that heat in such cases is not entirely, though very nearly, due to friction alone.

Perhaps one of the most singular of these transformations of energy is that already referred to of heat into electric energy. Certain crystals, such as tourmaline, become electrified by heat; but electric currents can be produced by simply heating a *junction* of two wires or bars of different metals, the other ends also being in contact. Now, if we were to heat the other junction, it is obvious that, as at it the metals are arranged in the opposite order, we should produce a contrary current; conversely, by cooling them we should strengthen the first. But the conservation of energy requires that such a junction should be heated or cooled according to the direction in which a current passes through it. This was discovered by Peltier.

Animal energy is simply a transformation of the potential energy of food. This is well illustrated by the increased diet which is required when man or beast abruptly changes from a state of inactivity to one of toil, as with a polar bear after his winter's sleep; or by the greater amount and better quality of food which are necessary for criminals subject to hard labor, than for those who are merely imprisoned.

Since, then, as far as we have yet seen, there is no such thing as gain or loss of energy anywhere, while it appears that the ultimate transformation of such energy is heat, and that the latter tends to a uniform diffusion or dissipation, in which it is unavailable, as far as we know, for further transformation (see *HEAT*), whence do we procure the supplies of energy which are requisite to maintain the economy of life? We answer: Chiefly, or indeed entirely, from the sun, whence they come as light and radiant heat, perhaps in other forms. Without the sun, where would be vegetation?—without the latter, where animal life? Where would be our stores of fuel, whether wood or coal? It is entirely then, we may say, to the directly supplied energy of the sun that we look for the maintenance of life; and this leads to a question not of much importance to ourselves, to be sure, but of vast future consequence to the human race: Is this supply finite? Will the sun in time have given off all its energy, or is it continually receiving accessions itself, and if so, has it an inexhaustible store to draw from?

Now, whether the sun be a hot mass, or be surrounded by an atmosphere in an intense state of combustion, or whether it derives the main part of its heat, as Thomson supposes, from gravitation (in a way presently to be considered), it is certain that, as far as we know, it must at some period be exhausted. Such is the apparently inevitable verdict of the conservation of energy.

The gravitation theory of the origin of energy generally may be given in some such form as this: The matter in the universe, in a state of coarser or finer division, originally filled all space, and possessed, therefore, by virtue of gravitation, a certain amount of potential energy. As particles gradually moved up to each other, and became slowly agglomerated into masses, more and more of this energy was realized in its kinetic form; some as heat (that of the sun, or the internal heat of the earth, &c.), some as vis-viva of axial or orbital rotation, &c. There still remains unagglomerated in space (see *ZODIACAL LIGHT, AEROLITES, COMETS, NEBULÆ*) much of this original matter still falling mainly towards the larger masses, as the sun and stars, and exchanging its potential for kinetic energy. But the latter, as we have seen, tends ultimately to become heat, and to seek a uniform diffusion. This, then, it appears, is to be the last scene of the great mystery of the universe—chaos and darkness as 'in the beginning.'

An immediate consequence of the truth of the conservation of energy is the impossibility of what is usually understood by the Perpetual Motion (q. v.); for it is to be carefully remembered that perpetual motion, in the literal sense of the words, is not only possible, but very general. If there were no such thing as friction, or if we had a perfectly smooth body, in the form of the tectonum, for example, it would spin for ever in vacuo with undiminished speed. The earth in its axial rotation affords a good example. Were it a perfect sphere, and of uniform material, the other masses of the system could produce no effect whatever on its rotation, and the latter would remain for ever unchanged. And even, as we have already seen, when one form of kinetic energy, as electricity, or ordinary vis-viva, is lost, we find it reappearing in other forms of kinetic energy, such as heat and light. But this is not the technical acceptance of the term, the perpetual motion; it is popularly understood to mean a source of motion which will not only preserve its own vis-viva unchanged, but also *do work*. This is, of course, incompatible with the conservation of energy, for wherever work is done, equivalent energy in some form or other is consumed. The ordinary attempts to obtain 'the perpetual motion' which are still being made in thousands by visionaries, are simply absurd, based as they are for the most part on ignorant applications of mechanics. There is absolute impossibility here; 'and a perpetual motionist' of the common herd is far more infatuated than a 'squarer of the circle;' for the latter's problem *may* be solved, though certainly not by the means usually employed, or in the form usually sought for.

We may now briefly consider the chief theories of the various forms of energy which have been advanced of late times. All of them assume at the outset forces of attraction or repulsion between particles, or else a highly elastic fluid, or rather solid, if we may so call it, in which the particles of matter float, or are imbedded. We have already considered the difficulties attending the latter supposition; but it is the only one which does not refer force back to force, thus apparently leaving the question where it found it. We may dismiss it with the remark, that a fluid or quasi-solid absolutely continuous and alike in every part is difficult to conceive; and it is hard to understand how motion can be propagated through it.

If it be not continuous, forces must be supposed to be exerted by its parts on each other, else the motion of one part would not affect the others. There is one way in which the latter difficulty has been attacked, which seems plausible enough; and that is, that the particles of this fluid are in a state of rapid motion, and continually impinging on each other and on the particles of matter, no forces being exerted except those of pressure at the impact. This is the notion of Le Sage. But, unless these particles be supposed *elastic*, their motion would be lessened at every impact, and destroyed completely if the impact were direct. This objection seems to be a very strong one. The first-mentioned theory, that of Epinus and Mosotti, assumes that material particles float in a general atmosphere of ether, that the particles of each repel one another, but that a particle of matter attracts one of ether. From these suppositions, and an hypothetical law connecting pressure with density in such an ether, Mosotti has deduced gravitation and the molecular forces; but to apply the hypothesis to the other physical energies, other suppositions are necessary. These have been supplied by Clausius and Redtenbacher, who, with the assumptions of particles of matter and of ether as before, imagine those of matter to attract each other, and also those of ether, but the latter to be mutually repulsive. Light and radiant heat, according to this theory, are vibrations of the ether which fills all space between the particles of matter, or rather, between the atmospheres of ether which, by the foregoing assumptions, the particles of matter will collect about them. Heat consists of vibrations of the molecules of matter, or of the groups of atoms (see *ATOMIC THEORY*) of which the molecule of a compound body is built up, together with their atmospheres. Electricity, magnetism, &c., are explained to be rotations in the atmospheres. Redtenbacher and Clausius are not quite agreed as to the physical energies corresponding to each of these forms of motion, but the above sketch will give a general idea of the nature of their speculations.

But the most startling of all the reflections on force, and its ultimate nature, which have perhaps ever been made, are those of Faraday. Without calling in question in ordinary cases the truth of the conservation of energy, he has endeavored, by experiment (the only genuine test in a question so novel and so profound), to prove what may be called the Conservation of Force. Here we understand *force itself*, and *not energy*. He argues thus: Two masses, according to the undisputed law of gravitation, attract with four times their mutual force if their distance be diminished to half; and with only one-fourth of the same, if their distance be doubled. He asks *whence* comes the additional force in the former, and *what becomes* of the lost force in the latter case?

Now, it is evident that this is a new question, totally distinct from any we have yet considered. To answer it we must know *what* force is. Would gravitation have any existence if there were but one particle of matter in the universe, or does it suddenly come into existence when a second particle appears? Is it an attribute of matter, or is it due to something between the particles of matter? Faraday has tried several experiments of an exceedingly delicate kind, in order to get at some answer to his question. A slight sketch of one of them must suffice.

A pound-weight is not so heavy at the ceiling of a room as it is when on the floor; for, in the former case, it is more distant from the mass of the earth than in the latter. The difference for a height of 30 feet is (roughly) about $\frac{1}{350,000}$ th of a pound. Now, if a mass of metal be dropped through such a space, an additional force, $\frac{1}{350,000}$ th of its weight, is called into play, and the object of the experiment was to detect whether electrical effects accompanied this apparent *creation* of force. The mass, therefore, was a long copper wire, whose coils were insulated (see *ELECTRICITY*) from each other, and whose extremities were connected with those of the coil of a delicate Galvanometer (q. v.). Had any trace of an electric current been produced, the needle of the galvanometer would have been deflected, but, when all disturbing causes were avoided, no such deflection was detected. Other experiments with a view to the detection of other physical energies, were also tried, but, like the first, with negative results only.

We must not hastily conclude that there is such a *thing* as force, though we are in the constant habit of speaking about it. Our sensations are all more or less misleading until we can interpret them. The pain produced by a blow is quite a different thing

from the energy of motion of a cudgel; and when our muscular sense impresses on us the idea that we are exerting force, we must be cautious in our conclusions. For it is certain that force is *merely the rate per unit of length at which energy is transferred or transformed.*

There are, in mechanics, several other quantities which retain a fixed value under certain circumstances. We may briefly consider a few of them.

Conservation of Areas. Invariable Plane.—We have seen (CENTRAL FORCES) that if a particle move about a center of force, its motion is confined to a plane, and its radius vector traces out equal areas in equal times. Similar theorems hold in any system of particles acted on only by their mutual attractions. If in such a system we suppose the positions of the respective particles to be continually projected (orthogonally, see PROJECTION) on any fixed plane, and radii vectores to be drawn from any point in that plane to the projections—the sum of the areas swept out by all those radii vectores will be equal in equal times. Also, this being true of all planes, there is one for which this sum is a maximum, and this plane is fixed in space. It is thence called the invariable plane of the system. Similar propositions hold for a system of bodies each of finite size, their several axial rotations being taken into account; hence what is called the invariable Plane (q. v.) of the Solar System.

Conservation of Momentum.—When two masses attract or impinge, the forces they exert on each other are evidently equal and opposite. Now, the measure of a force is the momentum it produces; hence equal and opposite momenta, in addition to their original quantities, will be communicated to the masses, and therefore the sum of the momenta of the two, resolved in any direction, will be unaltered; hence, *the sum of the momenta of any number of bodies will be unaltered by mutual actions either of the nature of attraction or impact.*

Conservation of the Motion of the Center of Gravity.—Again, in such a system, the momentum of the whole collected at its center of inertia, resolved in any assigned direction, is the sum of the momenta of the separate bodies in that direction; hence, *the center of inertia of a system, subject to none but the mutual actions of its components, either remains at rest, or moves uniformly in a straight line.*

For a simple, and as far as possible non-technical, discussion of the subjects so briefly noticed above, the reader may be referred to Tait's *Recent Advances in Physical Science* (second edition).

FORCE AND FEAR. As consent is of the essence, or rather is the essence of all contracts, and as consent implies not only intelligence, but unfettered power of action in the consenting parties, contracts, by the laws of all civilized nations, will be invalidated if it shall be proved that they were entered into under the influence of force or fear. Circumstances which constrain the will have the same effect as those which blind the understanding, and the law of force and fear is consequently closely analogous to that of Fraud (q. v.), including under that head misrepresentation, concealment, and consequent Error (q. v.). But it is not every degree of constraint, however exercised, which will have this effect in law. On the contrary, it must be of such a description as may be reasonably supposed to influence the will of the party in the circumstances in which he is placed at the time. In determining, therefore, whether there really has been force or fear in the legal sense, the law will take into account the age, sex, education, and other personal characteristics of the party, along with the accidental circumstances in which he was placed, e. g., the state of his health and spirits at the time, whether he was alone, what anxiety he may have felt for the life or interest of others, and the like. But 'where there is no peculiar weakness of age or sex, or condition,' says Mr. Bell, stating in this respect not the law of Scotland alone, but of most other countries, 'law will require, in order to annul a contract, such fear and compulsion as may reasonably shake a mind of ordinary constancy and resolution, and will not listen to the pretence of every vain and foolish fear.'—*Com. i. p. 22, Shaw's ed.* As a contract which is invalid on the ground of force and fear is not only incapable of being enforced after its invalidity has been ascertained by legal process, but from the absence of consent was invalid *ab initio*—i. e., no contract, in a legal sense, at all—the object of the law is to restore the parties to the position in which they were before it was entered into. All moneys which have been paid under the provisions of the extorted contract must consequently be repaid, and reparation in as far as possible must be made by the payment of damages for such personal injuries as the party who was dragged into it may have suffered from the enforcement of its provisions. See REDUCTION. By the law of England, Duress (q. v.) which will invalidate a contract must amount to fear of the loss of life or limb called Mayhem.

'Whatever is done by a man to save either life or member,' says Blackstone, 'is looked upon as done upon the highest necessity and compulsion. Therefore, if a man, through fear of death

or mayhem, is prevailed upon to execute a deed, or do any other legal act, these, though accompanied with all other the requisite solemnities, may be afterwards avoided.' But 'a fear of battery or being beaten, though never so well grounded, is no duress; neither is the fear of having one's house burned, or one's goods taken away and destroyed, because in these cases, should the threat be performed, a man may have satisfaction by recovering equivalent damages.'—*Stephen's Com. i. p. 142.* The avoidance of such a contract is, however, dependent on the will of the injured party. 'A contract made under duress may be avoided by the person whose free-will was thus restrained, though he has also an election, if he thinks proper, to insist upon it as a binding transaction' (*Ib. vol. ii. p. 62*). But the parties who are entitled to treat a contract either as a nullity or a subsisting contract, must make their election, and cannot, after treating the contract as rescinded, set it up as a subsisting contract (*Addison on Contracts, pp. 273, 436, and 1074*).

FORCELLINI, EGIDIO, an Italian philologist of great attainments, was born on the 26th of August 1688, in a village near Padua. Owing to the limited means of his family, F. was deprived of the benefit of early instruction, and was already verging towards manhood when enabled to commence a regular course of study in the seminary at Padua. His zealous industry, combined with unusual powers of learning, singled him out from his companions, and won the admiration of the learned principal, Giacomo Facciolati, who even associated him with some of his own scientific labors. The pupil rendered his teacher valuable service in the compilation of a highly important lexicon, a work which probably inspired both with the project on which F.'s literary repulse is based—viz., the compilation of a vast and comprehensive vocabulary of the Latin language. The work was published after F.'s death, and pronounced by public voice as one of the most valuable acquisitions to philological science of the age. In addition to the Italian and Greek signification of the Latin word, the literal and figurative application of each expression is given in a collection of examples, in themselves a perfect compendium of knowledge, embracing the customs, laws, arts, sciences, religion, and history of the Romans. This immense work was published in 4 vols., folio, under the title, *Totius Latinitatis Lexicon, consilio et cura Jac. Facciolati, opera et studio Aeg. Forcellini Lucubratum* (Padua, 1771). Furlanetto's appendix appeared in 1816 (Padua), and a new edition of the complete work was published in 1828 (Padua). F. died in 1768.

FORCENÉ, said, in Heraldry, of a horse when rearing, or standing on his hinder legs.

FORCEPS (Lat. a pair of tongs or pincers), the name given by surgeons to an instrument of great antiquity, used as a substitute for the fingers, and consisting of two levers of metal jointed together crosswise, nearer to one end than the other. The hand grasping the longer ends of the levers or handles, closes the shorter ends, which are shaped so as to seize firmly the intended object. There is scarcely a surgical operation in which it is not applied; and it is made of various forms, to suit different cases.

In addition to the forms used in Dentistry (q. v.), there is, e. g., the *dissecting* forceps, which has roughened points to lay hold of small portions of tissue which are to be divided by the knife; the *lithotomy* forceps, again, has blades concave like spoons; and *fenestrated* forceps have apertures in the blades, and as the soft tissues project into these, a firm hold is obtained with less risk of tearing the parts. By means of Liston's *cutting* forceps, a powerful hand can divide a great thickness of bone. But the most important of all is the *midwifery* forceps, an invaluable invention, in cases of difficult delivery, which daily rescues from suffering and danger numerous mothers and infants. It was gradually brought to its present perfection; but the name of Chamberlen, an accoucheur of the time of James II., is associated with it, as one of its chief improvers. It consists of two concave fenestrated blades, forming a cavity into which the head of the child fits. The blades are applied separately, one to each side of the head, and then locked together. Holding by the handles, the accoucheur aids the natural efforts of labor. The instrument does not necessarily or generally injure either mother or child.

FORCING, in Gardening, is the artificial application of heat to accelerate vegetation. The term is not usually applied to the cultivation of exotic plants in bothouses, where the object is to imitate as much as possible their native climate, but it is strictly applicable to the system usually pursued with vines and pine-apples, to secure the production of fruit at desired seasons and by different plants of the same kind in succession through a considerable period, the heat being increased for one set of plants sooner than for another. Many of the fruits and vegetables which grow well in the open air, are very commonly *forced*, in order that they may be procured at seasons when they could not without artificial means. Thus, sea-kale and rhubarb are forced by means of the heat produced by heaps of fermenting litter, by which at the same time they are blanched, and to this we

owe their appearance in the market very early in the season. Potatoes, pease, kidney-beans, asparagus, salads, &c., are often forced by means of hotbeds, or in flued pits; or a place is found for them in hothouses. Strawberries are cultivated in pots, and forced in hothouses; and some kinds of fruit trees are often treated in the same way, particularly cherries; and very diminutive trees may be seen richly loaded with fruit. Certain varieties are regarded by gardeners as particularly suitable for forcing. The system pursued in the Orchard-house (q. v.) cannot be called forcing.

FORD, FORDING. When a river or rivulet is crossed without the aid of either a bridge or ferry, it is said to be forded, and an established place for this crossing is called a ford. Thus, we have Oxford, Stratford, Deptford, Hungerford, &c., towns built around ancient fords. To the military engineer and the traveler in wild countries, the selection of the safest place for fording a river is a matter of some practical importance. In the first place, the widest part of the river should be chosen, as, wherever a certain quantity of water is flowing, the wider its bed—the rapidity of the flow being the same—the shallower it must be.

At the bend of a river, the line of shallow water does not run straight across, but extends from a promontory on one side to the nearest promontory on the other. The stream usually runs deep along hollow curves, and beneath steep perpendicular and overhanging banks, whilst it is always shoal in front of promontories, unless the promontory is formed by a jutting rock. For safe fording on foot, the depth of water should not exceed three feet; on horseback, four feet; or a foot less for each, if the current be very strong. The bottom of a ford should be firm and even; weeds, blocks of stone, &c., are serious obstacles, especially for cattle. When a caravan, a number of troops, or of cattle, have to cross, a sandy bottom is very bad, for the sand is stirred up and carried away by the stream, and renders the ford impracticable for the hindmost. For a small party, hard sand or gravel is the safest bottom.

The inhabitants of a district generally know the safest fords, and their experience affords a better guide than the best rules that can be given. Fords are continually varying, either from the swelling of the river or the shifting of its bed or banks, and therefore it does not follow that the place set down by one traveler as a safe ford, will continue so for the next that succeeds him.

FORD, JOHN, an English dramatist, was the second son of Thomas Ford of Ilington, in the county of Devon. The date of his birth is not known, but he was baptized in Ilington Church, 17th April 1586. His family was connected with the famous Lord Chief Justice Popham, and he became a member of the Middle Temple in November 1602; his cousin, a John Ford also, at the same period being a member of Gray's Inn. Unlike many members of the poetic tribe, F. seems to have adhered to his studies, and to have attained some professional success. His first poem was an elegy on the death of the Earl of Devonshire, entitled *Flume's Memorial*, and subsequently he assisted in the composition of various plays; perhaps from his conjunction with Webster and Decker, in this way, he acquired, or at least whetted, his appetite for tragic horrors. In 1629, he produced *The Lover's Melancholy*; and four years after, *The Broken Heart*, and *Love's Sacrifice*. Next year came *Perkin Warbeck*; and in 1638—1639, *The Fancies Chaste and Noble*, and *The Lady's Trial*. After this, F. drops out of literary history. Some think that he died soon after; others, that he retired to his native place, married, and lived to an old age, with sons and daughters growing up around him.

F. takes a high position as a dramatist, and this position he attains more by general mental force than by dramatic instinct, or by what we are accustomed to call poetic genius. In his compositions, there is a sense of effort; his writings look like task-work; and one can hardly suppose that he enjoyed his work. His versification—even when the subject matter is distinctly noble—is hard and prosaic. He has no humor. He has been praised for his pathos, but in his pathetic scenes effort is apparent. He cannot 'flatter' you to tears, as Shakspeare and the greater poets do. An edition of his works, published by Moxon (Lond. 1840), is enriched by biographical and critical notices by Hartley Coleridge; another, by the Rev. Alex. Dyce, appeared in 1869.

FORDUN, JOHN OF. Nothing more is certainly known of this early Scottish chronicler, than that he was a secular priest, and wrote about the year 1380. It has been inferred from his name that he was born at Fordun, in Kincardineshire, and it has been said that he was a canon of the cathedral church of Aberdeen. Having proposed to himself the compilation of a chronicle of Scotland, he is said to have traveled on foot through Britain and Ireland in search of materials. He lived to write only five books of his *Scotichronicon*, bringing the history down to the Death of King David I. in 1153. He left collections extending to the year 1385, about which time he is supposed to have died. The work which John of F. had left unfinished was resumed in the year 1441 by

Walter Bower, abbot of the monastery of Austin Canons Regular, at Inch Colm, or St. Colm's Inch, in the Firth of Forth. He enlarged the five books which F. had completed, and making use of his collections so far as they went, wrote eleven new books, bringing the *Scotichronicon* down to the year 1437; but he also made many arbitrary alterations which present things in quite a different light from Fordun's narrative. The work is the chief authority for the history of Scotland prior to the fifteenth century; its value being greatest during the fourteenth, when it is contemporary. It exists in upwards of twenty MSS., the principal of which is preserved in the Wolfenbüttel library. Four printed editions have been published, but the best is that edited by W. F. Skene (2 vols. Edinburgh, 1871—1872), from the text of the Wolfenbüttel and other standard MSS. Bower's interpolations and additions are separated from Fordun's text.

FORE (i. e., first), a term applied to the front or foremost part of a ship. The *forehold* is that part of the hold intervening between the cutwater and the foremast. The *forecastle* is that portion of the upper deck extending from the foremast to the bow; it is the part to which the common sailors have free access, and probably derives its name from a small turret or castle placed near the prow in ancient vessels, from which darts and other projectiles could be most conveniently hurled upon an enemy. *Foremast* is the first of the three masts, or of the two, when only that number are present. It is surmounted by the foretop-mast, foretopgallant-mast, and foreroyal; its sails being foresail, foretopsail, &c., between it and the bow flies the forestaysail, hoisted on the forestay, a massive rope passing from the foretop to the bow, and, with the backstays and shrouds, maintaining the mast in a perpendicular position. The *forebraces* are ropes passing from the extremities of the foreyard into the maintop, whence they descend through pulleys to the deck, where they serve, when necessary, to alter the direction presented by the foresail to the wind.

FORECLOSURE, in English Law, the process by which a mortgagor failing to repay the money lent on the security of an estate, is compelled to forfeit his right to redeem the estate. Every person having mortgaged his estate, is entitled to an equity of redemption, which can only be cut off by a formal process. For this purpose, the mortgagee files a bill of foreclosure, praying that an account may be taken of the principal and interest due under the mortgage, and that the mortgagor, on failing to pay, may forfeit his equity of redemption. If on the day fixed for payment, the money be not forthcoming, the mortgagor will be declared to have forfeited his equity of redemption, and the mortgagee will be allowed to retain the estate in perpetuity. See **MORTGAGE**.

FOREHAND RENT. In Scotch Law, rent is said to be forehand when it is made payable before the crop, of which it is the rent, has been reaped. After the period when it is due and exigible, forehand rent is *in bonis* of the lessor, and passes to his executor, not his heirs (Bell's *Law Dictionary*).

FOREIGN ATTACHMENT may have reference either to person or property. A defendant who has been arrested or attached in a foreign country, may be again arrested in England on the same ground of action. Thus, where a defendant had been arrested abroad on an English judgment, and escaped and came to England, the Court of Queen's Bench decided that he may be holden to bail in an action on the judgment. But after an arrest in Ireland or Scotland, the defendant cannot, in general, be again arrested in England for the same debt, neither of these countries being deemed foreign to that effect (Wharton's *Dic.*). Under the same name, a proceeding for securing the debts due to the defendant has been immemorially used in the cities of London and Bristol (Stephen's *Com.* iii. p. 663, *note*); and by the C. L. P. Act of 1854, a similar proceeding has been adopted, but with this difference, that whereas by a foreign attachment in the Lord Mayor's Court, debts are attached for the purpose of compelling the defendant to appear and put in bail to the action, no such proceeding can take place in the common-law courts till after judgment. See **GARNISHMENT**. In Scotland, where a creditor may both incarcerate a debtor and attach his effects, an English creditor may attach the property of his debtor, though he has imprisoned him in England. See **ATTACHMENT**, **APPREHEND**, **ARREST**, **FOREIGN COURTS**. The corresponding phrase in Scotland is *Arrestment*, which has reference both to person and goods, and is a proceeding at common law applicable to the whole country. As to the validity of a Scotch arrestment, *ad fundam jurisdictionem*, to enable the Scotch courts to proceed against a foreigner though absent, see the recent appeal case of the London and North Western Railway Co. v. Lindsay, Macqueen, iii. p. 99.

FOREIGN AUXILIARIES. In the early periods of English history, foreign auxiliaries were by no means uncommon. Harold had a body of Danes in his army when he defeated the Norwegian king; and to their refusal to march against the kindred Normans he owed not the least among the complications which ultimately overwhelmed him. Passing to modern times, William III. had

for some time a body of Dutch troops in his pay as king of England: throughout the 18th c., Hessian and Hanoverian regiments were constantly in the pay of the English government for temporary purposes. Hessians fought for us in the first American war; and the Landgrave of Hesse, who sold his troops at so much a head, received upwards of half a million for soldiers lost in the campaign. During the Irish rebellion, again, in 1798, many Hessian troops were employed.

On the outbreak of the continental war in 1793, it was determined to recruit the British army by the addition of a large body of foreigners; and accordingly, in 1794, an act passed for the embodiment of the 'King's German Legion,' consisting of 15,000 men. These troops, who were increased in the course of the war to nearly double that number, distinguished themselves in various engagements, and formed some of the regiments on which our generals could best rely. Corps of French *émigrés*, as the York Rangers and others, were also organized. The whole of the foreign legions were disbanded in 1815, the officers being placed on half-pay.

During the Russian war, in 1854, the British government again had recourse to the enlistment of foreigners; special provision being made in the act authorizing their employment, that the arms of the legionaries were in no case to be used against British subjects, in the event of internal discord. The numbers to be raised were 10,000 Germans, 5000 Swiss, and 5000 Italians; the pay to be the same as to British troops, but temporary service to convey no claim to half-pay. About half the number of men were enrolled, and were said to have reached great efficiency, when the stoppage of hostilities arrested their progress, and caused them to be disbanded at a great cost for gratuities, &c.

The Swiss auxiliaries used to form a regular contingent in many of the armies of Europe, especially of France and Italy. Over 1,000,000 served in France from the time of Louis XI. to that of Louis XIV. (1465—1715). See GARDES SUISSES. The Swiss usually served only on condition of being commanded by their own officers, and occasionally these officers obtained distinction and fame. But the privates returned home poor and often demoralized; and the cantons which supplied most mercenaries suffered severely by their absence. After the French Revolution, the cantons ceased publicly to hire out their subjects; and after 1830 most of the cantons forbade foreign enlistment. In 1859 the Confederacy passed a severe law against recruitment for service abroad. There is still, however, a large contingent of Swiss as mercenaries in the Dutch East Indian Colonies. The Papal Swiss troops have shrunk to a body-guard of about 100 men.

FOREIGN BILL OF EXCHANGE is a bill which is either both drawn and accepted abroad; or drawn by a person residing abroad on a person in this country, or the reverse. If a bill be drawn abroad, and accepted in England, it does not require a stamp; but if drawn in this country upon a correspondent abroad, or a foreign house, it must be stamped (19 and 20 Vict. c. 97, ss. 6 and 7); and when drawn abroad, it must be stamped by the holder, before he can present it for payment, or indorse, transfer, or otherwise negotiate it within the United Kingdom (Chitty on *Bills of Exchange*, 72). It has however, been decided that the stat. 17 and 18 Vict. c. 83, s. 3, does not render a stamp necessary where a bill drawn abroad has been indorsed abroad to a person in England, and presented by him for acceptance in England (Phillimore, *International Law*, iv. 609). Formerly, a bill drawn or payable in Scotland or Ireland, was foreign in England; but such bills were made inland by the statute just mentioned; and the same regulation was extended to the island of Man, Guernsey, Jersey, Alderney, and Sark (s. 7). See **BILL**. It has been established as a rule in England, that the liabilities of the drawer, the acceptor, and indorser, shall be governed by the laws of the countries in which the drawing, acceptance, and indorsement respectively took place (Phillimore's *International Law*, iv. p. 606 and 506).

In the case of bills which are both drawn and accepted abroad, and which are thus in reality foreign contracts, but of which the acceptor is a native of this country, and which are sought to be enforced in the courts either of England or Scotland, a distinction is made between the contract and the remedy: 'Whatever relates to the nature of the obligation—*ad valorem contractus*—is to be governed by the law of the country where it is made—the *lex loci*; whatever relates to the remedy, by suits to compel performance, or by action for a breach—*ad decisionem litis*—is governed by the *lex fori*—the law of the country to whose courts the application is made for performance or for damages.'—Lord Brougham in *Don v. Lippman*, House of Lords, 26th May 1837; Shaw and Maclean, ii. p. 723.

FOREIGN COURTS. Kent, after stating that in cases not governed by the constitution and laws of the United States, the doctrine of the English law, as to the force and effect to be given to foreign judgments, is the law of his own country also, observes, that the law thus common to England and America 'is exceedingly, if not peculiarly liberal, in the respect which it pays to

foreign judgments, in all other cases except the case of a foreign divorce or an English marriage. A distinction was early taken by Lord Nottingham, and is now recognized both in England and America, and indeed almost everywhere else, between a suit brought to enforce a foreign judgment, and a plea of a foreign judgment in bar of a fresh suit for the same cause. As the effect to be given to a foreign judgment is altogether a matter of comity, in cases where it has not been regulated by positive treaty, and no sovereign is bound to execute within his own dominions a sentence given out of it, the rule adopted, where a suit is brought to enforce a foreign judgment, is that the foreign judgment is to be received, in the first instance, as *prima facie* evidence of the debt, but that the defendant is entitled to impeach the justice of it, or to show that it was irregularly and unduly obtained. But the case is different where the losing party comes forward and wishes to institute a new suit upon the same matter, and to open up a foreign judgment dismissing the action, pronounced by a competent court. In this case, to interfere with the foreign judgment would be to assume the attitude of a court of review, and the rule in England, consequently, is that such a decision, when given by a foreign court, is final and conclusive. So obvious, indeed, is the convenience and necessity of this rule, that it has been regarded as forming a portion of general jurisprudence.'—Kent's *Com.* ii. 101, 102. As regards the enforcement of foreign decrees and judgments, the usages of nations have differed considerably, and the subject is far too wide and too difficult to admit of being satisfactorily discussed in this work. The distinction between the recognition of the judgment of a foreign court, as determining the validity of a foreign contract, and the application of a foreign remedy by the courts of this country, has been pointed out under **FOREIGN BILL OF EXCHANGE** (q. v.).

For practical purposes, however, it may be convenient that we should state that, contrary to the popular belief in England, the French courts are in the habit of giving effect to judgments obtained in England, and that debtors cannot escape from their creditors, as is too generally supposed, by simply crossing the Channel. The difficulty, no doubt, still exists where the debtor has escaped before any proceedings could be taken against him in this country, and where no judgment can be obtained. But if he has once been served with process in England, or cited either edictally or otherwise in Scotland, the creditor may go on with his action against him though he be personally absent from the country, and ultimately enforce his decree against him by the interposition of a French court. The same observations apply to Belgium. In England, there is no regular office, as in Scotland, for the publication of citations to persons abroad (see **EDICTAL CITATION**), but leave to substitute service at the last place of abode, in place of personal service, may now be obtained in some cases from the courts, or leave may be granted to serve out of the jurisdiction. In most countries, the rule as to two foreigners resident but not domiciled is, that they may sue each other in the ordinary courts, as natives do. To this the French courts are an exception, and hold themselves incompetent to entertain suits between undomiciled foreigners relating to personality, except in matters of commerce (Phillimore, *International Law*, iv. 645). See **JURISDICTION**; **DOMICILE**; **INTERNATIONAL LAW**, **PRIVATE**; **CONFLICT OF LAWS**, &c.

FOREIGN ENLISTMENT ACT. In the law of England, there was a statutory prohibition of enlistment in the service of a foreign prince in 3 Jac. I. c. 4, s. 18; but the statute commonly known as the Foreign Enlistment Act is 33 and 34 Vict. c. 90. It provides that if any British subject shall agree to enter the service of any foreign state, either as a soldier or a sailor, without the license of her majesty, or an order in council or royal proclamation, or if any person within the British dominions induces any other person to enlist in the service of a foreign state, such person shall be guilty of a misdemeanor. The officers of the customs, on information on oath, may detain any vessel having persons on board destined for unlicensed foreign service. Masters of vessels, knowingly having such persons on board, are punishable by fine or imprisonment, or both. Persons building any vessel for foreign service, without license, are guilty of a high misdemeanor, and the ship and stores are forfeited. Even to assist a foreign state with warlike stores, without license, is a misdemeanor punishable with fine and imprisonment. These penalties are irrespective of any consequences that may follow to the individual for having committed a breach of international law.

FOREIGNER. See **ALIEN**.

FO'RELAND, NORTH and SOUTH, two promontories on the east coast of Kent, between which are the Downs and Goodwin Sands. North F., the *Cantium* of Ptolemy, forms the north-east angle of the country and of Thanet Isle, in lat. 51° 22' N., and long. 1° 26' E., two miles east of Margate. It consists of chalky cliffs, nearly 200 feet high, projecting into the North Sea, and has a light-house with a fixed light, 184 feet high, and seen 24 miles off. South F., also composed of chalk-cliffs, is 16 miles south of

North F., 3 miles north-east of Dover in lat. $51^{\circ} 8' N.$, and $1^{\circ} 22' E.$ It has two fixed lights, respectively 380 and 275 feet above the sea, and seen from a distance of 25 and 22 miles. From this point, there is often a magnificent view of 200 to 300 merchantmen passing by, after having been detained by contrary winds in the Downs.

FO'RELOCK is a flat wedge driven through the end of a bolt to prevent its withdrawal: it is used principally on board ship.

FORESHORTENING, a term in Painting or Drawing, applied to signify that a figure, or a portion of a figure, which is intended to be viewed by the spectator directly or nearly in front, is so represented as to convey the notion of its being projected forward; and, though by mere comparative measurement occupying a much smaller space on the surface, yet to give the same idea of length or size as if it had been projected laterally. In compositions of figures and groups on ceilings, and in the interior of domes, &c., numerous examples will be found in which this art has been put in practice; in the works of Raphael, foreshortening is practised with most judgment and correctness; those of M. Angelo, Correggio, and Tintoretto display the greatest boldness; but the three last-named artists have been censured for introducing foreshortening too frequently into their compositions, for the purpose of parading their skill in practising it.

FOREST FLY (*Hippobosca equina*), an insect of the order *Diptera*. It receives the name F. F. from its frequent occurrence in forests, and particularly in the New Forest, Hampshire. It is also sometimes called **HORSE FLY**, from the annoyance which it gives to horses. It is a small insect, about four inches long; its wings, two in number, much exceeding the length of the abdomen. When at rest, the wings are laid flat on the back, one overlapping the other. The general color is brown, the thorax varied with pale yellow, the legs ringed with yellow and brown. The legs terminate in hooked claws. The skin is leathery and remarkably tough, so that the insect cannot be killed by any ordinary amount of squeezing. The structure of the mouth differs much from that of ordinary dipterous insects, and bears



Forest Fly (*Hippobosca equina*), magnified: 1, natural size; 2, the pupa, as deposited by the mother.

no inconsiderable resemblance to that of fleas. The F. F. lives by sucking the blood of quadrupeds, sometimes of oxen, dogs, &c., but most of all of horses. High-bred horses with smooth hair are most liable to this annoyance. The female F. F. does not deposit her eggs until they have reached the pupa stage in her abdomen. One only is produced at a time, enclosed in a tough, strong skin, egg-like, black, and shining like a bead, wonderfully large when the size of the abdomen from which it came is considered; the perfect insect finally emerges by bursting open a kind of lid or cap.

FOREST LAWS, in England, laws for the regulation of the royal forests. Forest is defined by Lord Coke to be a safe preserve for wild animals (*feræ*) of the chase, whence comes the term *foresta*, by the change of *e* into *o* (*Co. Litt.* 233 a). Both words probably spring from the same root as the Latin *foris* and the French *hors*, and signify that which is *without* the range of the peopled or cultivated country. Hence the Italian *forestiere* and *foresto*, and the Spanish *forestero*, signify strange, foreign, wild, and the like.

A forest, in the sense of the law of England, is a large tract of open ground, not necessarily covered with wood, but usually containing woodland interspersed with pasture, and forming part of the property of the monarch, and governed by a special code, called the forest law. This particular law had reference not only to matters connected with hunting and the like, but generally governed the persons living within the forest in all their relations. A chase is a smaller forest, in the hand of a subject, but not governed by forest law. Though the privilege of forest belongs of right to the sovereign alone, it may be granted by him in favor of a subject, who becomes entitled to exercise the privileges of forest in the district assigned. This right was exercised by the Saxon kings, who reserved large tracts of country for the royal pastime of hunting, and a charter of the forest was said to have been passed by Canute at Winchester in the year 1016. But the authenticity of this document is doubted by Lord Coke (*Inst.* iv. 320). William the Conqueror greatly extended the royal forests, by laying desert vast districts in Hampshire and Yorkshire; he also introduced penalties of the severest kind for offences against the game. The penalty for killing a stag or boar was loss of eyes; for William loved the great game as if he had been their father (*Sax. Chronicle*). It was not till the reign of Henry III. that the laws of the forest were reduced into a regular code. In the reign of that monarch was passed the charter of the forest, 9 Henry III.

(A.D. 1224). The right of the sovereign to create a forest is by the common law confined to lands of his own demesne. Henry II. had arbitrarily exercised his power by afforesting the lands of his subjects; but by the 1st and 3d chapters of the charter of the forest, it is provided that all forests so made should be disafforested. At a subsequent time, when Henry VIII. created Hampton Court Forest, he was obliged to obtain the consent of the freeholders, before he could erect a chase or forest over their grounds (*Coke Inst.* iv. 301). Mr. Hallam remarks: 'It is well known that Charles I. made Richmond Park by means of depriving many proprietors not only of their common rights, but of their freehold lands. It is not clear that they were ever compensated; but I think this probable, as the matter excited no great clamor in the Long Parliament.'—Hallam, *Const. Hist.* i. 463, note, 1st ed. By the charter of the forest, the penalties for destroying game are greatly modified. By cap. 10, it is provided that no man should lose life or limb for slaying deer, but that the punishment shall be restricted to fine or imprisonment for year and day. Cap. 11 contains the following curious privilege: 'Whatsoever archbishop, bishop, earl, or baron, coming to us at our commandment, passing by our forest, it shall be lawful for him to take and kill one or two of our deer by view of our forester if he be present; or else he shall cause one to blow an horn for him, that he seem not to steal our deer; and likewise they shall do returning from us.' This law is still unrepealed; so that a bishop may kill the Queen's deer, when summoned to or returning from parliament. Charles I. attempted to fill his empty exchequer by imposing penalties and exacting fines for alleged encroachments on the ancient boundaries of the forests, though the right to the lands thus taken was fortified by possession for several centuries.

This was one of the first grievances with which the Long Parliament dealt, and since the passing of the act for the 'certainty of forests' (16 Car. I. c. 16), the law of the forests have practically ceased. In Coke's time, there were sixty-nine royal forests, all of which, with the exception of the New Forest and Hampton Court Forest, had been created before the period of record. Of these, the principal were—the New Forest, Sherwood, Dean, Windsor, Epping, Dartmoor, Wichwood, in Oxfordshire, Saley Whittlebury, and Roekingham, in Northamptonshire, Waltham, in Lincolnshire, and Richmond, in Yorkshire. During the present reign, several of the royal forests have been disafforested by act of parliament—Hainault, 14 and 15 Vict. c. 43; Whittlewood, 16 and 17 Vict. c. 42; Wichwood, 19 and 20 Vict. c. 32. Public necessity is the plea on which these spots, long so famous for their silvan scenery, have been condemned. The plea is one which cannot be altogether disregarded; but it is to be hoped that it will not be suffered to prevail to the entire destruction of our royal forests, some of which, from their vicinity to large towns, afford resorts for public recreation highly prized by the citizens, and which never can be equalled in beauty and in healthfulness by any new-made pleasure-ground.

The royal forests of Scotland, in ancient times, seem to have been nearly as numerous as those of England. In Perthshire, there were the forests of Athole, Mamlorn, Glenartney, Glenfynlas, Glenalmond, Birnam, Cluny, Alyth, &c. In Forfarshire, there were Platan, Montrethmont, Kilgerry; in Kincardineshire, Cowie and Durris; in Aberdeenshire, the Stocket, Dyce, Kintore, Benachie, Drum, Birse, Braemar; in Banffshire, the Boyne and the Enzie; in Morayshire, Darnaway, &c. South of the Forth, there were the forests of the Torwood, Cadzow, Ettrick, Selkirk, Jedburgh, Traquair, the New Forest in Dumfriesshire, &c. The *Leges Forestarum*—the Scottish Forest Laws—have been printed more than once; the best edition is in *The Acts of the Parliaments of Scotland*, vol. i. pp. 323—328 (Edin. 1844). The forest code of Scotland, though neither so complete nor administered with the same rigor as that of England, was still generally complained of for its severe penalties or vexatious restraints. The grant of a right of forestry conferred the same privilege as if the ground over which it extended had been originally, and had continued to be, a king's forest. Hence arose great oppression and annoyance to neighboring proprietors, and in 1680 the supreme civil court suggested that a representation should be made to the king against the granting of new forests. From a case which was recently decided, it would seem that the high pretensions of royal foresters have in some places survived to the present day. The Dukes of Athole still hold the extensive mountainous district called the forest of Athole, either in their own right or as foresters for the crown. In virtue of his rights of forestry, the sixth duke claimed the power of preventing his neighbor, the Laird of Lude, from killing deer on his lands, and maintained that he was bound to allow the duke and his keepers to enter on his lands, and drive back any deer that might stray upon them from the forest of Athole. But the court decided against the duke on both points. See **DEER FORESTS**.

Forest Courts were courts established for the purpose of enforcing the forest laws in the royal forests. Of these courts, there were in England four—viz., the Court of Attachments, the Court

of Regard, the Court of Swainmote, and the Court of the Lord Justice in Eyre in the Forest, or Justice Seat. The last Court of Justice Seat that was held where business was transacted was in the reign of Charles I., before Lord Holland.

FOREST MARBLE, a member of the Lower Oolite, so called because of the occurrence of the typical beds in Wichwood Forest, Oxfordshire. The principal bed is a fissile limestone, containing large numbers of dark-colored shells, and capable of sustaining a fine polish. On this account, it is used to some extent as 'marble.' It is interstratified with blue marls and shale, and fine oolitic sandstones. The whole thickness of the group seldom exceeds forty feet.

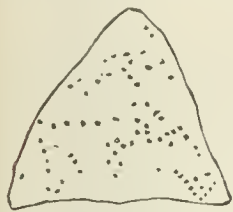
FOREST OAK, a name sometimes given in commerce to the timber of *Casuarina torulosa*, and other species of *Casuarina* (q. v.), Australian trees. This timber, which is light yellowish brown, and prettily marked with short red veins, is imported into Britain, and used for ornamental work.

FORESTALLING. See **ENGROSSING**.

FORESTS. See **ARBORICULTURE**.

FORESTS, FOSSIL, have been frequently observed in the coal measures. The seams of coal having in general been formed from the vegetation of the locality where they occur, it is to be expected that when the coal is removed, the stools and roots of the trees would be observed in the immediately subjacent bed of shale—the

ancient soil. Such a forest was laid bare in an open work at Parkfield Colliery, near Wolverhampton, in 1844. In this case of about one-fourth of an acre, the stumps of 73 trees, with their roots attached, appeared as shown in the annexed ground-plan. The trunks, broken off close to the root, were lying prostrate in every direction, often crossing each other. One of them measured 15, another 30 feet in length, but they were generally shorter. They were invariably converted into coal, and fattened to the thickness of 1 or 2 inches.



Ground-plan of the Fossil Forest at Parkfield Colliery.

The upright stems show that some of them had a circumference of more than 8 feet. Similar fossil forest have been observed in the coal-fields of Nova Scotia, and have been carefully described by Lyell, Logan, and Dawson. The usual height of the trees observed by Lyell was from 6 to 8 feet; but one tree was about 25 feet high, and 4 feet in diameter. Brogniart describes the remains of a fossil forest preserved in an upright position, in strata of micaceous sandstone, belonging to the coal measures at St. Etienne, near Lyon. Though most abundant in strata of the carboniferous period, fossil forests have been observed in other formations. The Dirt-bed (q. v.) of the Lower Purbeck series is the remains of an ancient forest. Instances are also abundant in the pliocene strata.

Sometimes, as on the coast of Devonshire and on the shores of the Firth of Tay, they are exposed on the surface, stretching from high-water mark to far below the furthest limit of low water; or they are exhibited in section, as in the cliffs of Eastern Norfolk, where, resting on the chalk or crag, there is a stratum in which the stools and roots of the trees stand in their natural position, the trunks having been broken short off, and imbedded with their branches and leaves. This stratum is covered with fresh-water beds and drift. The position of these forests indicates a variation, in recent geological time, of the relative level of land and water. The instances in Devonshire and Fifeshire may imply a simple subsidence of the land; at Norwich, however, a considerable depression must have taken place, to admit of the deposition of the fresh-water beds and the till, and a subsequent elevation, to expose the beds so high above the sea-level.

The remains of ancient forests, belonging to a yet later period, are to be found in beds of peat. There is good evidence that some kinds of peat had their origin in the destruction of forests. Trunks and branches of beech, hazel, fir, &c., are found in them, and their roots may be traced in the underclay. The rapidity with which this peat is formed is very remarkable. At Blair Drummond, the stratum of peat is eight to ten, and in some places even twenty feet in thickness. Many of the trees here have been felled with the axe, and that this was done while the Romans were in possession of the country, is proved by the discovery of 'corduroy roads,' leading from one camp to another, and the finding of camp-kettles at the bottom of the peat.

FO'RFANG, or **FOREFANG** (Sax. *fore*, before, and *fangen*, to take), the taking of provisions from any one in fairs or markets, before the king's purveyors were served with the necessities for his majesty. (Charter of Henry I. to the hospital of St. Bartholomew in London, anno 1133, referred to in Toulmin's *Die*.) It is also used to signify the rescuing of stolen or strayed cattle from a

thief, or from those having illegal possession of them; or the reward fixed for such rescue (Wharton's *Die*).

FO'RFAR, supposed to be the ancient *Orrea*, the county town of Angus or Forfarshire, situated near a small lake of the same name, on a rising-ground in the fertile valley of Strathmore. Pop. (1871) 11,031; (1881) 12,818. It has been a royal burgh since the reign of King David I. (1124–1153). It had a royal castle, of which no vestige remains, said to have been situated on a round hill, on the north side of the town, and to have been destroyed by order of King Robert Bruce, in the year 1307. Its staple manufacture is linen. It is connected by railway with Aberdeen, Arbroath, and the south. It joins with Montrose, Arbroath, Brechin, and Bervie, in sending a representative to parliament.

FORFARSHIRE, or **ANGUS**, is a maritime county in the east of Scotland, being bounded on the E. by the German Ocean, on the N. by Kincardine and Aberdeen shires, on the W. by Perthshire, and on the S. by the Firth of Tay. It extends from north to south 38 miles, and from east to west 27 miles, with 45 miles of coast. There are several valleys of considerable extent, the principal of which are Glen Isla, Glen Prosen, Glen Esk, Clova, and Lethnot, which are all well watered, and mostly productive. The surface of the county is irregular, and it is intersected with hills, the Sidlaw being 1400 feet high, and Catlaw, the highest, 2264 feet. The soil, which is various, ranging from the finest alluvial to the moorish, rests mostly on the old red sandstone and the trap. Devonian paving-stones, limestone, porphyry, and jasper, occur. The chief rivers are the Tay, North Esk, South Esk, and Isla; and there are some small lochs. F. is the chief seat of the Scotch linen manufacture. Cattle, corn, salmon, and paving-stone are the principal exports. The climate partakes of the qualities common to the east coast. The average of the fall of rain is about 25 inches. The valued rent of the county in 1674 was £171,440 Scots, or £14,287 sterling. The valuation for 1880–1881 was £639,282 sterling, including £53,066 of railways. In 1881, according to the agricultural returns of Great Britain, the total acreage in the county of all kinds of crops, bare fallow, and grass, was 253,203; under corn crops, there were 94,104 acres; under green crops, 53,813; and of clover, sanfoin, and grasses under rotation there were 80,338. The total number of cattle returned for 1881 was 45,835; sheep, 119,386; pigs, 4964. The number of horses used solely for agriculture, &c., returned by occupiers of land in the same year, was 10,358. Pop. (1871) 237,567, which had, in 1881, increased to 266,374. The chief towns are Dundee, Arbroath, Montrose, Forfar (the county town), Brechin, and Kirriemuir. The county returns one member to parliament, and the boroughs two. Angus was the province of a *Mormaer* during the Celtic period of Scottish history. It appears as an earldom in the 12th century. Its first earls were probably the descendants of the old *Mormaers*; it passed subsequently to the Umphravilles, the Stewarts, and the Douglasses. The castle of Forfar was the residence occasionally of some of the kings, until the time of Alexander III. The chief antiquities are some Roman camps, the vitrified fort of Finhaven, the remarkable stone forts of the White Caterthun, near Brechin, and of the Laws, near Dundee; the sculptured stone pillars at Meikle, Aberlemno, St. Vigeans, Glamis, Kirriemuir, Aldbar, Invergowrie, &c.; the fortified island of St. Margaret's Inch in the Loch of Forfar, the round tower and cathedral of Brechin, the ruins of Restennet Priory and Arbroath Abbey; and the old baronial castles of Glamis, Red Castle, Edzell, Melgund, Finhaven, Airlie, Careston, Inverquhar. At Stracathro, it is said Baliol resigned the crown to Edward I. Several eminent men were born in this county—Hector Boece, Andrew Melville, the Marquis of Montrose, Joseph Hume, Sir Alexander Burnes, Robert Brown the botanist, James Mill the historian of British India; and Graham of Claverhouse had a seat at Finty Mains.

FORFEITURE AND CORRUPTION OF BLOOD are penalties consequent on convictions for treason or felony. The penalty of forfeiture for treason is founded on this consideration, that he who hath thus violated the first principles of government, and broken his part in the original contract between king and people, hath abandoned his connection with society, and hath no longer any right to those advantages which before belonged to him purely as a member of the community (Stephen's *Com. iv.* 497). The penalty of forfeiture for treason prevailed in England before the Conquest, as is clear from the fact, that lands held in gavelkind, which is a Saxon tenure, may be forfeited for treason. But after the Conquest, forfeiture of lands and goods came to be regarded as the peculiar punishment of felony, of which treason against the sovereign was the highest kind, and was denominated high treason, to distinguish it from all other felonies, which were called petty treason. In cases of treason, the offender forfeits all his lands absolutely to the crown. In felony, according to the old law, the offender forfeited to the crown the profits of all estates of freehold during his life, and all his estates in fee-simple for a year and a day, after which they became escheat to the lord.

The crown, during the year of occupancy, was entitled to commit upon the lands what Waste (q. v.) it pleased. By *Magna Charta*, this power of committing waste was restrained. But by 17 Ed. II. c. 16, the king's title to waste was again recognized. As the law now stands, murder is the only felony by which forfeiture for year and day is incurred. In all felonies, the goods and chattels of the offender are, on conviction, forfeited to the crown; but until conviction, forfeiture of the goods does not operate. Where, therefore, a person has disposed of his goods before conviction, the crown cannot reach them. Forfeiture of lands does not take effect until sentence of Attainder (q. v.) has been pronounced. So that a person committing *Felo de se* (q. v.), or a rebel dying before sentence, or killed in open rebellion, does not forfeit his lands. But sentence of attainder, as soon as pronounced, has a retro-active effect, and annuls all conveyances made between the act of treason or felony and the pronouncing of sentence. Conveyances made before the act of treason are not affected. Hence, a wife's jointure is not forfeited, because settled on her before the commission of the act. But dower is forfeited by 5 and 6 Ed. VI. c. 11. Counterfeiting the coin was formerly treason; but by various statutes, it is provided that the wife's dower should not be forfeited, and that the lands should be forfeited only for the life of the offender. Forfeiture for treason and felony is accompanied by *corruption of blood*, whereby the offender is incapable of inheriting any lands or of transmitting any title to an heir. But where the lands were not vested in the offender at the time of the act, they are not forfeited to the crown, but to the overlord.

In England, this distinction is of little moment, except in copyhold lands, the crown being, in fact, the overlord of nearly all the freehold land in the kingdom. By 7 Anne, c. 21, it was enacted that, after the death of the Pretender and his sons, no attainder for treason should operate to the prejudice of other than the offender himself; but this provision was repealed, 39 Geo. III., c. 93. But in Scotland, where subinfeudation still subsists, the distinction is of practical importance. In Scotland, before the Union, forfeiture of estate was incurred on account of treason and certain other crimes, as theft by a landed man, and uttering false coin. Lord Stair is of opinion that the doctrine of corruption of blood did not prevail in Scotland to exclude those claiming, through a person attainted, where the offender was only apparent heir (Stair, iii. 3. 38). Since the Union, the law of Scotland in regard to forfeiture for treason has been assimilated to that of England.

In America, forfeiture of estate for crimes is very much reduced, and the corruption of blood is universally abolished. Several of the state constitutions have provided that no attainder for treason or felony shall work corruption of blood or forfeiture of estate, except during the life of the offender, and some of them have taken away the power of forfeiture absolutely, without any such exemption. Every person convicted of any manner of treason, under the laws of New York, forfeits his goods and chattels, and also his land and tenements, during his lifetime; but the rights of all third persons existing at the time of the commission of the treason, are preserved. Kent's *Commentaries*, ii. 505.

FORFEITURE OF LANDS was originally a penalty of the feudal law, incurred on account of some act by the tenant inferring disloyalty to his overlord. The acts inferring forfeiture might be of either a civil or a criminal nature. Forfeiture for crimes was incurred by treason or felony. See **FORFEITURE AND CORRUPTION OF BLOOD**. Civil forfeiture may be incurred in England in three ways—viz., by tortious alienation, by wrongful disclaimer, and by alienation in mortmain; the first two of these modes were incidents of the feudal tenure, the latter was introduced by statute. It must be observed that, according to the earliest feudal customs, a gift of lands was always made in favor of a particular person, and that alienation, without consent of the overlord, involved a forfeiture of the fee. But this strictness having by degrees ceased to be observed, forfeiture was only incurred in case of a tortious alienation. Tortious alienation was where the owner of a particular estate conveyed by common law conveyance, as feoffment, fine, or recovery, a greater estate than that to which he was himself entitled, as where a tenant-for-life made a feoffment in fee. The immediate effect of this act was the forfeiture of the land to the remainder man or reversioner. By 3 and 4 Will. IV. c. 74, abolishing fines and recoveries, and 8 and 9 Vict. c. 106, s. 4, declaring that feoffment should not have a tortious operation, forfeiture by tortious alienation has ceased to have a practical importance.

Forfeiture by wrongful disclaimer was where a tenant holding under a superior lord, on being summoned in any court of record, either disclaims his allegiance, or does any act which amounts to a disclaimer. Since the abolition, by the statute of *quia emptores*, of subinfeudation, this species of forfeiture can only arise in lands held of the crown. Forfeiture by alienation in mortmain is incurred by the conveyance of lands or tenements in favor of any

Corporation (q. v.), sole or aggregate, ecclesiastical or temporal. As by vesting the land in a tenant of this description, the overlord was deprived of all the duties and services due by his vassal, this act was declared by various acts of parliament to infer the forfeiture of the lands. See **MORTMAIN**. Forfeiture of copyholds was incurred by committing waste, and by other acts of a wrongful kind inconsistent with the fealty due to the lord. See *Blackstone*, *Com.* ii. 284. Forfeiture on breach of condition, subsequent is where an estate is held upon a condition contained in the grant itself. On failure of the condition, the grantor or his heirs may enter upon the lands.

In Scotland, civil forfeiture may arise either from statutory enactment, at common law, or by agreement. By 1597 c. 246, it is enacted that vassals failing to pay their feu-duties for two years shall forfeit their right. This forfeiture must be established by an action to recover the feu-duties in arrear, and may be avoided by payment at the bar. At common law, a vassal forfeited his land by disclamation or purpresture. The former is analogous to the English disclaimer, and consists in the denial by a vassal of his lawful superior. Purpresture was incurred by the vassal's encroachment on the streets, highways, or commons belonging to the crown or other superior. These forms of forfeiture are fallen into disuse. Forfeiture on special agreement depends wholly upon the terms of the condition inserted in the titles to the land. The condition must be fortified by irritant and resolute clauses, and must enter the sasine, in order that it may be effectual against purchasers of the lands (*Erskine*, ii. 3, s. 13). Of this kind of forfeiture are breaches of Entails (q. v.).

FORGE, FORGING. The process of hammering red-hot iron or steel into any required shape is called Forging, and the workshop in which the operation is performed, a Forge. The principal tools of a common smith's forge are the fore-fire or hearth, with its bellows, the anvil, and the various hammers, swages, &c. For large work, an air-furnace, blown by steam bellows, supplies the place of the simple hearth of the blacksmith, powerful tranes swing the work to its place on the anvil, and a steam-hammer (see **HAMMER**) strikes the blows that squeeze the red-hot mass into shape. Besides these, there are portable forges of various sizes and forms, used for military and other purposes. They usually consist of an iron frame, to which a bellows, worked by the foot, is attached; and above the bellows is an iron tray, with a hearth, &c., upon which the fire is made; and the anvil is either attached to this frame, or has a separate stand.

Under **CUTLERY**, the general method of forging small work is described. For the largest work to which hand-hammers are still applied, such as anchor-forging, two gangs of from six to twelve hammermen are employed; they swing the large hammers with such wonderful precision and regularity, that the instant one hammer is withdrawn, another falls upon the same place. A foreman, with a wand, directs the hammering. The two gangs relieve each other alternately, on account of the great severity of the labor. Shovels, spades, mattocks, and many other tools and implements, are partly forged under the tilt-hammer. See **IRON**.

In all processes of forging, it is of primary importance to obtain the greatest possible rapidity in the succession of the blows. There is a double reason for this: first, and simply, that the work is cooling, and the more slowly it is forged, the more frequently it must be re-heated; and secondly, that percussion generates actual heat, and if the blows are sufficiently heavy and rapid, the temperature of the work may be fully maintained out of the fire for a considerable length of time. The hammer used for tilting steel not only maintains the heat of the bar, but raises it from a dull to a bright red heat.

FORGERY (Fr. *forger*, to form metal into shape, to fabricate), the *crimen falsi* of the Roman law, is held in England, at common law, to be the fraudulent making or altering of a writing or seal, to the prejudice of another man's right, or of a stamp to the prejudice of the revenue. As regards writings, the instrument forged must be executed with such skill or in such circumstances as to be capable of being mistaken for a genuine document by a person of ordinary intelligence and observation. It is not necessary that there should be even an attempt at imitation. If there was intention to deceive, and the circumstances were such as to render deception possible, the crime has been committed, and it has consequently been held in Scotland that it is possible to forge the name of a person who cannot write (1 Alison, p. 372), and further that the crime may be committed by the addition of a cross or mark (*Macmillan*, January 24, 1859). Any material alteration, however slight, is a forgery just as much as the subscription of the name of the pretended maker, or the fabrication of the entire deed. It will not lessen the crime, though the whole deed should be genuine, the name only being forged, or the name being really the handwriting of the party to whom it belongs, but appended to a forged deed. Even if the name be a fictitious one, but appended for the purpose of deceiving, a forgery has been committed just as much as if it belonged to a real person. Long

before the recent extensions took place in the law of evidence, by which parties were admitted as witnesses in their own causes. It was provided by 9 Geo. IV. c. 32, that the party whose name had been forged might be a witness to the effect that the writing was not his. But, on the other hand, it is an established rule of law that the proof of forgery, by a mere comparison of hand-writing, is incompetent (Tailor on *Evidence*, p. 1428, n. 5, 2d ed.).

Identification of handwriting is, if possible, more difficult than identification of the person, which so often forms the chief difficulty in criminal trials. 'As illness, strange dress, unusual attitude, and the like, cause mistakes in identifying the individual, so a bad pen, or rough paper, a shaking hand, hurry, and many other things, change the appearance of a person's handwriting.'—Dickson on *Evidence*, p. 474. There are besides resemblances in handwritings proceeding from many accidental causes, so that much caution is necessary in weighing this kind of evidence. 'It ought never, therefore, to be regarded as full proof by the crown in criminal trials, and even in civil cases, corroborative evidence should be required, unless the proof of handwriting is so clear as to shift the *onus probandi*.' Though writing-masters, engravers, bankers' clerks, and other persons in the habit of examining handwritings are often adduced as witnesses in trials for forgery, their evidence is really of very little value, and generally so conflicting that it can be produced with equal effect on either side. The best witness is one who has often seen the party write, through whose hands his writing has been continually passing, and whose opinion is not the result of an inspection made on a particular occasion for a special purpose. The act 11 Geo. IV., and 1 Will. IV. c. 66, makes the forging of the great seal, the privy seal, or any privy signet, the sign-manual, the seals of Scotland, or the great seal and privy seal of Ireland—treason. The same statute declares the offence of forging, or uttering with intent to defraud, stamps, exchequer bills, Bank of England notes, bills of exchange, promissory notes, deeds, receipts, orders for the payment of money, transfers of stock, wills, &c., to be felony. Capital punishment was first abolished with regard to special cases of forgery by 2 Geo. IV., and 1 Will. IV. c. 66, and 2 and 3 Will. IV. c. 123; and then altogether done away with by 7 Will. IV. and 1 Vict. c. 84. The offender is now liable to penal servitude, the length of which is at the discretion of the court; but which cannot be for less than three years, or he may be imprisoned for not more than four, or less than two years, with or without hard labor and solitude. As to the forgery of Bank of England notes, see 16 Vict. c. 2. As to obtaining property by false pretences, see FRAUD.

FORGET-ME-NOT, or **SCORPION GRASS** (*Myosotis*), a genus of annual or biennial herbaceous plants, of the natural order *Boraginæ*, with 5-cleft calyx and salver-shaped corolla; the flowers small, and generally blue. The genus is diffused over the temperate zone in all quarters of the world, and a number of species are common in Britain, chiefly growing in ditches and damp meadows—as *Myosotis palustris*, with crooked creeping perennial roots—an angular stem of a foot in height, and calyx covered with appressed bristles. *M. sylvestris*, with calyx covered with stiff spreading hairs, grows in bushy places and woods, and is often planted in flower-gardens. The dark blue *F.* of the Azores (*M. Azorica*) has of late begun to be cultivated in Europe, but requires the green-house. The genus is a favorite one with most persons, both because of the brilliancy of the flowers, and because throughout Europe it is generally regarded as the emblem of friendship.

The English name Scorpion Grass is now seldom heard. The German name *Vergissmeinnicht* corresponds with the English *Forget-me-not*.—*M. versicolor*, very common in Britain, often as a weed in gardens, is remarkable for the change of color in the flowers, which are first yellow then blue. They are very small.—*M. alpestris*, found on some of the mountains of Scotland, is especially admired for the size and brilliancy of its flowers.

FORIO, a thriving town of Italy, is picturesquely situated on the west coast of the island of Ischia, which stands at the northern side of the mouth of the Bay of Naples. The central portion of the town consists of very narrow streets, but the suburbs are composed of charming white cottages. It has three highly decorated churches, a good harbor, and some trade with Leghorn, Naples, and Genoa. Pop. 5791.

FORISFAMILIATION (literally, the putting forth from or beyond the family) is the separation of a child from the family of his father. A child is said to be forisfamiliar, either when he marries or when he receives from his father a separate stock, the profits of which are enjoyed by himself, though he may still reside with his father, or when he goes to live in another family with the consent of his father. The same result is also brought about when a child renounces his *legitim*, i. e., his legal share of the father's free movable property due to him on the death of the latter. See Bell's *Dic. of the Law of Scotland*.

FORKS. These table instruments are only about three centuries old. The Greeks, Romans, and other ancient nations knew nothing of forks. They had large forks for hay, and also iron forks for taking meat out of pots, but no instruments of the nature of table-forks. In ancient times, as is the practice still in the East, meat was commonly prepared as stews; or if roasted, it was cut into small pieces by a carver, so as to be easily taken in mouthfuls by the guests, who used their fingers and a knife for the purpose. It certainly is a strange fact, that the use of any species of forks at table was quite unknown till the 15th c., and they were then known only in Italy, which has the merit of this invention. None of the sovereigns of England had forks till after the reign of Henry VIII.; all, high and low, used their fingers. It was accordingly a part of the etiquette of the table to employ the fingers so delicately as not to dirty the hand to any serious degree; but as even by the best management the fingers were less or more soiled, it was the custom to wash the hands immediately on the dishes being removed from the table. Hence, in the royal household, there was a dignitary called the *Eurar* or *Euary*, who with a set of subordinates attended at meals with basins, water, and towels. The office of Euary survived after forks came partially into use. We learn that when James I. entertained the Spanish ambassador at dinner, very shortly after his accession, 'their majesties washed their hands with water from the same ewer, the towels being presented to the king by the lord treasurer, and to the queen by the lord high admiral.'

The Prince of Wales had a ewer to himself, which was after him used by the ambassador.—Ellis's *Letters*. The first royal personage in England who is known to have had a fork was Queen Elizabeth; but although several were presented to her, it remains doubtful whether she used them on ordinary occasions. From the inventory of her majesty's appointments in Nichols's *Progresses*, it would appear that these forks were more for ornament than use. 'Item, a knife and a spoune, and a forke of christall, garnished with golde slightly, and sparcks of garnetts: given by the Countess of Lyncolne. Item, a forke of corall, slightly garnished with golde: given by Mrs. Frances Drury. Item, one spoune and forke of golde; the forke garnished with two litle rubyes, two litle perles pendant, and a litle corall: given by the Countess of Warwick.' These ornamental forks had doubtless been presented to the queen as foreign curiosities of some value, and were probably never used at table. As yet, and for a considerable time afterwards, forks were not in common use, a circumstance less attributable to ignorance of the invention, than to prejudice. So far was this prejudice carried, by even educated persons, that one divine preached against the use of forks, as being an insult to Providence not to touch one's meat with one's fingers!

Italy, as has been said, claims the merit of this useful invention. This fact is explicitly learned from an account of a tour in Italy by a traveler named Thomas Coryate, who visited that country in 1608. His travels, styled *Crudities*, were published first in 1611, and republished in 1776. In these *Crudities* appear the following passages respecting the Italian towns: 'I observed a custom in all those Italian cities and townes through which I passed, that is not used in any other country that I saw in my travels; neither do I think that any other nation of Christendom doth use it, but only Italy. The Italian and also most strangers do always at their meals use a little forke when they cut their meat. For while with their knife, which they hold in one hand, they cut the meate out of the dish, they fasten the forke, which they hold in their other hand, upon the same dish; so that whatsoever he be that sitting in the company of others at meals, should unadvisedly touch the dish of meat with his fingers, from which all the table doe eat, he will give occasion of offence unto the company, as having transgressed the laws of good manners, in so much that for his error he shall be at the least browbeaten, if not reprehended in wordes. This form of feeding, I understand, is generally used in all places of Italy; their forks being for the most part made of yron, steele, and some of silver, but these are used only by gentlemen. The reason for this curiosity is, because the Italian cannot by any means indure to have his dish touched with fingers, seeing that all men's fingers are not alike cleane. Hereupon, I myself thought good to imitate the Italian fashion by this forked cutting of meate, not only while I was in Italy, but also in Germany, and oftentimes in England since I came home; being once quipped for that frequent using of my forke, by a certain learned gentleman, a familiar friend of mine, Mr. Laurence Whitaker, who in his merry humour, doubted not to call me at table *furcifer*, only for using a forke at feeding, but for no other cause.'

The term here employed jocularly, was in its serious meaning one of reproach, having been employed by the Romans to those slaves who as a punishment bore a forked frame or yoke (*furca*), resembling an inverted Λ —hence the Italian *forca* and *forchetta*; the latter (little fork) being followed in the French term *fourchette*, while the former is the root of the English word fork.

Forks came so slowly into use in England, that they were employed only by the higher classes at the middle of the 17th cen-

tury. About the period of the revolution, few noblemen had more than a dozen forks of silver, along with a few of iron or steel. At length, for general use, steel forks became an article of manufacture at Sheffield: at first, they had but two prongs, and it was only in later times that the three-pronged kind were made. As late as the early part of the 18th c., table-forks, and we may add knives, were kept on so meagre a scale by country inns in Scotland (and, perhaps, also in some parts of England), that it was customary for gentlemen in traveling to carry with them a portable knife and fork in a shagreen case; and till this day a small knife and fork form part of the ornamental equipment in the Highland dress. The general introduction of silver forks into Great Britain is quite recent; it can be dated no further back than the opening of the continent to English tourists at the termination of the French war in 1814. The extensive use of these costly instruments in the present day, marks in an extraordinary degree the rapid progress of wealth and refined taste throughout the United Kingdom.

FORLI, an interesting city of Italy, capital of the province of the same name, is beautifully situated at the foot of the Apennines, in a pleasant and fertile plain, on the right bank of the Montone, 16 miles south-west of Ravenna. It is a well-built, handsome city, is surrounded with walls, and contains many striking specimens of architecture, of which the Guerini Palazzo, built after the designs of Michael Angelo, the Palazzo Comunale, the Monte di Pietà, the cathedral, a majestic building, and the churches of S. Filippo Neri, of S. Girolamo, and of S. Mercuriale, are the most notable. The ecclesiastical buildings of F. contain some of the best pictures of Cignani, Carlo, Maratti, Guido, and other masters. The citadel, founded in 1361, is now used as a prison. The inhabitants carry on silk-spinning and salt-refining, with a considerable trade in corn, linen, hemp, carthamus, wool, &c. F. (the ancient *Forum Livii*) is said to have been founded by Marcus Livius Salinator, after his victory over Hasdrubal, on the Metaurus, 207 B.C., and to have received its name from him. In the middle ages, it formed a republic, and exchanged its rulers frequently during the struggles of the Guelphs and Ghibellines. In 1860, F., formerly in the States of the Church, became Italian. Pop. (1881) 16,016; of prov. 251,112.

FORLO'RN-HOPE, the body of men selected to attempt a breach, or to lead in scaling the wall of a fortress. Mr. Skeat derives the expression from the corresponding Dutch *de verloren hoop*, the word *hoop* (pron. as English *hope*) meaning a band or troop. The French is *enfants perdus*. The name is given on account of the extreme danger to which the leaders of a storming-party are necessarily exposed. As, however, the honor of success is proportionate to the peril of the undertaking, there is ordinarily no lack of volunteers for this arduous service.

FORMA PAUPERIS, the phrase usually employed both in England and Scotland to signify the arrangements by which an action may be carried on by one who is too poor to sue in the ordinary way. In England, the statutes 11 Henry VII. c. 12, and 23 Henry VIII. c. 15, provide that such as will swear themselves not worth £5, except their wearing apparel and the matter in question in the cause, shall be exempt when plaintiffs, but not when defendants, from the payment of court-fees, and shall be entitled to have counsel and attorney assigned to them by the court without fee. They are further excused from costs when unsuccessful; a privilege which, according to Blackstone, amounted in former times only to the rather uncomfortable alternative of choosing between paying and being whipped. In the event of success, however, a person suing in this form is entitled to his costs, because his counsel and agent, and the officers of court, though they are bound to give their labor gratis to him, are not bound to give it on the same terms to his antagonist, unless he too be a pauper. To prevent the abuse of suing in the superior courts at Westminster in this form in matters of small amount, it is provided (19 and 20 Vict. c. 108, s. 30), subject to certain exceptions, that any plaintiff who resorts to one of these, in a case falling within the cognizance of a county court, and recovers no more than £20, or in some cases £5, shall have no costs, unless he satisfies the court or a judge that he had sufficient reason for taking that course. There are some other exceptions to the rule (see Stephen's *Com.* iii. p. 646).

In Scotland, this benevolent arrangement was introduced by statute more than half a century before the date of the English act we have mentioned. In 1424, the statute (c. 45), which we have already quoted under *Advocates* (q. v.), was passed for the purpose of securing professional assistance, gratis, to the poor, and for giving to them and those who assisted them their costs in the event of success. The more special arrangements applicable to litigation in this form in Scotland will be detailed under *Poor's Roll* (q. v.).

FORMATION, in Geology, is applied to a group of strata united by some character which they have in common, whether of age, origin, or composition, as the coal or chalk formation.

FO'RMEDON, an old form of action, in the Law of England, whereby an heir of entail or remainder man who had been ousted by a discontinuance, was entitled to vindicate his claim to the lands from which he had been ousted. By 21 James I. c. 16, it was enacted that writ of formedon should be brought within twenty years of the time when the cause of action arose. Writ of formedon is now abolished, together with other real actions.

FO'RMIC ACID ($C_2H_3O_2, HO$) derives its name from the circumstance of its having been first obtained from the *Formica rufa*, or red ant. In a concentrated state it is a fuming liquor with an irritating odor, and occasions vesication if dropped upon the skin. It crystallizes at a temperature below 32° , and boils at about 212° , yielding a vapor which burns with a blue flame. It is a strong reducing agent, at a boiling temperature reducing the salts of silver, mercury, platinum, and gold.

It may be obtained in various ways, as, for example: 1. By the distillation of red ants with water (a proceeding never adopted now). 2. By the distillation of a mixture of starch, binoxide of manganese, sulphuric acid, and water; this is the usual method, and various organic matters, as sugar, chaff, bran, saw-dust, &c., may be substituted for the starch. 3. By the distillation of oxalic acid mixed with sand, or far better (according to Berthelot), with glycerine; 1 equivalent of oxalic acid ($C_2O_4, 2HO$) yielding 1 equivalent of formic acid ($C_2H_3O_2, HO$) + 2 equivalents of carbonic acid ($2CO_2$).

Berthelot has recently obtained it synthetically by keeping carbonic oxide gas for a prolonged period in contact with hydrate of potash, at a temperature of 212° . The gas becomes gradually absorbed, and formate of potash is the result, the reaction being exhibited by the formula, 1 equivalent of hydrate of potash (KO, HO) + 2 equivalents of carbonic oxide ($2CO$) = 1 equivalent of formate of potash ($KO, C_2H_3O_2$).

Formic acid is a very common product of the oxidation of organic bodies; thus, for example, the albuminates, glycine, sugar, starch, &c., yield it in association with other products, when acted on by chromic acid; the fats and fatty acids yield it when acted on by nitric acid; and it is a product of the action of ozone on glycerine, fats, fatty salts, acetic acid, and sugar, provided a free alkali is present. Hence, we can readily explain its occurrence as a product of oxidation in the animal organism, in which it not unfrequently occurs, either free or in combination. Thus we find it not only in ants, but in the poison of the bee and wasp, and in the hairs of the procession caterpillar. It has been detected by various chemists in the sweat, in the expressed juice of the spleen, pancreas, thymus gland, and muscles, in the brain, the blood, and the urine.

The salts of formic acid, which are termed by some chemists formates, and by others formiates, require no special notice. They are all soluble, and yield a red color with persalts of iron.

FORMI'CA. See *ANT*.

FORMING'S ISLAND is a speck on the bosom of the Pacific, lying a little to the north of the Sandwich Group, or Hawaiian Archipelago, in lat. $30^\circ 49' N.$, and long. $159^\circ 20' W.$ It is one of the most recent additions to the British empire, having been formally occupied, mainly on account of its excellent harbor, towards the close of 1860.

FORMO'SA (Chinese name, *Tai-wan*), a large island on the south-east coast of China, opposite the province of Fo-kien, from which it is distant about 90 miles. It lies between $21^\circ 53' - 25^\circ 16' N.$ lat., and $120^\circ 15' - 122^\circ 4' E.$ long. Length, about 237 miles; average breadth; about 70 miles. A chain of mountains nearly bisects the island, the eastern side of which is held by aboriginal savage tribes. These having massacred some shipwrecked Japanese sailors, were in 1874 attacked and punished by a Japanese force, which event nearly led to a war between China and Japan. The western side has been in possession of the Chinese since 1683, and is a department of the province of Fo-kien. Pop. from 2 to 3 millions. *Tai-wan-foo* (q. v.), the capital, and Takao on the west coast, and Tamsui and Keelung on the north, have been opened to foreign commerce by treaties. Coal abounds at Keelung and is largely shipped. Tea is extensively cultivated; other products are camphor, rice, maize, sugar, tobacco, cinnamon, pepper, &c.; oranges, pine-apples, guavas, cocoa-nuts, grapes, peaches, &c., are abundant.

FORMS OF ADDRESS. Many persons are exposed to inconvenience from their ignorance of the formal modes of addressing letters to persons of title; we shall therefore, in the present article, give an enumeration, taken mainly from Mr. Dod's *Peerage and Baronage*, of the usual ceremonious modes of written address. Previous to their employment, the writer must, of course, learn either from the peerage-writers, or from some other source, the precise rank of the person whom he wishes to address, as well as the hereditary, personal, or official distinctions by which the rank is often modified.

1. *Archbishop*—Letters are addressed: 'His Grace, the Lord

Archbishop of —, and commence: 'My Lord Archbishop.' More formal documents are addressed 'The Most Reverend Father in God (John Bird), by Divine Providence, Lord Archbishop of Canterbury; other archbishops and suffragan bishops being 'by Divine permission.' When personally referred to, an archbishop is styled 'Your Grace,' not 'Your Lordship.' The Archbishop of Armagh is addressed as 'His Grace the Lord Primate of Ireland.'

Archbishops' wives and the other members of their families, enjoy no titles, as such.

2. *Baron*—Addressed: 'The Right Honorable Lord —;' referred to as 'His Lordship,' or 'Your Lordship.'

Baron's Daughter—'The Honorable Mary —;' or, if married, 'The Honorable Mrs —.' Letters commence, 'Madam.'

Baron's Son—'The Honorable John —.' Letters commence, 'Sir.'

Baron's Son's Wife—'The Honorable Mrs. —.' Letters commence, 'Madam.'

Baron's Wife, and *Baroness* in her own right—'The Right Honorable Lady —;' in strictness, but more commonly, 'The Lady —.' Letters commence, 'Madam,' and refer to her as 'Your Ladyship.'

Baronet—'Sir John —, Bart.' Letters commence, 'Sir.'

Baronet's Wife—'Lady —.' Unless she has a title as the daughter of a peer, no Christian name is used. She is referred to as 'Your Ladyship.'

Bishop—'The Right Reverend the Lord Bishop of —.' Letters commence, 'My Lord.' Frequently the address is simply, 'The Lord Bishop of —.' The style in formal documents is, 'The Right Reverend Father in God (John —), by Divine permission, Lord Bishop of —.' Scotch bishops are addressed 'The Bishop of —,' sometimes as 'The Right Reverend Bishop (e. g., Henry Cotterell), and letters commence, 'Right Reverend Sir.' The colonial bishops are addressed by their territorial titles, like those of England.

Bishops' Wives and Children have no titles.

Countess—'The Right Honorable the Countess of —.' Letters commence, 'Madam,' and refer to her as 'Your Ladyship.'

Duchess—'Her Grace the Duchess of —.' Letters commence, 'Madam,' and refer to her as 'Your Grace.'

Duke—'His Grace the Duke of —.' Letters commence, 'My Lord Duke;' and he is referred to as 'Your Grace.'

Duke's Daughter—'The Right Honorable Lady Mary —,' or less formally, 'The Lady Mary —.' Letters commence, 'Madam,' and refer to her as 'Your Ladyship.' If she is married to a person of inferior rank, her surname only is changed.

Duke's Eldest Son—Uses the second or some other title of his family by courtesy, and he is addressed as if he held the title by law, though in formal documents he is called '—, Esq., commonly called the Marquis or Earl' (as the case may be).

Duke's Younger Son—'The Right Honorable Lord John Russell,' or less formally, 'The Lord John R—.' 'My Lord,' and 'Your Lordship.'

Duke's Younger Son's Wife—'The Lady John —,' unless where she has a title in her own right. 'Madam,' and 'Your Ladyship.'

Earl—'The Right Honorable the Earl of —,' or less formally, 'The Earl of —.' 'My Lord,' and 'Your Lordship.'

Earl's Daughter—Like Duke's Daughter (q. v.).

Earl's Eldest Son is addressed as if the title which he holds in courtesy were a title in law.

Earl's Younger Son—Like Baron's Son (q. v.).

Earl's Younger Son's Wife—Like Baron's son's wife, unless of superior rank to her husband.

Earl's Wife. See *Countess*.

KING—'The King's Most Excellent Majesty.' 'Sire,' and 'Your Majesty;' or, in less formal notes, thus: 'Mr. Pitt presents his duty to your Majesty.'

Knight Bachelor—Like Baronet (q. v.), except that the word 'Bart.' is omitted.

Knight Bachelor's Wife—Like Baronet's Wife (q. v.).

Knight of the Garter—K.G. is added to the name or other title of the bearer.

Knight of St. Patrick—K.P. used in the same manner.

Knight of the Thistle—K.T.

Knight of the Bath—if a Knight Grand Cross, K.G.C.B.; if a Knight Commander, K.C.B.

Knight of the Bath's Wife—Like the wife of a Baronet or Knight Bachelor.

Lord Advocate (of Scotland)—'The Right Honorable the Lord Advocate' by courtesy; but in official documents he is styled 'Her Majesty's Advocate for Scotland.' Letters ought strictly to commence, 'Sir,' not 'My Lord,' though the latter mode of address is the more usual.

Lord Lieutenant (of Ireland)—'His Excellency the Lord Lieutenant;' and letters commence in accordance with his rank in the peerage or otherwise. If a duke, he is styled 'His Grace the Lord Lieutenant.'

Lord Mayor—'The Right Honorable the Lord Mayor.' 'My Lord,' and 'Your Lordship.' There are only three Lord Mayors—those of London, York, and Dublin.

Lord Provost—The Provost of Edinburgh is 'The Right Honorable the Lord Provost;' of Glasgow, 'The Honorable the Lord Provost;' of Perth and of Aberdeen, 'The Lord Provost.' There are no other Lord Provosts. Perhaps the distinction in the title of the chief magistrate of the Scottish capital is traceable to his having been always a member of the Privy Council of Scotland, from at least the period of the Revolution.

Lord of Session (in Scotland)—'The Honorable Lord —.' 'My Lord,' and 'Your Lordship.'

Lords of Her Majesty's Treasury—These in their collective capacity are addressed as 'The Honorable the Lords Commissioners of Her Majesty's Treasury;' individually they have no title from their connection with the Treasury.

Maid of Honor—'The Honorable Miss;' and 'Madam.'

Marchioness—'The Most Honorable the Marchioness of —.' 'Madam,' and 'Your Ladyship.'

Marquis—'The Most Honorable the Marquis of —,' not 'The Most Noble.' Letters commence 'My Lord Marquis;' but when personally addressed, he is styled 'My Lord,' and 'Your Lordship.'

Marquis's Daughter—Like Duke's Daughter (q. v.).

Marquis's Eldest Son—Like Duke's Eldest Son (q. v.).

Marquis's Younger Son, like Duke's Younger Son (q. v.).

Mayors—In formal documents, 'The Right Worshipful the Mayor —;' but in letters, simply 'The Mayor.'

Members of Parliament—The letters M.P. are added to their usual address.

Officers in the Navy and Army—Their rank in the service, if above subalterns, is always prefixed to any other title they may possess, thus: 'Captain the Lord John —.'

Prince—'His Royal Highness Prince —;' or 'His Royal Highness the Duke of —,' when the Prince is also a Duke. In practice, the initials H.R.H. are usually substituted for the words. A letter begins 'Sir,' not 'My Lord Duke;' and the mode of reference is 'Your Royal Highness.'

Princess—'Her Royal Highness the Princess —,' or 'The Duchess' (as the case may be). 'Madam,' and 'Your Royal Highness.'

Prince's Wife, though of inferior rank, like a Princess by birth.

Privy Councillor—'The Right Honorable John —.'

Privy Councillor's Wife and Children have no title.

QUEEN—'The Queen's Most Excellent Majesty,' 'Madam,' and 'Your Majesty;' or, 'The Lord John R—' presents his duty to your Majesty.'

Viscount—'The Right Honorable Lord Viscount —,' or less formally, 'The Lord Viscount.' 'My Lord,' and 'Your Lordship.'

Viscountess—'The Right Honorable the Viscountess,' or less formally, 'The Viscountess.' 'Madam,' and 'Your Ladyship.'

Viscount's Daughter, like Baron's Daughter (q. v.).

Viscount's Son, like Baron's Son (q. v.).

Viscount's Son's Wife, like Baron's Son's Wife (q. v.).

The formality of these modes of address experiences considerable modifications when employed by persons of equal rank. Between friends and relatives they are either entirely dispensed with (except, of course, in addressing letters) or adapted to the feelings and caprices of the writers. In this, as in many other respects, we of the present generation are far less ceremonious than our fathers, and still less so than our grandfathers were. In most old letters, it will be found that the titles of the writers are preserved even where there is the freest and most familiar interchange of thought and feeling; wives addressing their husbands and husbands their wives, children their parents, and occasionally even parents their children, as 'Sir' or 'Madam,' 'My Lord,' or 'Your Royal Highness,' as the case might be.

FORMS OF PROCEDURE. See PROCESS.

FORNICATION (*fornicatio*, from *fornix*, an arch-vault, and by metonymy, a brothel, because brothels at Rome were in cellars and vaults under ground). In most countries, this crime has been brought within the pale of positive law at some period of their history, and prohibited by the imposition of penalties more or less severe; but it has always been found ultimately to be more expedient to trust to the restraints which public opinion impose on it in every community which is guided by the principles of morality and religion. In England, in 1650, during the ascendancy of the Puritan party, the repeated act of keeping a brothel or committing fornication was made felony without benefit of clergy on a second conviction. At the Restoration, when the crime of hypocrisy seemed for a time to be the only one which, under the influences of a very natural reaction, men were willing to recognize, this enactment was not renewed; and though notorious and open lewdness, when carried to the extent of exciting public scandal, con-

tinued, as it had been before, an indictable offence at common law, the mere act of fornication itself was abandoned 'to the feeble coercion of the spiritual court, according to the rules of the canon law, a law which has treated the offence of incontinence with a great deal of tenderness and lenity, owing perhaps to the constrained celibacy of its first compilers.'—*Blackstone*. The proceedings of the spiritual court were regulated by 27 Geo. III. c. 44, which enacts that the suit must be instituted within eight months, and that it cannot be maintained at all after the marriage of the parties offending. But proceedings in the ecclesiastical courts for this offence have now fallen into entire desuetude (*Stephen's Com.* iv. 347). In Scotland, shortly after the Reformation, fornication was prohibited by what Baron Hume calls 'an anxious statute of James VI.' (1567 c. 13), entitled 'Anent the Filthie Vice of Fornication, and Punishment of the same.' This act, which was passed in the same parliament by which incest and adultery are punished with death, provides that the offender, whether male or female, shall pay for the first offence a fine of £40 Scots, and shall stand bareheaded, and fastened at the market-place, for the space of two hours; for the second, shall pay a fine of 100 merks, have the head shaven, and shall be exposed in the same public manner; and for the third, pay a fine of £100, be thrice ducked in the foulest pool of the parish, and be banished the town or parish for ever. There is but one instance of this statute having been enforced by the Court of Justiciary, which occurs, as might be supposed, during the government of the Protector in Scotland. The offence of keeping a house of notorious ill-fame and scandalizing the neighborhood, is punishable in Scotland as a police offence, though it is greatly condoned. See NUISANCE and PROSTITUTES.

FORRES, a royal burgh in the county of Elgin or Morey, situated on a well-marked old sea-terrace and promontory distant about two miles from the mouth of the river Findhorn (q. v.). Pop. (1881) 4031. It was a royal burgh in the reign of King David I. (1124—1153), and was subsequently the seat of the Archdeacon of Moray, who had as his prebend the church of Forres, dedicated to St. Laurence the martyr, and the church of Logynfythenach (now Edinkillie), dedicated to St. John the Baptist. A painting of St. Laurence holding in his hand the gridiron on which he is said to have been roasted, is preserved at Brodie House near Forres. The antiquities of the place are the remains of its castle, at the west end of the town, now surmounted by a monument, erected to the memory of Dr. Thomson (a native of Cromarty, distinguished by his eminent medical services in the Crimean war), and the remarkable sculptured pillar—25 feet high—sometimes called Sueno's Stone, but more commonly 'the Stan'in' Stane,' which stands about a mile to the eastward. A monastery of black friars is said to have stood formerly on the site now occupied by Anderson's Academical Institution. F. lies at the foot of a curiously formed group of four gravelly hills, named the Cluny or Cleeny Hills, evidently water-made, on the highest of which, the site of an old encampment, is a tower 66 feet high, erected to the memory of Nelson in 1806. Upon one of these eminences is an excellent hydropathic establishment called Cluny Hill House.

FORSTER, JOHN, an English political and historical writer, was born at Newcastle in 1812. He was educated for the bar, but early, like so many other law-students, devoted himself to periodical writing. In this sphere of literature he displayed more than usual ability; and his political articles in the *London Examiner*, for which he commenced writing in 1834, attracted more attention than is usually bestowed on newspaper leaders. There was a vigor and point about them, coupled with a truth, consistency, and outspoken honesty, which obtained a wide renown for the paper. F. succeeded Dickens for a short time as editor of the *Daily News*, and was editor of the *Examiner* for ten years. He is the author of many admirable biographical and historical essays, and we are indebted to him for much new and valuable information tending to elucidate obscure points, and correct erroneous notions about the times and statesmen of the English Commonwealth. It is to this period of history that F. has chiefly directed his studies, and no person desirous of properly understanding it, should neglect his *History of the Grand Remonstrance; Arrest of the Five Members; Sir John Eliot, a Biography; and Lives of the Statesmen of the Commonwealth*. His literary memoirs are also excellent. The chief are *The Life and Times of Oliver Goldsmith* (1848); *Walter Savage Landor*, 2 vols. (1868); *The Life of Charles Dickens*, 3 vols. (1871—1874); and the first volume of a *Life of Swift* (1876). F.'s style is clear, forcible, and elegant. He was appointed Secretary to the Commissioners in Lunacy in 1856, and a Commissioner in Lunacy in 1861. F. died in 1876.

FORSTER, JOHANN REINHOLD, a German traveler and naturalist, was born in Dirschau, in Prussia, in 1729, and died in Halle in 1798. He was educated at Halle and Danzig for the clerical profession, and in 1753 became pastor at Nassenhuben, near Danzig; but he seems to have devoted most of his time to

the study of mathematics, natural philosophy, natural history, and geography. In 1765, he accepted an offer made to him by the Russian government, to inspect and report upon the new colonies founded on the banks of the Volga; and the matter of his report is said to have been so good as to have given the Empress Catharine suggestions for her great code of laws. His irritable temper soon involved him in difficulties with the Russian government; and in the following year he repaired to England, where the exertions of some of his scientific friends in London soon procured for him the office of teacher of natural history, and of the French and German languages, at an educational institution for dissenting elergymen at Warrington, in Lancashire. He retained this post until 1772, when he received, through the influence of Mr. Banks, the offer of naturalist to Captain Cook's second expedition to the South Seas. In the course of the voyage, his temper seems to have frequently brought him into unpleasant collision with the other officers; and after the return of Captain Cook's vessels in July 1774, a controversy arose between F. and Lord Sandwich, on the question as to who should write the narrative of the voyage. It was settled that F. should write the philosophical and Cook the nautical parts of the work; but further difficulties arose, and Cook's journal appeared alone. In 1776, in association with his son, he published a work (in Latin) on the botany of the expedition; and in 1778 his *Observations faites dans un Voyage autour du Monde sur la Géographie Physique l'Histoire Naturelle, et la Philosophie Morale*. In the latter year, he returned to Germany, and was soon afterwards made Professor of Natural History and Mineralogy at Halle, where he remained until his death. Besides the above works, he published *De Byssu Antiquorum* 1775; *Zoologia Indica*, 1781; *Geschichte der Entdeckungen und Schiff-fahrten im Norden*, 1784 (Eng. and French trans.), &c.

FORSTER, JOHANN GEORG ADAM, commonly known as George F., eldest son of Johann Reinhold Forster (q. v.), a German traveler and naturalist, was born at Nassenhuben, near Danzig, in 1754, and died at Paris in 1794. When only 17 years of age, he accompanied his father in Captain Cook's second voyage; and shortly after his return, he published, with the assistance of his father, an account of the expedition. His book, which does not differ materially in its facts from Cook's narrative, was well received by the public, and was translated into French, German, Swedish, and other languages. Humboldt spoke of this work in the highest terms. F., for a time Professor of Natural History at Cassel and at Wiina, was librarian to the Elector when Mainz was taken by the French in 1792. F., who had become an ardent republican, was sent as a deputy to Paris, to request the incorporation of Mainz with the French republic.

While he was in Paris on this mission, the Prussians retook the city, and F. lost all his property, including his books and manuscripts. He died 12th January 1794. Besides numerous translations, and the account of Captain Cook's voyage, he wrote a number of minor works. His widow, the daughter of Heyne (Therese Huber), published his *Letters* in 1828; and a complete edition of his works, in 9 vols., was published in 1843.

FORSTER, THE RIGHT HON. WILLIAM EDWARD, son of William Forster, who was for more than 50 years a minister of the Society of Friends, and died on an anti-slavery mission in Tennessee, was born at Bradpole, Dorset, on July 11, 1818. He was educated at the Friends' School, Tottenham, and became a worsted manufacturer at Bradford. In 1846 he distributed in Ireland a famine relief fund raised by the quakers. In 1859, he contested Leeds unsuccessfully in the Liberal interest, and in 1861 was elected for Bradford. He filled the post of Under-Secretary for the Colonies from November 1863 till July 1866, and was Vice-president of the Committee of Council on Education, and Fourth Charity Commissioner, from 1868 to 1874. Mr. F. acquired a great reputation from the admirable manner in which he piloted through the House of Commons the Education Bill of 1870, and also the Ballot Bill of 1871. He became Irish Secretary in the Liberal Ministry of 1880. The extent to which outrage and intimidation prevailed in Ireland led the government to pass, in the face of the opposition of the Irish party, a Peace Preservation or Coercion Act, giving the Irish administration the power of imprisoning without trial persons reasonably suspected of crime; and on F. was concentrated all the odium of introducing and applying this measure. When, in 1881, the leaders of the Land League were arrested, the bitterness with which 'Buckshot Forster' was denounced throughout Ireland was prodigious; though F. deserved great credit for zeal, determination, and skill in carrying the Land Act of 1881, which conferred unparalleled privileges on the Irish tenantry. In May 1882 the government resolved to release the chief political suspects; and Mr. F., disapproving this step, resigned office.

FORT, a term of peculiar meaning in British N. America, applied to a trading-post in the wilderness with reference to its indispensable defences, however slight, against the surrounding bar-

barism. It has thus been often employed to designate merely a palisaded log-hut, the central oasis of civilization in a desert larger, it may be, than Scotland.

FORT, FORTRESS (from Lat. *fortis*, strong), a stronghold, made secure by walls, and generally further protected by a ditch and parapet. For the construction of forts, see **FORTIFICATION**.

FORT ADJUTANT, an officer holding an appointment in a fortress—where the garrison is often composed of drafts from different corps—analogueous to that of adjutant in a regiment. He is responsible to the commandant for the internal discipline, and the appropriation of the necessary duties to particular corps. Fort adjutants are staff-officers, and so receive a certain allowance per day in addition to their ordinary regimental pay.

FORT AUGUSTUS, a village at the S. end of Loch Ness, 29 miles S.W. of Inverness. A fort intended to overawe the Highlands, and having accommodation for 200–300 men, was built here soon after the rebellion of 1715, on a small eminence. It was taken by the rebels in 1745, and became the headquarters of the Duke of Cumberland after Culloden. In 1867 the fort and crown property adjoining were sold to Lord Lovat, who has since converted it into a Benedictine Educational Institute.

FORT GA'RRY, a Hudson's Bay Company's station, beside which has sprung up the thriving town of WINNIPEG, capital of the province of Manitoba, in the Dominion of Canada. Winnipeg (q. v.) is situated at the junction of the Assiniboine and Red Rivers. Pop. (1871) about 350; (1881) 15,000.

FORT GEORGE, a fortification in the N.E. of Inverness-shire, on a low sandy projection into the Moray Firth, here only 1 m. broad. It is the most complete fort in the kingdom, and was built, at a cost of £160,000, after the rebellion of 1745, to keep the Highlanders in subjection. It covers 12 acres, and can accommodate 2000 men. It is an irregular polygon, with 6 bastions, and upwards of 70 guns. It is defended by a ditch, covert-way, a glacis, two lunettes, and a ravelin. It has casemated curtains, 27 bomb-proof rooms, bomb-proof magazines, and is supplied with water from 8 pump-wells. It is, however, only secure from attack by sea.

FORT GEORGE (INDIA). See **MADRAS**.

FORT MAJOR, the next officer to the governor or commandant in a fortress. He is expected to understand the theory of its defences and works, and is responsible that the walls are at all times in repair. He is on the staff, but has to resign his regimental appointment, and receives an addition to his half-pay.

FORT ROYAL, a fortified seaport of the French island of Martinique, in the West Indies, is the capital of the colony. It stands on the west coast, in a bay of its own name, in lat. 14° 35' N., and long. 61° 4' W. It has a population of about 12,000, and contains offices for the local government, barracks, arsenal, and hospital.

FORT ST. DAVID, on coast of the Madras province, in the district of South Arcot, 100 miles south of Madras. It became British in 1691, and was an important place during the struggle of England with France. It was the capital of the English settlements in the Carnatic from 1746 to 1758. It soon decayed.

FORT WAYNE, a city of Indiana, U.S., on the Wabash and Erie Canal. It is a railway center, has machine shops, flour-mills, tanneries, and other manufactures. Incorporated in 1840, it had 17,718 inhabitants in 1871, and 26,881 in 1881.

FORT WILLIAM, a village in Inverness-shire, near the west base of Ben Nevis, 63 miles south-west of Inverness, and at the south end of the Caledonian Canal. A fort was originally built here by General Monk, and afterwards rebuilt on a smaller scale by William III. It is an irregular work, with ditch, glacis, ravelin, bomb-proof magazine, and barracks for 100 men. It resisted sieges by the Highlanders in 1715 and 1745. It is now converted into private houses. F. W., so long one of the keys of the Highlands, is now, like Oban, only a center for tourists. Pop. (1881) 1594.

FORT WILLIAM (INDIA). See **CALCUTTA**.

FORTÉ, in Music, the Italian term for loud; *fortissimo*, as loud as possible.

FORTESCUE, SIR JOHN, an eminent judge and writer on English law, descended from a Devonshire family, was the son of Sir Henry Fortescue, Lord Chief-justice of Ireland, and was born some time in the reign of Henry IV. Educated at Exeter College, Oxford, he was called to the bar at Lincoln's Inn, and in 1441 was made serjeant-at-law. The following year, he was appointed Lord Chief-justice of the Court of King's Bench. In the struggle for the crown between the Houses of York and Lancaster, he steadily adhered to the latter, and is supposed to have been for a time Lord High Chancellor of England. Lord Campbell in his *Lives of the Lord Chancellors* (vol. i. p. 367), under date Feb-

ruary 17, 1461, says: 'If Sir John Fortescue ever was *de facto* chancellor, and in the exercise of the duties of the office, it must have been now, after the second battle of St. Albans, and at the very conclusion of the reign of Henry VI.' In March of that year, he fought at the battle of Towton for that Monarch, and was attainted by the parliament under Edward IV. He accompanied the Queen, Margaret of Anjou, and her young son, Prince Edward, on their flight into Scotland, and while there wrote a treatise in support of the claim of the House of Lancaster to the English crown. In 1463, he embarked with the queen and her son for Holland, where he remained for several years, intrusted with the education of the young prince. During his exile, he wrote his celebrated work, *De Laudibus Legum Anglie*, for the instruction of his royal pupil. In the introduction and throughout the dialogue, he designates himself 'Cancellarius.' It was when he was in Scotland that the title of Chancellor of England is said by some to have been conferred upon him by the dethroned monarch. He probably had the titular office of chancellor *in partibus* during his exile, but never exercised the functions in England. In 1471, he returned with Queen Margaret and her son; but on the final defeat of the Lancastrian party at the battle of Tewkesbury, where he is said to have been taken prisoner, finding that parliament and the nation had recognized the title of Edward IV., he submitted to that monarch, and, as a condition of his pardon, wrote a treatise in favor of the claim of the House of York. He was allowed to retire to his seat of Ebrington, in Gloucestershire, where he died in his 90th year. His male representative was, in 1789, created Earl Fortescue and Viscount Ebrington in the peerage of Great Britain.

FORTH, a river of Scotland, rises in the northwest of Stirling-shire, in the mountains between Loch Katrine and Loch Lomond, from two main branches, the Duchray, 16 miles long, from the east side of Ben Lomond, and the Avendhu, 12 miles long, flowing through Lochs Chon, Dhu, and Ard. These streams unite at Aberfoyle, and issue from the mountains. The F. then runs east and south-east along the borders of Perth and Stirling shires, with numerous windings, in a wide valley abounding in picturesque scenery. It passes Stirling, and a little above Alloa it widens out into the Firth of Forth. The F. is only 50 miles in a straight line from its source to the mouth of the Devon; but, owing to its sinuosities, its real course is more than twice that length. It is navigable for vessels of 100 tons to Stirling. Its chief tributaries are the Teith, the Allan and the Devon.

FORTH, FIRTH OF, an arm of the sea, or the estuary of the river Forth, lies between Clackmannan, Perth, and Fife on the north, and Stirling and the Lothians on the south. It first extends six miles south-east from where the Devon joins the Forth; then, with an average breadth of 2½ miles, it runs 10 miles to Queensferry; and finally, it extends 36 miles north-east, gradually expanding in width to 15 miles between Fife-ness and Tantallon Castle on the coast of Haddingtonshire. The project of building a railway bridge across the estuary at Queensferry was resumed in 1881; at Alloa also a bridge is to be made. The waters of the Firth are from 7 to 30 fathoms deep, and encircle the Isle of May, Bass Rock, Inchkeith, Inchcolm, Cramond Isle, &c. On the coast, are many fine harbors. St. Margaret's Hope, above Queensferry, is one of the safest roadsteads in the kingdom. The chief rivers which fall into the firth are the Forth, Carron, Avon, Almond, Esk, and Leven. The counties along its shore are the most fertile and best cultivated in Scotland, and include the maritime towns of North Berwick, Musselburgh, Portobello, Leith, Queensferry, Grangemouth, Culross, Burntisland, Kirkcaldy, &c.

FORTHCOMING, in the Law of Scotland, is an action by which an arrestment is made available to the arrestor. The arrestment secures the goods or debts in the hands of the creditor or holder; by the forthcoming the arrestee and common debtor are called before the judge to hear sentence given, ordering the debt to be paid, or the effects to be delivered up to the arresting creditor. (Bell's *Law Dictionary*.)

FORTIFICATION, a term derived through the Italian from the Latin *fortis* and *facere*, means literally the 'making strong' of any place whatever, be it a town, an arsenal, a camp, a mere house, or the extended position of an army occupying a tract of country, a province, or even a kingdom. In effect, the term is limited to strengthening by means of walls, ditches, or other stationary obstructions, aided more or less by artillery, which may impede hostile advance.

Fortification cannot pretend to render strongholds impregnable, for no works, however skillfully devised, will withstand the continued fire of well-directed artillery, backed by energy and discretion on the part of assailants: its aim is to enable a beleaguered garrison to hold out, without losing ground, until it can be relieved by the advance of allies operating in the field. In fortifying a place, the engineer usually proceeds upon some defined system of entourage; but if he hope for success, his science must be sufficiently elastic to adapt itself to all the natural features of

the locality; and from this it follows that a system perfect in theory, and of universal application, will in practice have to undergo modifications, differing in almost every instance.

The origin of the art is involved in an obscurity which history need not hope to penetrate. The earliest records of all nations speak of walled cities and forts.

The prime element of all fortification is the parapet (from Italian *para*, before; *petto*, the breast), which may be a wooden stockade, a wall of masonry, or a mound of earth, and is intended to give more or less cover to the defender from the projectiles of his adversary, while he is still able to use his own weapons against the latter. The simplest form of parapet being the mound of earth, the ground adjoining it would probably be dug up for its formation, and from this would almost unconsciously ensue the ditch, as an additional means of separating the assailant and the assailed. Starting, then, from this parapet and ditch or fosse, as the elementary forms of defence, it will be well, before proceeding to describe the ancient and modern systems, to give concise practical definitions of the parts, adjuncts, and technical names of a fortification.

The first duty of a defender is to prevent, as far as possible, the enemy's near approach to any of his works. In developed systems, this is sought to be done by bastions, &c. (of which hereafter), which stand out at angles to the general line, so as to afford a fire commanding all parts. But as cases occasionally happen of troops, defended by a mere straight parapet and ditch, having to withstand the advance of the enemy, it is necessary to adopt every measure which can obstruct his path, harass his advance, and, if possible, aid in cutting off his retreat in the event of failure.

Abattis (q. v.) are among the simplest obstacles to be improvised, consisting of trees cut down, shorn of their leaves and smaller twigs, having their branches pointed, and then laid close together, in one or more lines parallel to the works, branches outward, and trunks imbedded or pinned down in the earth. Accoutred troops must remove these before they can pass, and the operation of removal under fire from the besieged is a very serious one indeed.

Chevaux-de-frise (q. v. for derivation and illustration) are pointed iron or wooden rods fixed crosswise in a wooden beam, and until removed offering a complete obstacle to progress. They are very useful in a breach or other enclosed portion of a work, and are now made in pieces, so as to be portable, and yet ready for immediate putting together. A *cheval-de-frise* is usually 12 feet long, with a beam 9 inches square.

Chausse-trapes, or *Caltraps* (q. v.), give serious annoyance to troops advancing, and are especially dangerous in cases of night-attack. Their use was, however, more general formerly than it is now.

Trous-de-loup (wolf-traps), which are deep holes dug, and armed at the bottom with spikes, young trees cut down and their stumps pointed, inverted harrows, broken sword-blades, bayonets, or any similar annoyances, are resorted to as expedients to gain time, and thereby insure a more deadly fire on the assailants. They are frequently constructed in the glacis of a work.

Fraises and Stockades represent another form of additional de-



Fig. 1.—Fraise and Stockade (in section):
AB, parapet; C, escarp; D, fraise; E, stockade; F, glacis;
G, ditch; H, counterscarp.

fence, and are stout posts driven horizontally or perpendicularly into the earth, in long close rows. Fig. 1 shows the use of both these defences in the ditch of a fortress, and it will be perceived

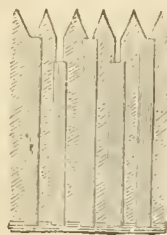


Fig. 2.—Stockade.



Fig. 3.—Double Stockade.

at once how formidable to an attacking party solid lines of these posts must be. The stockade forms likewise, at times, a good substitute for the parapet itself, particularly when the direct fire

of artillery is unlikely to be brought against it, as in warfare with barbarous tribes, or in a work at the very crest of a steep hill. In this case it is usually constructed of two rows of strong palisades firmly imbedded in the ground: the outer nearly a foot square, planted with three-inch intervals between; the second about six inches in diameter, closing these spaces behind. Every second small palisade is cut short a few inches, so as to leave a loophole for musketry-fire (as in fig. 2). A hill protected in this manner is shown in fig. 3.

CONSTRUCTION OF THE PARAPET.—The object of the parapet being to defend, or *degrade* a certain portion of ground behind it, its height must be calculated so that missiles passing across its crest shall fail to strike the troops mustered behind. The mini-

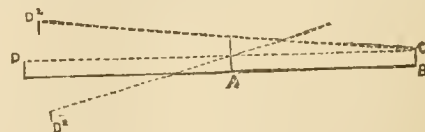


Fig. 4.

mum width defiladed to allow of safe communication for troops behind, and actually defending, is 30 feet; but if the men have to be drawn up in line, not less than 90 feet will suffice. The mode of ascertaining the height of parapet necessary in particular cases will be seen from the next diagram (fig. 4). Let A be the position at which the parapet is to be made, and AB the space which it is required to defilade to a height throughout equal to BC. D, D₁, D₂, are three points, according to the supposed country round, from which fire could be had at the parapet—one, D, being on the level, the others on the ground respectively higher and lower than the parapet: if lines be now drawn from these points to C, their intersection with a perpendicular, raised on the point A, will show the elevation necessary for the parapet protecting the space AB to the height BC. From this, the disadvantage will be apparent of constructing a parapet within range of higher ground, as for every extra foot of elevation in the commanding rise a proportionate addition must be made to the height of the parapet.

In practice, the ordinary parapet for a level is eight feet high, which allows for the depressed trajectory of a spending ball. See **PROJECTILES**. If the parapet be raised on ground above the attacking position, it may be lowered, according to the angle, to about six feet six inches, the height necessary for a man standing up to be thoroughly protected. On the other hand, if the position, A, be lower than the point occupied by the assailant, the parapet must be raised; as 12 feet forms the limit to which a parapet can conveniently be thrown up, further height necessary for protection is obtained by sinking the ground to be defiladed before the parapet's base. In measuring for these heights, the instruments used are *boning-rod*s, which are fixed in the ground at D and B, with the normal height of a man marked on them; a third rod at A is then marked at the point where the line of sight between the normal points on the two others intersects it, and so shows the height of the parapet.

The foregoing parapet has been provided only as a straight breastwork, deriving its safety solely from its own fire in a direct line upon the besiegers; but in practice such a rampart would be

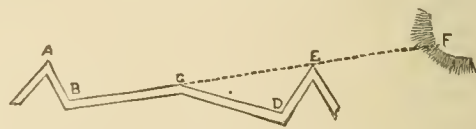


Fig. 5.

exposed to the disadvantage of holding but little command over the *scarp* or *escarp* (part cut away) at its foot; so that, if approached under cover, an enemy could readily lodge himself therein. To guard against this a work is *flanked*, so that the fire of one part shall take in flank an enemy advancing against another part. See fig. 5, where ABCDE is a flanked or reciprocally defensive parapet, in which it is evident that the fire from AB, DE, must take in flank any force moving on BC or CD, while the latter also, in like manner, flank AB, DE, themselves. In a flanked defence of this sort, the angles, A, C, E, which project towards the country, are technically termed *salient angles*; those at B and D, *re-entering angles*. The flanked parapet has often, likewise, the power of defilading larger spaces than the simple line of parapet, since the salient angles can, perhaps, be brought on elevated ground; while the re-entering angles, though with less elevation, may in some degree compensate that defect by greater distance from the front. A disadvantage of flanked defences is, that the hostile fire crosses the parapet at a less angle than in the straight line, and may, therefore, be more deadly; indeed, the object of the assailant will always be to obtain an enfilade fire along one or

more parapets of the defence, as (in fig. 5) an enemy posted at F, would be able to sweep the complete line of the parapet CB. To avoid this, the engineer who constructs the works must ascertain minutely the elevation of the surrounding points, and make his salients at such angles that the prolongation of his parapets towards the enemy shall always fall on low ground, whence no command can be obtained.

Now, where the salient angle becomes somewhat acute, and there is an enemy on both fronts, the soldiers defending the right parapet, and standing on its banquette, would be exposed to a *reverse* or back fire from the enemy in front of the left parapet, beyond the defilading of which they would doubtless be. As a remedy, an internal parapet, called a *traverse*, or, from its duty, a *parados*, is raised between the parapets of the salient, its height being determined on precisely the same principles as were made use of in regard to the original parapets.

Where both the faces of the salient are unavoidably so placed as to be enfiladed, a small work, called a *bonnet*, is constructed at the angle, which consists in the parapet being so raised up to an extra height of twelve feet if necessary, and at the same time widened, that the banquette shall be defiladed. If a height of twelve feet is insufficient to defilade the whole length of the banquette, traversing parapets must be raised at right angles to the face of the work, and within it, at such distances that the whole

may be safe: of course, the height of the bonnet and of the traverses must be decided on rules analogous to those explained in fig. 4. The increased height of the parapet of the bonnet renders it necessary to have two or more banquettes at that portion of the work, with steps to aid the ascent (see section in fig. 6); as AB, the crest

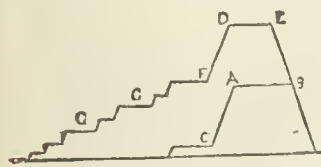


Fig. 6.—Bonnet.

of the general parapet, with banquette at C; and DE, the bonnet, with banquettes at F and G.

In enclosed work—i. e., in works entirely surrounded by parapets—the position of the *parados* is of vital importance; and they have often to be devised with great ingenuity, so as to protect the defenders from reverse fire in any direction, and at the same time not to prevent necessary communication between different portions of the fortress.

Relief means the height of any point in a work above the plane of construction, which may be the line of sight or the bottom of the ditch. In the latter case, the relief of the parapet is an important item in estimating the resisting power of a work, as it represents the vertical equivalent of the obstacle which will be offered to a foe.

When the relief of the parapet's crest has been determined, its thickness becomes the next consideration. The dimensions are laid down on the ground, and depend, first, on the angle at which the material to be used will pile; and then, on the nature of the missiles against which the parapet is to afford protection. For example, an earthwork of from three to four feet suffices to resist musketry; a thickness of 18 feet is impervious to the 24-pounder; while large guns can pound through even more solid obstructions.

Taking fig. 7 as an example, in which *a* is the crest of the parapet, then the banquette *e* should, for convenient firing, be four feet three inches below *a*; its width three feet, if for a single line of soldiers; four feet six inches for a double rank; its slope

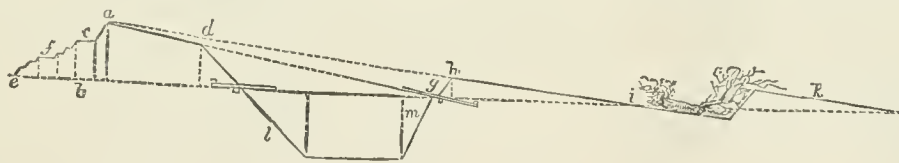


Fig. 7.—Section of Parapet, Ditch, and Glacis.

should be one in twelve, that water may run freely off. The base, *de*, of the slope, up which the men mount to the banquette, should be twice its height *de*, and cut into steps with inclined sides, to allow of easy ascent; and where the height is considerable, a supplemental banquette (on which relieving-men can, if necessary, reload), is desirable. The interior slope, *ac*, of the parapet should be one in four; the exterior slope, or *plongée*, *ad*, intended for the direction of the guns on an assailant, one in six, a deviation being permitted between one in nine and one in four: but the crest being more liable to destruction as the slope of *ad* is augmented, it is best to keep it as small as circumstances will allow; one in six is the ordinary slope in English fortification, the angle of the interior slope being constant. In some continental services, however, the angle, *ead*, is kept constant at 100°, by increasing the deviation of the interior slope of the parapet from the perpen-

dicular as the plunge of the exterior is greater. The flatter, however, the crest of the parapet is the better, as sand-bags are in certain cases ranged on it to form cover for the men, while they fire through loopholes left in this additional defence. Earth of medium tenacity maintains its position properly when sloped at an angle of 45°; and this is the greatest angle which can be counted on for the outer slope of the parapet. The scarp, *l*, and counterscarp, *m*, of the ditch need not have so great an incline, as the ground in which they are cut has usually had time, and the footsteps of ages, to consolidate it. In such cases, the base of the triangle is frequently made equal to half the perpendicular. Cases, of course, occur in which steeper banks are considered indispensable; and then, to prevent slips, the earth must have a coating to keep it up, which may be of fascines, hurdles, planks, or sand-bags, for temporary works, or those constructed in the midst of action; while the most solid masonry performs the same function in fortresses of a more permanent nature. This outer coating is denominated a *revêtement*.

In fig. 7, *ghi*, is the *glacis*, formed during the excavation of the ditch, and having for object the bringing of an advancing enemy into the best line of fire from the parapet. The base and perpendicular of its interior slope, *gh*, should be equal; the slope of the outer face should be one in twelve, unless the slope of the ground render some different angle desirable. An advanced glacis, *k* in fig. 7, is sometimes adopted, in order that the enemy may the sooner be brought under fire. It is absolutely necessary that the crest of the parapet should be five and a half feet higher than the crest of the glacis, as, otherwise, an assailant having reached the latter, would be able to pour a musketry-fire over the former into the work.

No part of any glacis, whether near or advanced, should be more than two feet below the line of fire from the parapet—i. e., the line joining the crests of the parapet and glacis continued; if more depth be allowed, the enemy may advance in a crouching posture, without being liable to be hit. Advanced glacis are usually made of earth thrown up in prolonging beneath the ground the plane of the preceding glacis. They may be defended entirely from the parapet, in which case palisades or abatis are often fixed (as in fig. 7) to delay the advancing enemy when at the point of greatest exposure. On the other hand, these advanced glacis are occasionally defended as a series of advanced intrenchments, and only abandoned, one by one, as the defenders are driven in towards their main work.

The dimensions of the ditch depend in some measure on the amount of earth required for the parapet and glacis; but in addition to being the mine whence the materials for the latter works are drawn, the ditch must also oppose a considerable obstacle to any hostile advance. To do this effectually, the minimum width across the top is 18 feet; its depth need only be limited by the trouble of raising the earth; but in practice 12 feet is found the greatest which can be conveniently arrived at. Having ascertained the profile of the parapet, with its banquette or banquettes, bonnets, traverses, glacis, &c., it becomes a mere matter of mensuration to complete the area of a section, to multiply it by the length, and so to obtain the cubic feet of earth required. With the length of the ditch known, a very simple calculation then exhibits its width and depth—a small allowance being made for the fact that the earth dug out from the ditch, where it has probably been long compressed, will occupy somewhat more space when thrown up, and broken into clods, for forming the parapet.

The *scarp*, or inner face of the ditch, is most difficult of ascent

by the assailant, when in a continuous line with the parapet (as in fig. 7); but sometimes it would be dangerous to construct the work with this continuity, as damage to the scarp would jeopardize the stability of the parapet. In these cases a narrow step, called a *Berm* (q. v.) of from two to four feet, is made to intervene between the foot of the parapet and top of the scarp: as a precaution, it is covered with all possible obstacles to any lodgment being effected on it by the enemy. When a berm is employed, greater steepness is usually given to the scarp.

The *counterscarp*, or outer sloping side of the ditch, should be somewhat steeper than the scarp. The bottom of the ditch should slope from both sides towards the center, to carry off the water; and obstacles should be scattered about to prevent an enemy from forming his troops in the ditch.

EARTHWORKS IN FIELD FORTIFICATION.—As the most readily

constructed, earthworks naturally recommend themselves to the engineer, who, in the field, is called upon to defend the position of an army against sudden attack. Their utility has been shown in their employment from the earliest times; and modern experience tends to prove that earth-parapets are of all fortifications among the most difficult to overcome. An army manœuvring before a superior force, can scarcely hope to avoid battle being thrust upon it, unless, strengthened by fieldworks, it be rendered more nearly equal to the adversary. Napoleon, Marlborough, Eugène, Wellington, have given their names as witnesses to the indispensability of such works. The Russian parapets at Borodino made the French victory so sanguinary a triumph that it was useless to the victors. A few redoubts at Pultowa saved Peter the Great from total defeat by his formidable Swedish rival. The world-famed lines of Torres Vedras enabled Wellington with 50,000 troops, half of whom were untried Portuguese, to withstand for five months, and ultimately to drive back, the hitherto victorious army of 70,000 French, under such commanders as Masséna, Ney, and Junot. The earthworks surrounding Sevastopol partook greatly of the nature of fieldworks for the protection of a large army, and history will not forget to recount the resistance they offered for almost a year to the best troops of the civilized world.

For a line, whether of earth or masonry, to be efficient, it must combine artillery fire with that of musketry. The guns will generally be so placed as to command some specific line of approach, such as a ravine, a line of abattis, or some portion of the glacis. They should themselves be as little exposed as possible, nor should the gunners be uncovered more than is absolutely requisite. To effect this, the gun is generally made to fire through an *embrasure* (q. v.) in the parapet, instead of over the latter. The embrasure is a cutting through the solid parapet, 20 inches wide at its inner extremity, and outwards half as much as the width of the parapet. In cases where it is necessary, for proper command, that the line of fire should not be lower than the top of the parapet, the embrasure is made through an additional parapet—raised, as in the previous case of the bonnet, above the original one. The bottom of the embrasure is called the *sole*, and slopes downward sufficiently to allow of a certain depression being given to the gun. The remainder of a parapet below the sole is the *genouillère* (from *genou*, a knee), and in field fortification should be three and a half feet high; the portion between two embrasures is the *merlin* (Ital. *merlone*, battlement); and an embrasure need not cut the parapet perpendicularly, an angle being admissible, when an oblique fire is necessary. When, however, the obliquity would exceed 70° , it is usual, in order that the thickness of the parapet should not be too much diminished, to form a projecting angle in it, through which the embrasure is cut (as in fig. 8). The sides of the embrasures are *cheeks*, and require revêting.

A *barbette* is a platform raised behind a parapet, higher than the general interior, with a view to guns being fired from it over the parapet.

There are certain fixed rules in all fortification, such as:—1. The length of lines must never exceed musketry range, or the flanking-works would become ineffective for their object. 2. The angles of defence should be about right angles. 3. Salient angles should be as obtuse as possible. 4. Ditches should have the best possible flanking. 5. The relief of the flanking-works must be determined by the length of the lines of defence. 6. The value of almost every detached work depends on the support it can give to or receive from an army or other work or works. 7. The reduction of every fortified work is merely a question of time; and a work fairly surrounded is sure to fall, unless relieved from without.

Fieldworks, which, it must be borne in mind, are intended mere-

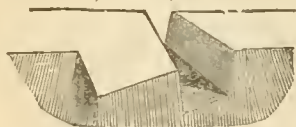


Fig. 8.



Fig. 9.

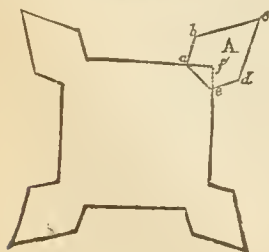


Fig. 10.—Bastioned Fort.

stand the nature of a single bastion, see A (fig. 10), which represents one at the corner of a square work; *ab* is the left flank; *bc* the left face; *cd* the right face; *de* the right flank; *ae* is the gorge; *af*, *fe* are the *demi-gorges*, being continuations of the sides, or curtains, of the work; *a* and *e* are the left and right curtain angles; *b* and *d*, the left and right shoulder angles, and *c* is the flanked angle.

Continued lines are simple parapets, either connecting fortified posts, or covering the front or flank of an army. Redans joined by curtains (as in fig. 11) are those most easily constructed; but as the ditches can only be defended by an oblique fire, the curtains are occasionally so broken



Fig. 11.—Continued line of Redans.

as to form nearly right angles with the faces of the redan, as in the dotted line; they then become *lines of tenailles*.

Lines en Crémallière have long faces with perpendicular flanks. *Lines with intervals* are often as effective as continued lines. They consist of detached works in two lines, within musketry fire of each other. The re-entering angle, *abc* (fig. 12), should as nearly as practicable be a right angle. The celebrated lines of Torres Vedras, before adverted to, consisted of 150 detached forts.

Tête-du-pont, is a work constructed to cover the approaches to a bridge, and will be found described under BRIDGE-HEAD.

A *tenaille* is the reverse of a redan, and consists of two faces forming a re-entering angle: it can only be used in connection with some other work.

A *flèche* is a breastwork of two faces, forming a salient angle, constructed on the exterior of a glacis, usually at its foot, in order to defend the ground before a bastion or ravelin.

Having now explained the principal forms which elemental works of fortification are made to assume, we proceed to describe—very briefly, of course—the systems into which these have been



Fig. 12.—Line with intervals

incorporated for the defence of fortresses, towns, and other permanent purposes. It will merely be necessary to state, in addition to what has been already written, that a *rampart* is a raised structure of earth or stone, above the mean level of the country, on which the parapets, &c., can be thrown up, and which affords to the town or space protected the extra cover of its height, while it elevates the inner works sufficiently to enable them to command and fire over those situated exteriorly to themselves. It need scarcely be said that a line which can be made of earth may equally be constructed of any other material which circumstances may render desirable, the maximum resistance and minimum liability to splinter being the qualities to be chiefly considered.

SYSTEMATIC FORTIFICATION FOR PERMANENT WORKS.—Adverting to the most ancient fortifications mentioned in history, we find Greek cities surrounded with walls of brick and rubble, and occasionally of stone in huge blocks. Babylon had a wall of prodigious circuit—100 feet high, 32 feet thick, and surmounted by towers. Jerusalem, at the time of Vespasian's siege, had similar walls with masonry of enormous solidity. These seem to represent fortification as it stood from the time of that emperor to the introduction of cannon for breaching purposes. Then the square and round towers, which had formed sufficient flanking defence against arrows, proved useless when cannon-balls, fired from a distance, were the instruments of assault. At the same time, the walls, which had resisted battering-rams, crumbled to atoms under the strokes of artillery.

Fortunately, however, the art of defence has always made equal progress with that of attack; and, early in the 15th, if not late in the 14th c., the Italians had commenced to flank their walls with small bastions. The bastions at Verona, built by Micheli in 1523, are usually looked upon as the oldest extant specimen of modern fortification. Tartaglia and Albert Dürer, painter and engineer, were early in the field. In most of the earlier systems the face of the bastion was perpendicular to its flank. The first principles were successively improved by Marchi, an Italian, who died 1599, by Errard Bois-le-Duc, and the Ville, under Henry IV. and Louis XIII. of France. The Count de Pagan, whose treatise appeared in 1645, did much towards demolishing previous errors, and laid the basement of that science which Vauban subsequently wrought almost to perfection. Born in 1633, Vauban had a genius which penetrated in every direction, equally in the ways of war and in those of peace. He might possibly have taught how fortresses could be rendered impregnable, had not the restless ambition of his master, Louis XIV., led him to demonstrate, first, that the reduction of any work was a mere question of time and powder. His talent so improved the system of attack, that even he himself could not construct a rampart that should withstand the fire conjured up against it by his discoveries. He constructed 33 new

fortresses, improved above 100, and conducted personally more than 50 sieges. To him are soldiers indebted for the sweeping fire of ricochet, and to him in a degree for the traverses which endeavor to render it harmless. Coehoorn, director-general of the

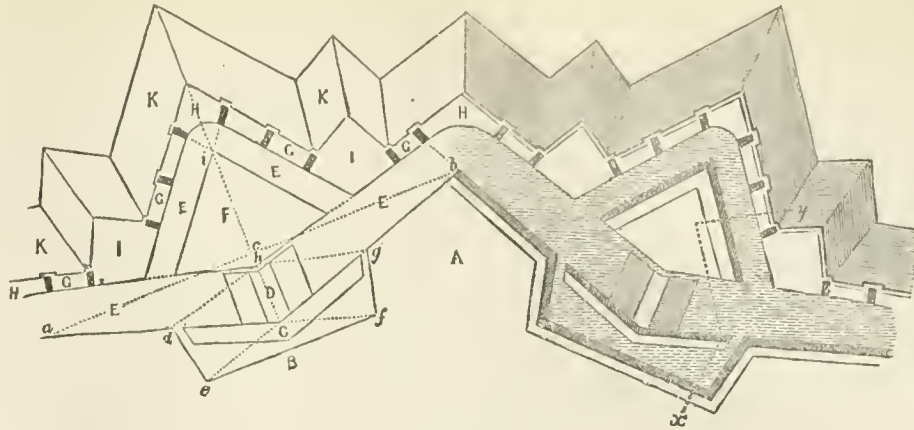


Fig. 13.—Vauban's First System; Ground-plan:
A, bastion; B, curtain; C, tenaille; D, caponniere; E, ditch; F, ravelin; G, covert-way; H, salient place of arms; I, re-entering place of arms; K, glacis.



Fig. 14.—Vauban's First System; Profile:
a, b, banquettes; c, parapet; d, revêtement; e, escarp; f, counterscarp.

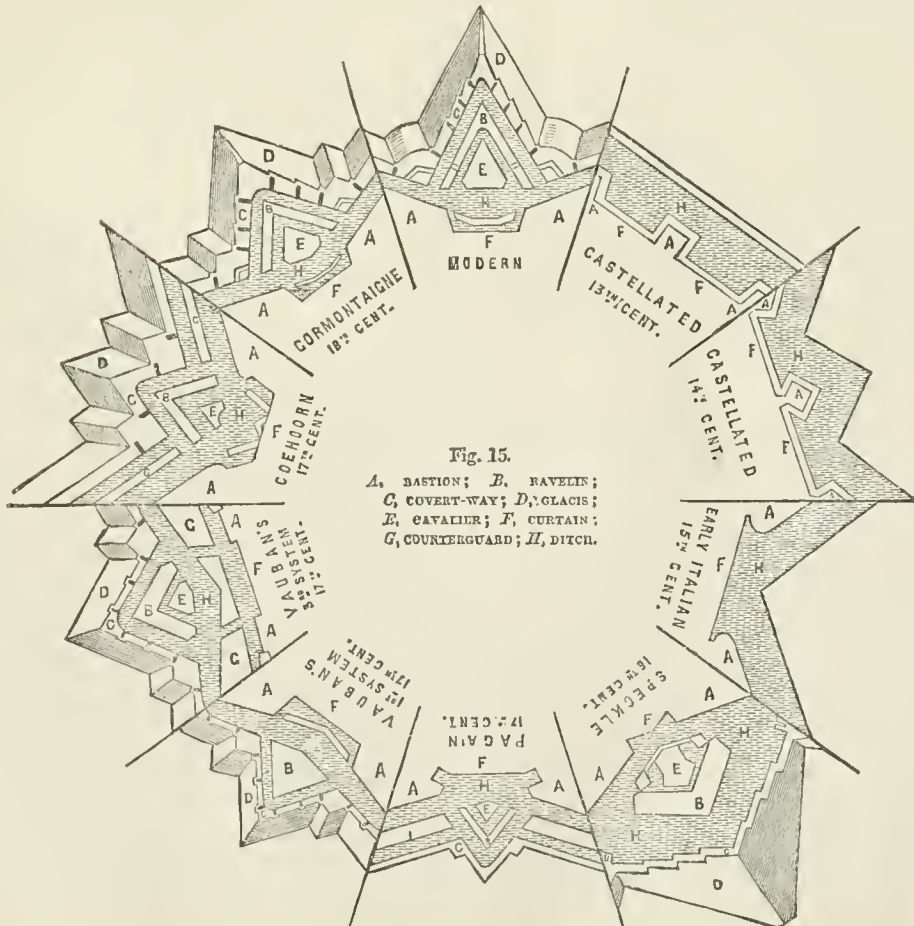


Fig. 15.
A, BASTION; B, RAVELIN;
C, COVERT-WAY; D, GLACIS;
E, CAVALIER; F, CURTAIN;
G, COUNTERGUARD; H, DITCH.

fortresses of the United Provinces, was the contemporary, rival, and opponent of Vauban; his master-piece is Bergen-op-Zoom. Cor-
montaigne, Belidor, Montalembert, Boussard, and Carnot may also be mentioned as conspicuous masters in the science.

Irrespective of irregularities in the form of the place to be defended, a particular polygon is selected as that on which the lines of defence are to be drawn. Each side of this is a *face of defence*, and the length of a side is rarely made greater than 360 yards.

Vauban's first system is shown in fig. 13 as regards the outline of its ground-plan; fig. 14 displaying the same in profile.

In this instance, the polygon taken is an octagon. Let *ab* (fig. 13) be a side of this polygon; bisect this in *c*, and draw a perpendicular to *ab*. On this, inwards, mark off *cc'* one-sixth of *ab*; join *ac*, *bc*, and produce the lines; then from *a* and *b* respectively mark off *ad*, *bg*, each equal to $\frac{1}{2}$ *ab*, for the faces of the bastions. Next, from *a* and *b* as centers, with radius, *ag*, describe arcs cutting *ac*, *bc*, produced in *f* and *e*; join *de*, *fg*, for the flanks of bastions, and *ef* for the curtain of the work. The first line of defence is then complete, the necessary parapets, &c., being of course raised on the site laid out. From an examination of this, it will be seen that the whole space in the front is covered. The faces of the bastions and the curtain command more or less the entire front, while the bastion flanks sweep along the faces of adjoining bastions and along the curtain. In front, however, of the apex of each bastion, the line of advance is only covered by an extremely oblique fire. To obviate this, a ravelin, *F*, is constructed on the further side of the main ditch, which commands the double fronts, and, at the same time, forms an outwork capable of assisting in the general scheme of defence. To trace the main ditch, describe from the flanked angle of the bastion, *a* or *b*, an arc with radius 30 yards (if dry ditch, 36 if wet), and from these arcs draw tangents to the shoulders, *d* and *g*, of the opposite bastions. These tangents, meeting in the line *cc'*, form the counterscarp line of the main ditch. From *h*, the re-entering angle of the counterscarp, set off 100 yards along the perpendicular to *i*, which will be the apex of the flanked angle of the ravelin. From *i*, draw lines to points situated in the faces of the bastions, 10 yards from the shoulder angles; these lines to the points intersecting the counterscarp give the faces of the ravelin. The ditch of the ravelin is 20 yards wide, with counterscarp parallel to the escarp. The zigzag line now arrived at gives the inner side of the covert-way—10 yards wide—behind the glacis, which last slopes gradually towards the country, and is ordinarily the outer work of all. The tenaille is a comparatively low parapet sweeping the depressed interior of the ravelin, and commanded by the bastions and curtain.

The caponnière, forming a communication between the tenaille and the ravelin, consists of a passage between two low parapets, each with a glacis sloping towards the ditch, which is swept from the work.

Nine feet clear are allowed round the traverses on the covert-way; at the re-entering angles of the covert-way, *places of arms* are formed by setting off 30 yards on each side, and with this as gorge, advancing faces inclined to each other at 100°. If the polygon had been a square, *cc'* would have been $\frac{1}{2}$ *ab*; if a pentagon, $\frac{1}{3}$ *ab*; and for any polygon of more sides than seven, $\frac{1}{4}$ *ab*.

Vauban's second and third systems were those in which he adapted old walls to his modern improvements. Availing himself of the works already formed, he added counterscarps in front of the corner-towers, thereby making hollow bastions, and avoiding the necessity of entirely rebuilding.

Coeboorn's system had counterscarps in front of the bastions and parallel to them. The flanked angle of his ravelin had a fixed value—viz., 70°.

Cormontaigne widened the gorge of his ravelin, thereby reducing the length of the bastion face available for breaching from without. He also revived the step-like formation of the covered way, originally seen in Speckle in the 16th c., and which gives defenders a continued line of fire from each traverse along the covert-way.

The modern system differs but little from that of Cormontaigne. The re-entering places of arms have circular fronts instead of angular; the angle of the ravelin is fixed at 60°, and all the best points of older styles are associated.

Fig. 15 is intended to present at one view a representation of the systems in force since artillery came into common use, as well as the gradual transition from square towers on castle walls to flanked bastions on modern lines. The elements of fortifying against shipping will be found under MARINE FORTIFICATION; the principles of attacking fortresses generally, under SIEGE, and MINES, MILITARY.

FORTIGUE'RRRA, NICOLÒ, an Italian poet, was born at Pistoja, November 7, 1674. Destined from youth for the church, he proceeded to Rome at an early period, where the power of the prelate Carlo A. Fabroni, who was his relative, speedily secured him advancement, and where he was ultimately raised to the dignity of prelate and papal chamberlain by Clement XI. An ardent cultivator and protector of letters, it must be owned that F.'s own compositions are more prized for a certain rich joviality of imagery, and profuse facility of language, than for any salient beauty of style or conception. His chief work, *Il Ricciardetto*, was

originally commenced in confutation of friends, who maintained that the striking ease and fluency of Ariosto, Berni, and other poets of a similar school, were but apparent, and in reality the fruit of deep art and severe labor. F., in a few hours threw off an entire canto of *Il Ricciardetto*, strikingly in imitation of the above poets, and continued the work at random much beyond its originally designed limits. It was published in 1738, two years after his death, and met with unequivocal favor, notwithstanding the incredible incidents and licentious images with which it is replete. F. died 7th February 1735.

FORTRO'SE, or FORTROSS, a parliamentary and royal burgh, seaport, and watering-place in the east of Ross-shire, on the west side of the Moray Firth, opposite Fort George, ten miles north-north-east of Inverness. Pop. (1881) 874. It unites with Inverness, Forbes, and Nairn in sending a member to parliament. F. had a fine cathedral and a bishop's palace; but both of these buildings were partially destroyed under Cromwell, and the stones sent to Inverness, to be used in building a fort there. F. is now of little importance, but, in the 16th c., it had a considerable trade, and is said to have been the seat of arts, science, and divinity in the north of Scotland. Previous to 1444 it was known by the name of Chanonry, but in that year it was united with the adjacent burgh of Rosmarkie under the name of Fortross.

FO'RTS and FORTALICES. The military power of the state is intrusted by the constitution of this country to the sovereign. After having been unconstitutionally claimed by the Long Parliament in the time of Charles I., it was again vindicated for the crown by 2 Car. II. c. 6. This branch of the royal prerogative extends not only to the raising of armies and the construction of fleets, but to the building of forts and other places of strength. Sir Edward Coke lays it down (1 Inst. 5), that no subject can build a house of strength embattled without the license of the king; and it was enacted by 11 Henry VII. c. 18, that no such place of strength could be conveyed without a special grant.

FORTU'NA, called by the Greeks *Tyche*, was in classical mythology the Goddess of Chance. According to Hesiod, she was a daughter of Oceanus; according to Pindar, a sister of the Paræe. She differed from Destiny or Fate, in so far that she worked without law, giving or taking away at her own good pleasure, and dispensing joy or sorrow indifferently. She had temples at Smyrna, Corinth, and Elis. In Italy, she was extensively worshipped from a very early period; and had many names, such as *Patricia*, *Plebeia*, *Equestris*, *Virilis*, *Primigenia*, *Publica*, *Privata*, *Muliebris*, *Virginensis*, &c., indicating the extent and also the minuteness of her superintendence. Particular honors were paid to her at Antium and Præneste; in the temple of the former city, two statues of her were even consulted as oracles. Greek poets and sculptors generally represented her with a rudder, as a symbol of her guiding power, or with a ball, or wheel, or wings, as a symbol of her mutability. The Romans proudly affirmed that when she entered their city, she threw away her globe, and put off her wings and shoes, to indicate that she meant to dwell with them for ever.

FORTUNATE ISLANDS. See CANARIES.

FORTUNA'TUS is the title of one of the best people's books (*Volksbücher*) ever written. It originated about the middle of the 15th c., though many of the tales and legends included in it are of much older date. The opinion that it was worked up into German from a Spanish or English original may be considered as set aside. The substance of the book is that F., and his son after him, are the possessors of an inexhaustible purse of gold and a wishing-cap, which, however, in the end, prove the cause of their ruin. The moral is, that worldly prosperity alone is insufficient to produce lasting happiness.

The oldest printed edition of the book now extant bears the date Frankfurt am Maine, 1509. Later German editions mostly bear the title, *Fortunatus, von Seinem Seckel und Wunsch-hütlein* (Fortunatus: Story of his Purse and Wishing-cap. Augsb. 1530; Nürnberg, 1577; and Basel, 1699). It has been reprinted in Simrock's *Deutsche Volksbücher* (3 vols., Frankt. am Maine, 1846). Various French versions of the German story have appeared from time to time, as the *Histoire de Fortunatus* (Rouen, 1670); which served as the groundwork of the Italian *Avvenimenti de Fortunatus e de' Suoi Figli* (Naples, 1676). From the German original, have also sprung, among others, the Dutch version *Een Nieuwe Historie van Fortunatus Borse en van Zijnen Wensch hoed* (Amst. 1796); later, the English *History of Fortunatus and his Two Sons* (London, no date); the Danish *Fortunati pung og ønskehat* (Köpen. 1664, 1672, 1695, 1756, 1783); the Swedish *Fortunatus* (1694); and about 1690, two Icelandic versions, one in verse and another in prose. The first to dramatize the subject was Hans Sachs, in his *Der Fortunatus mit dem Wunschseckel* (1553), after whom comes the English Thomas Decker with his *Pleasant Comedie of Old Fortunatus* (1600), a work which had the honor to make its reappearance in German about the year 1620. The most poetical edition of the story is that given by Tieck in his *Phantasus* (3 vols., Berlin,

1816). See Grässe's *Die Sagenkreise des Mittelalters* (Dresd. and Leip. 1842), and Ersch and Gruber's *Encyclopædie* (sect. 1, vol. 46).

FORTUNE, ROBERT, a distinguished botanist and traveler, was born in the county of Berwick in 1813. After completing his education at a Scotch parish school, he served an apprenticeship as a gardener, and obtained employment in the Royal Botanic Garden at Edinburgh. There he had good opportunities of obtaining a sound knowledge of botany and the higher departments of his own profession, so far as they relate to the cultivation of subtropical and tropical plants under glass in a temperate climate, and these opportunities he turned to good account. He afterwards obtained a situation in the garden at Chiswick, where his abilities and acquirements attracted the attention of London naturalists. He was, in 1842, sent by the Botanical Society of London to Northern China to make a botanical exploration of the country. His journey was most successful, and he sent home a very large number of new and valuable plants. He gave an account of his adventures in his *Three Years' Wanderings in Northern China*, a work which places its author in the foremost rank of contemporary explorers. F., on his return to England, acted for a time as curator of the Physic Garden at Chelsea. In 1842, he was appointed by the East India Company to proceed to China to make investigations relative to the cultivation of the tea-plant; and on his return to England he published a work entitled *Two Visits to the Tea Countries of China*. He was afterwards employed by the American government to collect for them seeds, chiefly those of the tea-plant, in the East. It was F. who introduced the tea-plant from China into the North-west Provinces of India. *Yedo and Peking*, published in 1863, devotes special attention to the natural productions and agriculture of the districts visited. F. died at London, 13th April 1880.

FORTUNE-TELLER. Under the designation Vagabonds, in the Scottish Act 1579 c. 74, are included all who go about pretending to foretell fortunes. The punishment inflicted on them by the statute is scourging and burning on the ear.

FORT WAYNE, a flourishing town of the state of Indiana, North America, at the confluence of the St. Joseph and St. Mary rivers, which form the Maumee, and on the Wabash and Erie Canal, 122 miles east-north-east from Lafayette. It is a great railway center, and its growth has been very rapid. A fort was erected here by order of General Wayne in 1794, and it continued to be a military post till 1819. Pop. (1870) 17,718; (1880) 26,881.

FO'RUM, a Latin word, which originally signified an 'open place,' and is probably connected with *foras*, 'out-of-doors.' The Roman *fora* were places where the markets and courts of justice were held. The former were termed *fora venalia*, and the latter *fora judicialia*. Of the *fora judicialia*, the most ancient and celebrated was the *forum Romanorum*, or *par excellence*, the *forum magnum*, occupying the quarter now known as the *campo vaccino* (or cattle-market). It stretched from the foot of the Capitoline Hill, where the arch of Septimius Severus stands, to the temple of the Dioscuri, was seven *jugera* in extent, and was surrounded by streets and houses. The boundary on the east and north was the *Sacra via*, of which the side nearest to the forum was left open; while on the other were corridors and halls, such as those of the *argentarii* (bankers or money-changers). At a later period, the site of these was, for the most part, occupied by basilicas and temples. In the eastern portion of this space, were held the earliest *Comitia* (q. v.) of the Romans—the *comitia curiata*; hence this part took the name of the *comitium*, and was distinguished from the forum strictly so called. Here were hung up for the benefit of the public the laws of the Twelve Tables; and, after 304 B.C. the *Fasti* written on white tables to inform the citizens when the law-courts were open. The *Forum*, in the narrower usage of the word, probably ceased to be employed as a market-place about 473 B.C., when it became the place of assembly of the *Comitia Tributa*. Of the later *fora venalia*, the principal were the *forum boarium* (the cattle-market), the *forum suarium* (pig-market), *piscatorium* (fish-market), *olitorium* (vegetable market), &c. Public banquets for the populace, and the combats of the gladiators, were in the time of the republic, usually held in the great forum, which also contained monuments of various kinds, of which may be mentioned the famous *Columna Rostrata* of C. Duilius, erected in memory of his victory over the Carthaginians. The rostra, or platforms from which public orations were delivered, formed the boundary between the forum in its narrower usage and the *comitium*. After the time of Julius Cæsar and Augustus, the *Forum Romanorum* lost the importance it had previously derived from being the central point of Roman political life. The other two *fora judicialia* were the *Forum Julii* and the *Forum Augusti*. Compare Becker, *Handbuch der Röm. Alterthümer* (1 vol., Leipsic, 1843).

FORUM CO'MPETENS, in Law, is the court to the jurisdiction of which the party is amenable.

FOSCARI, FRANCESCO, Doge of Venice from 1423 to 1457, a brilliant period of conquest and prosperity to his country, and of unexampled affliction to himself and family. Born about 1370, his aspiring ambition soon fired him with passionate eagerness to exalt his reign by the glory of conquest, and speedily involved the state in a severe conflict with the Dukes of Milan; which, however, the doge's great military ability in the end turned into a source of glory and aggrandizement to Venice. His triumph was embittered by the successive loss of three sons; and the one who remained to transmit the name, and succeed to the inheritance of the family, was, in 1445, denounced for having received bribes from the hostile generals, to use his influence with the doge in procuring less rigorous terms. Tried for this grave crime before the Tribunal of the Ten, and racked cruelly in view of his father, Giacompo Foscari was banished for life, under pain of death should he attempt to revisit his native land. In 1450, the assassination of one of the 'Council of Ten,' Hermolao Donati, was imputed, on what seem most unfounded grounds, to Giacompo, who was consequently summoned from his exile, tried, tortured, and banished a second time on still more rigorous terms to the island of Candia. Grown reckless through suffering, and longing to see his home and country on any terms, Giacompo petitioned the Duke of Milan to intercede in his behalf with the senate, a step which, by Venetian law, was punished as a high crime, and led to the unfortunate Giacompo being for the third time subjected to torture and renewed banishment, on entering into which he died of grief. The doge had vainly besought to resign a dignity grown loathsome to him, from its imposing the barbarous obligation of witnessing his son's torture; but in the end he was deposed, and ordered to vacate the palace in three days. At the age of 87, decrepit from years, and bowed by sorrow and humiliation, Francesco F., supported by his venerable brother, descended the Giant's Staircase, and passed out for ever from the ducal palace, the scene of such vain pomp and bitter misery. Pasqual Malapieri was elected in his stead in 1457, and at the first peal of the bells in honor of elevation, F. expired from the rupture of a blood-vessel. Byron has written a tragedy on the subject, entitled *The Two Foscari*.

FO'SCOLO, Ugo, an Italian author, was born about 1778, at Zante, one of the Ionian Isles, and proceeded to Venice in his 16th year, where for a time he pursued his studies, repairing later to Padua to enjoy Melchiorre Cesarotti's noble course of classic literature. His earliest efforts at poetical composition were strictly modelled on his favorite Greek classics; and, as early as 1797, his tragedy, *Il Tieste*, was received with favor by a critical Venetian audience. The dismemberment of the Venetian states decreed by the treaty of Campo Formio, bitterly incensed F.'s patriotic spirit, and inspired him with one of his most remarkable works, *Le Lettere di Jacopo Ortis*, which, owing to the fierce political excitement then prevailing throughout the entire peninsula, was received with immense popularity. F. repaired to Milan on its being declared the capital of the Cisalpine republic, and there obtained the grade of officer in the Lombard legion.

On the downfall of the republic, he retreated with the French into Genoa, where, in the midst of the terrors of a rigorous siege, he composed two exquisite odes to *Luigia Pallavicini Caduta da Cavallo*, and *All' Amica risanata*. F. subsequently entered France with the intention of joining Napoleon's expedition against England, and prepared a much admired version of Sterne's *Sentimental Journey*, to exercise himself in English. On the failure of the plan, he returned to Milan, and prepared a splendid edition of Montecuculi's works, with notes and historical references—*Opere di Raimondo Montecuculi, per Luigi Mussi* (Milan, 1807–1808), a very rare edition. At this time, he also published his exquisite poem, in blank verse, *I Sepolcri*, which at once placed him among the classic authors of his country. In the same year, he was appointed to the chair of eloquence in Pavia, and occupied the post, until the professorship was suppressed in all the colleges of Italy. His inaugural address, *Dell' Origine e dell' Ufficio della Letteratura*, is a masterpiece of beautiful, noble, and patriotic writing. *Ajace* and *Ricciarda* are tragedies. From the time F. lost faith in the sincerity of Bonaparte's intentions to his country, he employed the full powers of his wrath and sarcasm in denouncing his treachery. After various vicissitudes, F. finally sought refuge in Britain about 1816, and soon mastered the language sufficiently to contribute to the *Quarterly* and *Edinburgh Reviews*. In London, some of his best writings were published—viz., *Essays on Petrarca and Dante*, *Discorso sul testo del Decamerone*, *Discorso storico sul testo di Dante*, and various minor compositions. He died October 10, 1827, of dropsy, near London. His remains were finally deposited in the church of Santa Croce, Florence, in 1871. His works and letters were published in 12 vols. by Le Monnier (1850–1862).

FOSS, or FOSSE (Lat. *fossa*, from *fodio*, I dig), in Fortification, is a ditch or moat, either with or without water, the excavation of which has contributed material for the walls of the fort it

is designed to protect. The foss is immediately without the wall, and offers a serious obstacle to escalading the defences.

FOSSA ET FU'RCA, or PIT AND GALLOWES, was an ancient privilege granted by the crown to barons and others, which implied the right of drowning female felons in a ditch, and hanging male felons on a gallows.

FOSSA'NO, a town of Piedmont, N. Italy, in the province of Coni or Cuneo, is situated on the left bank of the Stura, on a hill surmounted by an old castle, 14 miles north-east of Coni. It is surrounded with old walls, and is well built; but the houses are erected over arcades, under which run the footways, and thus the streets have a somewhat gloomy appearance. It has a handsome cathedral, ten churches, a royal college, and numerous minor educational institutions, silk-factories, paper-mills, and tanneries. Pop. (1871) 7272.

FOSSIL (Lat. *fossilis*, dug out of the earth), a term formerly applied, in accordance with its derivation, to whatever was dug out of the earth, whether mineral or organic, but now restricted to the petrified remains of plants and animals imbedded in the earth's crust. They were formerly, and are sometimes still, called petrifications. They occur in nearly all the stratified rocks, which have, on this account been called Fossiliferous strata. It is difficult or impossible to detect them in the metaphoric rocks, for the changes that altered the matrix have also affected the organisms, so as either almost or altogether to obliterate them. In the fundamental mica-schist and gneiss they have escaped notice, if ever they existed; but comparatively recent investigation has proved their presence in or among those gneissose rocks which are the greatly metamorphosed representatives of the Lower Silurian Measures in the north of Scotland. See GNEISS.

The conditions in which fossils occur are very various. In some Pleistocene beds the organic remains are but slightly altered, and are spoken of as sub-fossil. In this state are the shells in some raised sea-beaches, and the remains of the huge struthious birds of New Zealand, which still retain a large portion of the animal basis. In the progress of fossilization, every trace of animal substance disappears; and if we find the body at this stage, without being affected by any other change, it is fragile and friable, like some of the shells in the London clay. Most frequently, however, a petrifying infiltration occupies the cavities left in the fossil by the disappearance of the animal matter, and it then becomes hardened and solidified. Sometimes the whole organism is dissolved and carried off by water percolating the rock, and its former presence is indicated by the mould of its outer surface, and the cast of its inner in the rocky matrix, leaving a cavity between the cast and the mould agreeing with the size of the fossil. This cavity is occasionally filled up with calcareous spar, flint, or some other mineral; and we thus obtain the form of the organism, with the markings of the outer and inner surfaces, but not exhibiting the internal structure. The most advanced and perfect condition of fossilization is that in which not only the external form, but also the most minute and complicated internal organization is retained; in which the organism loses the whole of its constituents, particle by particle, and as each little molecule is removed, its place is taken by a little molecule of another substance, as silica or iron pyrites. In this way we find calcareous corals perfectly preserved in flint, and trees exhibiting in their silicified or calcified stems all the details of their microscopic structure—the cells, spiral vessels, or disc-bearing tissue, as well as the medullary rays and rings of growth.

FOSSIL FERNS. As far as has been yet determined from the rocky tablets of the earth's crust, ferns first appeared in the Devonian period, but then only sparingly, not more than nine or ten species having been observed. In the immediately succeeding Coal-measures, they suddenly reached their maximum development. The dense forests and the moist atmosphere of this period were so suited to their growth that they formed a large bulk of the vegetation. Upwards of 350 species have been described, some of them tree ferns of a size fitting them to be companions of the immense Sigillarias and Lepidodendrons whose remains are found associated with theirs in the Carboniferous rocks. Twenty-three species have been found in Permian strata. Many new forms appear in the Trias, and their number is increased in the Oolite. The fresh-water beds of this period contain numerous beautiful ferns, upwards of fifty species having been described. The marine beds of the Cretaceous period contain very few forms, and in the Tertiary rocks they are equally rare.

FOSSILIFEROUS ROCKS are those which contain organic remains. If we except the lowest metamorphic rocks, in which, as yet, no fossils have been found, the term is equivalent to the 'stratified rocks,' when used comprehensively; but it may also be applied to a particular bed, as when we speak of an unfossiliferous sandstone compared with the neighboring fossiliferous shale or limestone.

FOSSOMBRO'NÉ, a small episcopal town of Italy, in the province of Urbino and Pesaro, is pleasantly situated on a hill on the left bank of the Metauro—which is here spanned by a fine modern bridge—11 miles east of the town of Urbino. It rose in the 14th c., from the ruins of *Forum Sempronii*, destroyed by the Goths and Lombards. Some interesting Roman inscriptions and remains of the ancient city are contained in the cathedral of St. Aldobrando. F. is celebrated for its fine manufactures of carpets and woollen cloths, and particularly for the excellent silk of its neighborhood. Three miles from F. is Il Monte d'Asdrubale, famous as the scene of the engagement in which the Carthaginian general was defeated and killed by the Romans in 207 B.C. Pop. about 4500.—See Lauro Giacomo, *Historia e Pianta di Fossombrone*.

FOSTER, JOHN, a well-known English essayist, was born in the parish of Halifax, Yorkshire, September 17, 1770. He was educated for the ministry at the Baptist College at Bristol, but after preaching for several years to various small congregations with very indifferent success, he resolved to devote himself mainly to literature. His *Essays, in a Series of Letters*, were published in 1805, while he was officiating as pastor of a Baptist chapel at Frome, in Somersetshire. They were only four in number—On a Man's Writing Memoirs of Himself; On Decision of Character; On the Application of the Epithet Romantic; and On some of the Causes by which Evangelical Religion has been rendered less acceptable to Persons of Cultivated Taste; yet Sir James Mackintosh did not hesitate to affirm that they showed their author to be 'one of the most profound and eloquent writers that England has produced.' They have been remarkably popular, especially among the more thoughtful of the community, and have gone through upwards of twenty editions.

In 1808, F. married the lady to whom his essays were originally addressed, and retired to Bourton-on-the-Water, in Gloucestershire, where he lived a quiet, studious, literary life, preaching, however, in the villages round about on Sundays. In 1819 appeared his celebrated *Essay on the Evils of Popular Ignorance*, in which he urges the necessity of a national system of education. He was long the principal writer in the *Eclectic Review*, and a selection from his contributions to that magazine was published by Dr. Price in 1844. He died at Stapelton, near Bristol, October 15, 1843. F. was a man of deep but sombre piety. The shadows that overhung his soul were, however, those of an inborn melancholy, and had nothing in common with the repulsive gloom of bigotry or fanaticism. His thinking is rugged, massive, and original; and at times, when his great imagination rouses itself from sleep, a splendor of illustration breaks over his pages that startles the reader both by its beauty and its suggestiveness. Besides the works already mentioned, F. published several others, of which the most important is an *Introductory Essay to Doddridge's Rise and Progress of Religion* (1825). Compare the *Life and Correspondence* of F. (2 vols. 1846), edited by J. E. Ryland, and republished in Bohn's Standard Library in 1852.

FO'THERGILL PROCESS. This is one of the numerous dry processes in Photography (q. v.) which have, for their object the preservation of sensitive plates ready for exposure. It is named after the inventor, and consists in the partial removal of the free nitrate of silver which adheres to the collodion film on withdrawing it from the sensitizing bath by washing with water, and the subsequent conversion of the remaining free nitrate of silver into albuminate and chloride of silver by pouring over the plate dilute albumen, containing chloride of ammonium, the excess of albumen being finally washed off by violent agitation with a copious supply of water. The plates being set aside to drain on folds of blotting-paper, are, when dry, ready for use. For details of manipulation, see handbooks of photography.

FOUCHÉ, JOSEPH, Duke of Otranto, the son of a sea-captain, was born at Nantes, 29th May 1763, and educated at the Oratoire. He hailed the Revolution with enthusiasm, and in 1792 became a member of the National Convention. He voted for the death of Louis XVI., and was one of the commissioners of the Committee of Public Safety sent to Lyon in 1794 to reduce that city to obedience. In 1795, he was expelled from the Convention as a dangerous Terrorist, and kept in confinement for a short time. After the revolution of the 18th Brumaire (5th November 1799), in which he took a part, F., as minister of police (an office to which he had been appointed on the 31st July of the same year), organized an extraordinary police. He restrained the new government from deeds of violence, and by his advice the list of *émigrés* was closed, a general amnesty proclaimed, and the principle of moderation and conciliation steadily adhered to. His remark upon the execution of the Duke d'Enghien was very happy: '*C'est bien pis qu'un crime, c'est une faute*' (It is much worse than a crime; it is a blunder).

In July 1804, he was again placed at the head of the police. His chief endeavors were directed, as before, to attaching the royalists to the imperial throne by prudent moderation. In 1809,

the Emperor conferred on him the title of Duke of Otranto, along with large grants from the revenues of the Neapolitan territory. When the English expedition landed on Walcheren (1809), the Emperor was absent, and F., who then held the portfolio of the interior, as well as of the police, organized the measures that led to the retirement of the English. In a proclamation issued on this occasion, he made use of a boastful expression which lost him the favor of Napoleon, and in the following year he was forced to resign. In the campaign of 1813, the Emperor summoned F. to headquarters at Dresden, and sent him thence as governor of the Illyrian provinces, and, after the battle of Leipsic, to Rome and Naples, in order to keep a watch upon Murat's proceedings. Being recalled to Paris in the spring of 1814, he predicted the downfall of Napoleon even before his arrival in France. After the Emperor's abdication, F. advised him to abandon Europe altogether. On his return from Elba, Napoleon again nominated him minister of police; but after the battle of Waterloo, F. placed himself at the head of the provisional government, brought about the capitulation of Paris, and drew back the army behind the Loire, thereby preventing unnecessary bloodshed. At the Restoration, Louis XVIII. reappointed him minister of police; but he resigned his office in a few months, and went as ambassador to Dresden. The law of the 12th January 1816, banishing all those who had voted for the death of Louis XVI., was extended to F. also, who from that time resided in different parts of Austria. He died at Trieste, 26th December 1820, leaving an immense fortune. Napoleon, at St. Helena, called F. 'a miscreant of all colors'; and Bourrienne declares that he 'never regarded a benefit in any other light than as a means of injuring his benefactor'—statements which are far too exaggerated to be worth much. The simple truth appears to be, that F. was a man whose highest principle was self-interest, but whose sagacity was not less conspicuous, and who never failed to give the governments which he served the soundest political advice. It is true, however, that he was unscrupulous in passing from one party to another, and that he was as destitute of political morality as Napoleon himself. In his private relations, the character of F. stands higher than in his public. As father of a family and as a friend he is worthy of all praise. He saved many a life; and harsh measures were often softened by his considerate administration. In 1824, appeared a work entitled *Mémoires de Fouché, Duc d'Otrante*, edited by A. Beauchamp, which, though declared to be spurious by the sons of F., is generally held to have been based on genuine documents.

FOUGERES, a handsome town of France, in the department of Ile-et-Vilaine, stands on a hill on the right bank of the Couesnon, 28 miles north-east of Rennes. It is a well-built town, with wide streets, and in the old quarter retains traces of the middle ages in the ancient arcades which still obtrude in some places upon the streets. The castle of F. is picturesque, but being commanded by other parts of the town, forms but a feeble defence. In the neighborhood is a great forest containing Druidical remains.

A famous engagement took place here between the Vendean royalists and the Republicans, November 15, 1793. F. has manufactures of sail-cloth, canvas, tape, flannel, lace, hats, &c.; and dyeworks, principally for the dyeing of scarlet. In the vicinity are important glass and paper-works. Pop. (1876) 10,396.

FOU'LA, or FOULAN, an island of Shetland, parish of Walls, from which it is distant 20 miles in a westerly direction. It extends 3 miles in length by $\frac{1}{2}$ in breadth, and rises to a height of 1369 feet above the sea. It is solitary, and with it there is no regular communication. F. has about 270 inhabitants, who subsist by fishing and farming on a small scale. On the island, there is a school maintained by the Society for Propagating Christian Knowledge; there is also a chapel connected with the Church of Scotland, and a chapel with a missionary maintained by the Congregational Union of Scotland. F. is chiefly remarkable for its sublime cliffs of red sandstone on its north-western side, where the precipice rises from the sea-margin to a height of nearly 1200 feet, being the grandest thing of the kind in the British Islands. Among the sea-birds which occupy the cliffs is the Skua Gull, or Bonxie (*Lestris cataractes*). Of this powerful bird there are about 13 pairs, which are prized by the natives for their services in keeping down the numbers of the eagles on the cliffs. The landing-place on F. is at a scattered hamlet of wretched thatched huts on the south-east. Here there is a store, at which imported commodities are bartered for fish and other articles, and at which an apartment is let to strangers, there being no inn. F. however, is rarely visited by strangers, and little is known of it even in Scotland.

FOULD, ACHILLE, was born in Paris on the 31st of October 1800, and was educated at the Lycée Charlemagne, one of the most celebrated establishments of Paris. He originally belonged to the Jewish creed, his family being wealthy Jew bankers, but he adopted the Protestant faith. Early in life, he was initiated into finan-

cial transactions by his father, and his natural talents were developed by travel in Europe and the East.

In 1842, he began his political career, being then chosen as a member of the council-general of the Hautes Pyrénées, and immediately after elected a deputy for Tarbes, the chief town of that department. He soon acquired a high position in the Chamber of Deputies for the peculiar talent with which he handled questions of finance and political economy. In 1844, he was appointed reporter to the commission on stamps on newspapers, and his views were adopted, in spite of the opposition party, he being at that period a staunch supporter of M. Guizot's home and foreign policy. After the revolution of 1848, F. accepted the new régime of the republic, and offered his services to the provisional government. In July 1848, he was elected representative for the department of the Seine, and continued to rise in public estimation by the elevated views he expressed in the chamber, while opposing among other things a proposed issue of assignats. During the presidency of Louis Napoleon, F. was four times Minister of Finance, and his repeated resignations for state reasons did not prevent him from being again appointed on the occasion of the *coup d'état*, 2d December 1851. He once more resigned his position on the 25th January following, in consequence of the decree ordering the confiscation of the property of the Orleans family. The same day, however, he was created a senator, and shortly afterwards returned to power as minister of state. In this capacity he superintended the Universal Paris Exhibition in 1855, the completion of the palace of the Louvre, and other great measures. He remained one of the most confidential ministers of Napoleon III. till December 1860, when he was succeeded as minister of state by Comte Walewsky. He was out of office up to the 14th November 1861, at which date he was reappointed finance minister, his long experience and well-known ability as a financier pointing him out as the man to manage the crisis of the French finances at that time. He died in 1867.

FOULIS, ROBERT and ANDREW, two eminent printers of Glasgow, brothers, whose names are usually classed together.—Robert, the elder, born in that city, April 20, 1707, was bred, and, like Allan Ramsay, for some time practised as a barber—in those days of flowing periwigs, a profitable and respectable profession. Having attended for several years the lectures of the celebrated Dr. Francis Hutcheson, then Professor of Moral Philosophy in Glasgow University, he was advised by that gentleman to become a bookseller. In winter, he and his brother Andrew (born November 23, 1712) employed themselves in teaching languages; and in summer, they made short excursions to the continent, and thereby acquired a considerable amount of learning and knowledge of the world. Andrew seems to have been designed for the church. In 1727, he entered as a student at the university of Glasgow, where he is supposed to have undergone a regular course of study. About the end of 1739, Robert began business in Glasgow as a printer, his first publications being chiefly of a religious nature. In 1742, he published an elegant edition in 4to of *Demetrius Phalereus on Elocution*, supposed to be the first Greek work printed in Glasgow. In 1743, he was appointed printer to the university. In 1744, he brought out his celebrated immaculate edition of Horace, 12mo, each printed sheet of which was hung up in the college of Glasgow, and a reward offered for the discovery of any inaccuracy.

Soon after, he took his brother Andrew into partnership; and for thirty years they continued to bring out some of the finest specimens of correct and elegant printing, particularly in the Latin and Greek classics, which the 18th c. produced, either in this country or on the continent. Among them were Cicero's works, in 20 volumes; Caesar's Commentaries, folio; Homer's works, 4 vols.; Herodotus, 9 vols., &c.; also an edition of the Greek Testament; Gray's poems; Pope's works; a folio edition of Milton, and other publications in English. With the view of promoting the cultivation of the fine arts in Scotland, Robert Foulis, after a two years' visit to the continent in preparation, commenced, in 1753, an academy at Glasgow, for the instruction of youth in painting and sculpture. The great expense attending this institution led to the decline of the printing business, which, however, continued to be carried on till the death of Andrew, September 18, 1775. In 1776, Robert exhibited and sold at Christie's, Pall Mall, London, the remainder of his paintings, when, after all expenses were defrayed, the balance in his favor amounted only to fifteen shillings. He died the same year at Edinburgh, on his return to Scotland. He was twice married, and left several children. One of them was a printer in Glasgow as late as 1806. His Virgil, printed in 1778, and his *Æschylus*, 1795, for beauty and exactness, were not unworthy of the name of Foulis.

FOUNDATION, This term may be applied either to the surface or bed on which a building rests, or to the lower part of the building which rests on the natural bed. 1. Foundation as the bed.—The best that can be had is solid rock, or any kind of re-

sisting incompressible stratum, free from water. Where there is no chance of water, sand forms a solid foundation. When the soil is soft, loose, and shifting, a solid bearing can be obtained only by driving *piles* or long beams of wood, sharpened at the end, through the soft soil, till they reach a hard bottom. This is then planked or laid with cross-beams, on which the superstructure is built. The piers of many bridges are formed in this manner. When the soil is soft, but not shifting, as in the case of made or deposited earth, the method of *Concreting* (q. v.) is adopted—i. e., a large surface is laid with broken metal or gravel, and run together with hot lime, so as to form a broad solid artificial rock, on which the building may rest. 2. Foundation as the base of the building.—The broader and larger the lower courses of the mason-work, the stronger the wall. The stones should, if possible, extend through and through, and project on each side of the wall.

In the best periods of art, the foundations have always been most attentively considered. The Romans formed solid bearings of concrete as above described, and paid great attention to secure the stability of their buildings. In the dark ages, when there was want of knowledge combined with want of materials and means, many buildings fell from the yielding of the foundations. Some of the earlier Gothic buildings also suffered from the same cause. But knowledge came with experience, and the foundations of the later Gothic buildings, during the 14th and 15th centuries, were built with extreme care, and on the virgin soil—the stones being as finely dressed as those above ground, where necessary to resist a strong thrust. And where the weight is thrown unequally on piers and walls, these detached points are all carefully united below the floor with a net-work of solid walls.

Bad foundations have been the cause of the ruin of many modern buildings. This has arisen from the costly nature of making a good foundation, when the soil is not naturally suitable. But it is clear that no expense should be spared to make the foundation good, as the value and stability of the superstructure depend entirely on the security of the foundation.

FOUNDER, also called LAMINITIS, consists of inflammation of the vascular sensitive laminae of the horse's foot. It is rarely met with in cattle or sheep, owing to the corresponding structures being in them greatly less developed. Occasionally, the laminae are strained from severe exertion; more frequently they suffer from the morbid effects of cold, which is especially injurious after the excitement and exhaustion of labor. Very commonly also, they become inflamed from their close sympathy with diseases of the digestive organs, often following engorgement of the stomach, or inflammation of the bowels. All four feet are sometimes affected, more usually the fore ones only. They are hot and tender; the animal stands as much as possible upon his heels; trembles and groans when moved; and is in a state of acute fever and pain. Except when following superpurgation or internal disease, bleeding is useful. The shoes must at once be removed, and the toes, if long, reduced, but no further rasping or cutting is permissible. The feet must be enveloped in hot bran poultices, and kept off the hard ground by a plentiful supply of short litter. Soap and water clysters, repeated if necessary every hour, usually suffice to open the bowels, which are very irritable, and physic, if required, must therefore be used with extreme caution. Two drachms of aloes is an ample dose in founder. Have the strain taken off the inflamed laminae by getting the animal, if possible, to lie down, or, where this is impracticable, by slinging him. When the inflammation continues so long that serum and lymph are poured out between the sensitive and horny laminae, they must have free exit provided, by making an opening through the toe with a small drawing-knife. This may prevent the *pumiced* and disfigured feet that are apt to follow severe and repeated attacks. After the acute symptoms pass, cold applications to the feet, and a mild blister round the coronet, help to restore the parts to their natural condition.

FOUNDING, or METAL-CASTING, is the art of obtaining casts of any desired object by means of pouring melted metal into moulds prepared for the purpose. It has risen to great importance in recent times, on account of the many new applications of iron. Iron-founding, brass-founding, type-founding, as well as casting in bronze and zinc, are the principal divisions of the art. The casting of the finer metals and alloys, as gold, silver, and German silver, is necessarily conducted on a smaller scale.

When the casting of an object is required, it is necessary, in the first place, to make a pattern. Suppose it to be a plain round iron pillar, such as is used for hanging a gate upon. A pattern of this is turned in some wood which can be readily made smooth on the surface, such as pine, and then varnished or painted so as to come freely out of the mould. This wooden pillar, or any similar pattern, is always made in at least two pieces, the division being lengthwise, for a reason which we shall presently see. The next step is to prepare the mould.

The moulds used by the iron-founder are either of sand or loam,

but more generally of fine sand. Proceeding with the preparation of the mould, the founder takes a moulding-box, which is composed of two open iron frames with cross-bars, the one fitting exactly on the other, by means of pins in the upper, dropping into holes in the lower frame. One-half of the box is first filled with damp sand, and the pattern laid upon it, a little dry *parting sand* being sprinkled on the surface. The upper half of the box is then put on, and sand firmly rammed all round the pattern. The box is then carefully opened, and, when the pattern is removed, its impression is left in the sand. The mould at this stage, however, is generally rough and broken. It is necessary, therefore, to give it a better finish, which is done by taking each half of the mould separately, repairing it with a small trowel, and re-introducing the corresponding half of the pattern till the impression is firm and perfect. Finally, the surface of the mould is coated with charcoal-dust, which gives a smooth surface to the future casting. These columns being made hollow, there is yet another matter to arrange before the casting can be made—namely, the *core*. In the instance before us, it would simply be a rod of iron, covered with straw and loam to whatever thickness the internal diameter of the column happened to require. The core of course occupies the center of the mould.

The cast iron is melted with coke in a round fire-brick furnace, called a *cupola*, the heat being urged by means of a powerful blast, created by fanners revolving at a high speed. The molten metal is run from a tap at the bottom of the furnace into a malleable iron ladle, lined with clay, from which it is poured into the mould through holes called *runners* or *gates*. When the mould is newly filled, numerous jets of blue flames issue from as many small holes pierced in the sand. These perforations are necessary for the escape of air and other gasses produced by the action of the hot metal on the mould. Care must also be taken not to have the mould too damp, otherwise steam is generated which may cause holes in the casting, and even force part of the metal out of the mould. The casting remains covered up for a time, in order to cool slowly, and is then removed by breaking away the sand, and drawing out the core.

In the case of a fluted, or otherwise ornamented pillar, the pattern would require to be in at least four pieces instead of two, because it is only a plain pattern that will come out of the mould in halves without tearing away the sand. When a pattern is necessarily made in several pieces, it is drawn out of the mould bit by bit, to the right or left, as the case may be, and so parts from the sand without breaking it.

Suppose that a small ornamental vase was to surmount the pillar, the founder would prepare the pattern of this in a more elaborate manner. He would first mould it in wax or clay, from which a cast in plaster of Paris is made; from that, again, a cast is taken in an alloy of tin and lead, which, after being sharply chased, and divided into the required number of pieces, is used as a pattern to cast from. All ornamented patterns, such as figures, scrolls, leaves, enriched mouldings, and the like, are made in this way, whatever metal the ultimate casting is to be produced in.

Very large engine cylinders, pans, and such vessels, are cast in loam-moulds, which are built of brick, plastered with loam, then coated with coal-dust, and finally dried by means of a fire. This method is adopted with large plain objects, where a pattern would be expensive, and when few castings of one kind are required.

Iron moulds, coated with blacklead or plumbago, have recently been introduced for casting pipes into; they are greatly more expensive than any other kind, but they enable the founder to dispense with a pattern, as, when once made into the required form, they are not destroyed like moulds of sand or loam at each casting.

Bronze and brass are cast in moulds prepared with finer sand than that used for iron. Pewter and similar soft metallic alloys are cast in brass moulds. The type-founder, on the other hand, uses moulds of steel, which are now worked to a great extent by a machine.

The variety of articles produced by founding or casting are very numerous, among others we may mention cylinders, cisterns, paper-engines, beams, boilers, pumps, and the heavy parts of machinery generally, gates, railings, lamps, grates, fenders, cooking-vessels, and the like, in iron; cannon, many portions of machinery, and numerous ornamental objects, in brass; sculpture and other works of art in bronze and the more costly metals. One of the most remarkable castings yet executed for the requirements of modern engineering, was the cylinder of the hydraulic press used for raising the tubes of the Britannia Bridge. It measured 9 feet $\times$ 3 feet 6 inches, the metal being 10 inches thick, and weighed upwards of twenty tons. It remained red hot for three days, and it was seven days more before men could approach it to remove the sand. Sole plates for steam-hammers, and for other purposes, have been cast more than double this weight, but the same care was not required in their execution. In regard to sculpture, perhaps the most wonderful casting known

is the colossal statue of Bavaria at Munich, finished in 1850, which stands 54 feet high, the face being equal to the height of a man. It took eight years to cast, and the cost of the bronze used was about £10,000.

FOUNDLING HOSPITALS, establishments in which children that have been abandoned by their parents and found by others, are nurtured at the public expense. Amongst the ancient nations, these institutions were not unknown, though as the law usually placed the power of life and death in the hands of the father, and permitted him to sell his children into slavery, it is to be feared that infanticide, as among eastern nations at the present day, was the usual mode of solving the difficulty which foundling hospitals are intended to meet. Desertion, however, and exposure as less atrocious, were still more frequent crimes; and to meet these, the reception and education of foundlings were enjoined on private persons, to whom they were assigned in property. When this means of support failed, they were protected by the state. The Egyptians and Thebans are praised by the classical historians for discouraging the exposure of infants.

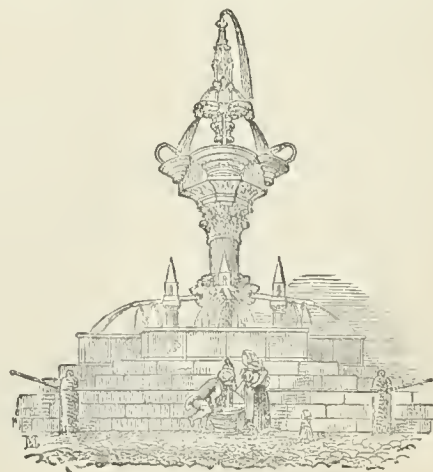
The practice of exposing infants probably prevailed even amongst the Germanic nations previous to the introduction of Christianity; and though Tacitus says that infanticide was forbidden, in Iceland, in particular, it is said to have reached a fearful height. From the period at which Christianity became the state religion of the Roman empire, a sensible change in the spirit of legislation on the subjects both of infanticide and exposure is apparent; and though the latter is spoken of by Gibbon as one of the most stubborn remnants of heathendom, it gradually gave way, and the Christian church, at a very early period, lent its encouragement to the establishment of foundling hospitals. So early as the 6th c., a species of foundling hospital is said to have existed at Treves. The bishop permitted the children to be deposited in a marble basin which stood before the cathedral, and gave them in charge to members of the church. But the first well-authenticated one is that of Milan, established in 787, probably in obedience to the 70th article of the Council of Nice, which enjoined that a house should be established in each town for the reception of children abandoned by their parents. It is probable, however, that foundling hospitals existed pretty extensively at an earlier period, as mention is made of them in the capitularies of the Frankish kings. In 1070, a foundling hospital was established in Montpellier; in 1200, in Einbeck; in 1212, in Rome; in Florence, in 1317; in Nürnberg, in 1331; in Paris, in 1362; in Vienna, in 1380. In France, the utility of these establishments, which were the special labor of Vincent de Paul (q. v.), was early called in question; and letters-patent of Charles VIII., in 1445, affirmed that 'many persons would make less difficulty in abandoning themselves to sin when they saw that they were not to have the charge of the upbringing of their infants.' In Germany, the system of foundling hospitals was soon abandoned, the duty of rearing the children being, as in England, imposed by law, first on the parents, then on more distant relatives, whom failing, on the parish, and last of all, on the state. The reproach made by Roman Catholic countries against this more natural arrangement—that it tends to promote infanticide—is said to have been in no degree established by statistical investigations. The revolutionary government of France not only adopted the system of foundling hospitals, as it had been handed down to it, but in 1790 declared all children found to be children of the state (*enfants de la patrie*). Nay, as a still further premium on immorality, it declared that every girl who should declare her pregnancy should receive a premium of 120 francs! The imperial government in 1811, abolished this insane enactment, but continued and further systematized the arrangement by which the foundling hospitals had become government establishments, and the children, children of the state. This state of things remained unaltered till recently, and every considerable town had its foundling hospital and turning-wheel. The expense of rearing a child to the age of twelve in the hospital of Paris was computed at 952 francs, 42 centimes, or a trifle less than £40.

The moment that the child was received it was weighed, and if its weight was less than six pounds, it was considered that its chance to live was very small. It was then inscribed in a register, and a formal statement was drawn up of any name which had been given along with it, or of any particular mark which it bore either on its person or otherwise; of the hour at which it was deposited, its sex, and its dress. It was then inspected by a medical man, and handed over to the nurses. At Paris, each child was committed to a special nurse, many of whom were retained on the premises, and paid 40 centimes a day. Other nurses were brought in from the country in carriages kept by the Hospital, which returned conveying the children along with their new mothers. The children thus boarded out were inspected twice a year by local medical men appointed for the purpose. The parents and relations were permitted to reclaim them at any period, or they might be legally adopted by any French citizen in a condition to maintain them. A large proportion of the children were

not proper foundlings, but orphans and infants abandoned by parents unable or unwilling to bear the expense of their maintenance; and the mothers were known in many instances by offering themselves as nurses to get charge of their own infants. The question of the propriety of encouraging secrecy by the use of the turning-box, or of causing the parents openly to deposit the children in the hands of an officer, was long discussed with much keenness in France. The argument in favor of the turning-box was that by which the whole institution was defended, viz., that it tended to discourage infanticide. But even if that were unquestionable, there were many other obvious considerations to be taken into account, and these have preponderated. An official report by M. Gasparin, in 1837, showed that the number of children exposed had increased between 1811 and 1833, from 70,000 to 130,000; that the infant mortality was appalling; and that those who survived, ushered into the world without friends or means, constituted a large proportion of the thieves and prostitutes of the country. Within the last thirty years the whole system has been greatly modified, the changes being in the direction recommended in M. Gasparin's report. A large number of hospitals have been suppressed. The turning-box has been abolished, or, where retained, placed under such restrictions as make the abandonment public; the officers of the hospital, on receiving the infants, make full inquiry into the position and residence of the mother. The newborn infants have a separate department assigned them, and assistance is given at their own dwellings to mothers in circumstances to require it. The very name of 'enfants trouvés' has been exchanged for 'enfants assistés.' The result has been a vast diminution of the number of exposures, and a great saving of expense to the country, and lessening of mortality among the infants. The present number of foundling hospitals in France is believed to be about 130. In Spain they number about 70. Portugal, Belgium, Austria, and Norway possess foundling hospitals, and those of Moscow and St. Petersburg are among the largest in the world.

The Foundling Hospital in London was established by Captain Thomas Coram, a benevolent sailor, in 1739, as 'an hospital for exposed and deserted children.' The ground in Guildford Street was purchased from the Earl of Salisbury for £7000, and the architect of the hospital was Theodore Jacobson. The system of foundling hospitals never having been approved in England, the London hospital was changed in 1760 to what it is now—viz., an hospital for poor illegitimate children whose mothers are known. The committee, previous to admitting the child, must be satisfied of the previous good character and present necessity of the mother. The qualification for a governor is a donation of £50. The great Handel was one of the chief benefactors of the hospital. He endowed it with a magnificent organ, and frequently performed his oratorio of the *Messiah* in the chapel, which is still celebrated for its music. Though every attention is paid to the health and comfort of the children at the Foundling—to such an extent, indeed, as very often to unfit them for the hardships which many of them must encounter in after-life—we have been informed by the physician that they do not attain to the height of average English men and women. Foundling hospitals exist in Mexico, and in almost all the states of South America; in the United States there are few, and these mainly supported by private charity.

FOUNTAIN, a basin or jet for the supply of fresh running water. There are fountains of every form and variety, from the



Fontana Grande, Viterbo.

simple spring with its natural basin, to the most elaborate and ornamental structure for the display or supply of water. In all

ages, fountains have been considered as public monuments of the greatest importance; and where the source of their supply has not been provided by nature on the spot, immense labor and expenditure have often been incurred to make up for the deficiency. The splendid Aqueducts (q. v.) of the Romans are instances of the important light in which they regarded the fountains of their cities. Every Roman town had at least one aqueduct, the water from which was distributed to as many fountains as the population required.

Utility is the first object of a fountain, and although they are frequently made subjects of great display and magnificence, the finest fountains are those where the water is the greatest ornament. In the middle ages, fountains of great beauty and variety of form were built, but the useful nature of the structure was never lost sight of. Sometimes a spring was arched over for protection, with a beautiful vault, and a statue of the patron saint placed in a niche, with a basin below to contain the water. In towns where a number of persons might require to draw at one time, a large basin was erected, with a pillar in the center, from which pipes radiated all round—each with its separate jet to supply the running water—while the basin was used for washing the pitchers. Many examples of this kind of fountain remain. On page 271 is represented a fountain at Viterbo, in the former Papal States, where there are many of the same description. The pillar is sometimes surmounted by a statue, or has one or more smaller basins, with ornamental streams and jets of water falling from tier to tier. A beautiful fountain of this nature existed in the royal palace at Linlithgow, and a copy of it has been erected in front of Holyrood Palace.

In modern times, the French have distinguished themselves by their magnificent fountains, those of Paris and Versailles being almost unrivalled. In England, the fountains at Chatsworth (q. v.) and those at the Crystal Palace are among the finest, and are remarkable for the great height to which the water is thrown. Although Rome has lost four-fifths of the aqueducts which so lavishly supplied her with fresh water in the times of the Empire, she is still unsurpassed for the number, beauty, and utility of the public fountains which adorn her streets and places.

Modern fountains are, for the most part, entirely ornamental. This arises from the modern mode of distributing water in pipes through the houses, making the street-fountains to a great extent useless. It is found, however, that our town populations—both man and beast—require some public supplies of water, and these are now largely supplied by the numerous drinking-fountains which are being constructed in all our principal towns.

FOUNTAIN. Water is represented heraldically by a round ball, having waving stripes of blue and white, barways, called a fountain.

FOUQUÉ. **FRIEDRICH HEINRICH KARL, BARON DE LA MOTTE**, a modern German author, was grandson of the Prussian general of this name, distinguished in the Seven Years' War. Born at Brandenburg, 12th February 1777, served as Prussian officer in the campaigns of 1792 and 1813. The interval between these campaigns was devoted to literary pursuits in the country, and the rest of his life was spent alternately in Paris and on his estate at Nennhausen, and subsequently at Halle. He died in Berlin, 23d January 1843. F. appeared first under the name Pellegrin, as translator of Cervantes's *Numancia*, and author of some effusions in the spirit of Spanish poetry. But the Norse legends and old German poetry attracted him most strongly; this was evinced in numerous romances, in prose and verse, which picture the old life of medieval Europe. Among the best known of these are *Sigurd, der Schlangentöchter* (1809)—the first work to which F. attached his real name—*Der Zauberring, Die Fahrten Thiodolfs* and *Undine*.

Successful in exhibiting many of the beauties of the romantic school, he is yet chargeable with all its extravagances. Straining too often after fantastically unnatural conceits, he seems fascinated by the antique life which he pictures, rather merely from its quaint contrast with modern manners, than as a form into which the life of actually living men had shaped itself in former times. He himself edited a selection of his works (*Auserwählte Werke*, 12 Bde., Halle, 1841).—F.'s first wife, **KAROLINE VON BRIEST**, is also known in Germany as a productive authoress.

FOQUIER-TINVILLE, ANTOINE QUENTIN, the notorious public accuser in the French Revolution, was born in the village of Hérouelles, in the department of Aisne, in 1747. His early career was immoral, but insignificant. On the outbreak of the Revolution, he figured as one of the fiercest democrats. By Robespierre, he was appointed, first, a member, then director and public accuser, of the Revolutionary Tribunal. Without education, conscience, or sense of justice, he executed with brutal apathy the bloody orders of the Committee of Public Safety. In reference to this feature of his character, his countrymen say that 'he had no soul—not even that of a tiger, which at least pre-

tends to be pleased with what it devours.' Incapable of friendship, or of anything even remotely allied to generosity, he systematically abandoned his coadjutors in their hour of need, and sent to the scaffold, without the slightest compunction, Bailly and Vergniaud, Danton and Hebert, Robespierre and St. Just. He himself died by the guillotine, in a cowardly manner, 7th May 1795.

FOUR EVANGELISTS, part of a larger group of islands known as the *Twelve Apostles*, lie off the west entrance of the Strait of Magellan. They are about lat. 52° 34' S., and long. 75° 5' W. The eight other islands, with which they are classed as above, run about 15 miles further out into the Pacific.

FOUR LAKES, a chain of connected sheets of water in Wisconsin, United States, are fed chiefly by springs, and form, through their outlet, the Catfish, a north-eastern source of the Mississippi. They are navigable for steam-boats, and drain a beautiful country. Madison, the capital of the state, stands on the strip of land which separates the uppermost of the series from the next in order.

FOURCHAMBOULT, a rapidly increasing town of France, in the department of Nièvre, five miles north-north-west from Nevers, near the right bank of the Loire, which is here crossed by a suspension bridge. It is a station on the railway between Orleans and Nevers. There are great iron-foundries, employing between 2000 and 3000 workmen. The manufacture of arms is extensively carried on. Pop. (1876) 5686.

FOURCRO'YA, a genus of plants of the natural order *Amaryl-lidææ*, nearly allied to *Agave* (q. v.), but with stamens shorter than the corolla. The species are all tropical. The leaves of some—perhaps of all—of them yield a fibre similar to the *PITA FLAX* obtained from those of species of *Agave*.

FOURIER, JEAN BAPTISTE JOSEPH, BARON, a distinguished French mathematician, was born of a respectable family at Auxerre, 21st March 1768. He became a pupil, and at the age of 18, a professor, in the military school of his native place. He was afterwards removed to the normal school in Paris, and then to the Polytechnic, and accompanied General Bonaparte to Egypt. Besides performing political services on this occasion, he was secretary to the *Institut d'Egypte*, and an active contributor to the *Description de l'Egypte*, the masterly historical introduction to which is from his pen. On returning to France, he was made préfet of the department of Isère in 1802, an office which he held till 1815, and was created baron in 1808. As préfet, he succeeded in draining the marshes in Bourgoin, near Lyon, which had for centuries baffled all attempts. On the return of Napoleon from Elba, F. issued a royalist proclamation; notwithstanding which he was appointed by Napoleon préfet of the department of the Rhone, but was shortly after removed. He now took up his abode in Paris, and devoted himself exclusively to science. The Academy of Sciences, which in 1807 had crowned his essay on the propagation of heat through solid bodies, chose him a member in 1815, and afterwards secretary for life, conjointly with Cuvier. He died 16th May 1830.

His most famous work is the *Théorie Analytique de la Chaleur* (Par. 1822), in which he applies new methods of mathematical investigation. An allied subject is discussed in his *Mémoire sur les Températures du Globe Terrestre et des Espaces Planétaires* (Par. 1827). Besides heat, he occupied himself with the theory of equations, which received from him important improvements. His work, *Analyse des Equations Déterminées*, distinguished both for its substance and manner of exposition, was left unfinished and was published after his death by Navier (Par. 1831).

FOURIER, FRANÇOIS MARIE CHARLES, a French Socialist, was born at Besançon, April 7, 1772. His father, a merchant, had him educated in an academy at Besançon for his own profession. He distinguished himself by his perseverance and success in study, and excelled in geography, mathematics, music, and the natural sciences. He left his studies with regret to enter upon the duties of a merchant's clerk, which he performed with zeal and integrity at Lyon, Rouen, Marseille, and Bordeaux. He also traveled in the interest of his employers, not only in France, but in Holland and Germany. In these journeys and residences, nothing escaped his observation; he noted climate, culture, population, public and private edifices, and remembered even the topography of villages, and the dimensions of buildings, with astonishing accuracy. His father died in 1781, leaving him about £5000, which he became possessed of in 1793, and invested in trade at Lyon. This was lost in the Revolution; and he was thrown into prison, and compelled to serve two years as a cavalry soldier. Discharged on account of illness, he obtained employment in a mercantile house at Marseille, where he was employed to superintend the destruction of an immense quantity of rice, held for higher prices, in the midst of a scarcity of food, until it had become unfit for consumption. This circumstance called his attention to the frauds and duplicities of commerce, and he devoted his spare time to the

study of social problems, until he developed the system of Socialism to which his name is commonly given. This system is contained in several works, written and published under discouraging circumstances.

In 1808, he published his *Théorie des Quatre Mouvements, et des Destinées Générales* (Theory of the Four Movements, and of the General Destinies of the Human Race). In 1822, he produced his *Traité d'Association Domestique Agricole* (Treatise on Domestic and Agricultural Association); in 1829, *Le Nouveau Monde Industriel et Social* (The New Industrial and Social World); in 1831, *Pièges et Charlatanisme des Deux Sectes Saint-Simon et Owen, promettant l'Association et Progrès* (Snares and Quackeries of the Two Sects of St. Simonians and Owenites, promising Association and Progress); in 1835, *La Fausse Industrie, Morcelée, Répugnante, Mensongère, et l'Antidote, l'Industrie, Naturelle, Combinée, Attractive, Véridique, donnant Quadruple Produit* (False Industry, Fragmentary, Repulsive, and Lying, and the Antidote, a Natural, Combined, Attractive, and Truthful Industry, giving Quadruple Products.) These works, written in the midst of commercial pursuits, and published at long intervals, by means of his small savings, found for many years few readers, and no disciples. Towards the close of his life, a small group of intellectual men accepted his views, and gathered round him, to learn the details of his social system from his own lips. He was unwearied in his efforts to interest men of power or capital, who could give his theories the test of practical realization, and for many of the last years of his life waited patiently at a certain hour every day, expecting to be visited by such a patron. His less patient disciples probably hastened his death by immature and partial efforts at realization. He died in Paris, October 8, 1837.

FOURIERISM, the Social System invented by Charles Fourier, is contained in his published works, in a large collection of unpublished MSS., and in the writings of Considerant, Lechevallier, Brisbane, and others of his disciples. It differs materially from the systems of Communism strictly so called, and all other social theories, and professes to be based upon natural laws, and capable of being carried out on mathematical principles, as certain as those of geometry, music, or colors. The earth and human society, Fourier taught, are in their crude and infantile stage. The period of the race will be 80,000 years, the latter portion of which will be its declining phase, as the present is its ascending. The middle term will be a long period of maturity, prosperity, and happiness. What we call civilization, Fourier considers a false and imperfect condition, with poverty, crime, ignorance, idleness, repugnant toil, disease, wasting wars, general antagonism, oppression, and misery. He believed that Association would produce general riches, honesty, attractive and varied industry, health, peace, and universal happiness. Considering attractions and repulsions the governing forces of all nature, and that God has distributed them for the happiness of all His creatures, he held that 'attractions are proportional to destinies,' or that the desires or passions of men, their aptitudes and inclinations, if they could have free scope, would infallibly produce the highest condition and greatest happiness of which they are capable. He believed in a universal harmony, flowing from and centering in God, the author of all harmonies, and that there is therefore a principle of 'universal analogy.'

Seeing that all things, from suns and planets to atoms, range themselves in groups and series, according to certain fixed laws of attraction and repulsion, he labored to discover the kind of human society that must eventually form itself in obedience to those laws. This is the Association or Phalanstery, which is to consist of 400 families or 1800 persons, which number he found included the whole circle of human capacities. These should live in one immense edifice, in the center of a large and highly cultivated domain, and furnished with work-shops, studios, and all the appliances of industry and art, as well as all the sources of amusement and pleasure. When the earth is covered with palaces of attractive industry, the associations will also unite in groups and series, under a unitary government. There will be but one language and one government, and the only armies will be the great industrial armies, which will drain swamps, irrigate deserts, plant forests, and effect the amelioration of climates. The system of Fourier does not propose to destroy, but rather to conserve property, position, and hereditary rights, nor does it war directly with morals or religion. The property of the Association is to be held in shares, and the whole product of the industrial and artistic groups is to be divided into twelve parts, of which five parts are due to labor, four to capital, and three to talent. The apartments are to be of various prices, and the styles of living to vary in luxury and cost; but the poorest person in the Association is not only to be secure of comfort, but his minimum of enjoyments will be greater than the present social arrangements can give to princes and millionaires; while these will have opened to them pleasures of which they can now scarcely have a conception. The economies of the large scale in the Phalanstery reduce by two-thirds

the expenses of living, while an attractive and scientific industry would quadruple the products of civilization.

The passions of the human soul to which the system of Fourier would give full scope, he described as the five sensitive—sight, hearing, taste, smell, touch; four affective—friendship, love, ambition, and paternity; three distributive—the emulative, alternating, and composite. In these he found the springs of industry and true society. Emulation, the desire of success, honors, rewards, is the great stimulant to exertion; alternation of employments makes work a recreation; and the composite passion requires combinations of charm and enjoyment which only Association can give. Many attempts have been made—a few in France, and more in America—to carry the ideas of Fourier into practical realization; but they have all been on a small scale, and with inadequate means, and have resulted in failure. Whatever we may think of the system, in its principles or its theoretical development, nothing can be founded upon the failure of such experiments. It remains to be proved whether human nature, in its present state, is capable of carrying out successfully a social system so widely varying from all existing social conditions. The moral objections to Fourierism are, that it appears to make luxury, ambition, and sensual delights the end of existence—the incentives and rewards to all exertions; and that the passions of men, when left in the perfect freedom which this system requires would lead to ruinous demoralizations. The answer is, that 'attractions are proportional to destinies,' and that these excesses belong to the present state, and are incident to the poverty and repressions of civilization, but could not exist in a true society; which raises the question—What is a true society? Whatever may be thought of the practicability of the system, its study in the works of Fourier is full of suggestions to the student in sociology.

FOURNI ISLANDS (anc. *Corássiæ* or *Córseæ*), a group of about 20 small islands in the Grecian Archipelago, between Nicaria and Samos, on the eastern coast of Asiatic Turkey. The largest of these islets is about five miles in circuit.

FOWEY, or FOY, a borough town on the south coast of Cornwall, on the right bank of the river Fowey, 25 miles south-south-west of Launceston. It is sheltered by hills, and lies amid picturesque scenery, rude sea-cliffs, and promontories. The harbor admits large vessels at all states of the tide, and its entrance is guarded by three forts. The chief business is catching and curing pilchards, which, with 'china-stone' and iron-ore, form the main exports. F. sent 47 ships and 770 men to the siege of Calais by Edward III. in 1347. It was burned by the French in 1457, and taken by Fairfax in 1646. Pop. (1881) 1656.

FOWL (Ger. *vogel*; allied to the Lat. root *fug-*, to flee, and perhaps to *vag-*), a word originally synonymous with *bird*, and still employed in that signification, but also in a much more restricted sense, as the designation of the genus of Birds (*Gallus*) to which the common Domestic Fowl (*G. domesticus*) belongs. This genus gives its name to the important order of *Gallinaceous Birds*, also called, from their well-known habit of scraping the earth in search of food, *Rasores* (Lat. Scrapers); and is included in the family *Phasianidæ*, with pheasants, tragopans, &c. The general form, and the characters of the bill, feet, &c., agree with those of the pheasants; but the crown of the head is generally naked, and furnished with a fleshy *comb*, the base of the lower mandibles also bearing fleshy lobes or *wattles*, characters which are most conspicuous in the males; and the tail is very different from that of the pheasants, and, indeed, very singularly formed, being composed of fourteen feathers in two nearly vertical planes, or as if a horizontal tail were folded together, so as to make a sharp angle at top, the two middle feathers being the uppermost, and in the males elongated beyond the rest, and gracefully arched. The tail-coverts of the male are also very ample, and the feathers of the back of the head and of the neck are either elongated and loosely webbed, forming the *hackles*, so much valued by anglers for dressing artificial flies, or are otherwise modified to serve the purpose of adornment; characters which are also sometimes exhibited in a very inferior degree in the female sex. The legs of the male are armed with spurs, as in the pheasants, of which much use is made in the combats of these birds among themselves, all of them being very pugnacious. They are all polygamous, and unable to endure the presence of a rival. They are all natives of the East Indies and of the Malayan Archipelago. From what country, and at what period the Domestic Fowl was originally introduced into Europe, is uncertain. The remains of Egyptian antiquity carry us back to a period when it was apparently unknown in Egypt, and there is no distinct allusion to it in the Old Testament; but it seems to have been common in the south of Europe from the earliest ages of European civilization.

The cock was sacred to Apollo, to Mercury, to Mars, and to Æsculapius. It was figured on Grecian and Roman coins and gems; it was highly valued for its courage and pugnacity, and the sport of cock-fighting was a favorite one both with the Greeks and the

Romans, as it is amongst the Chinese, the Malays, and many other nations at the present day, and in former times was amongst all classes of society even in Britain. See **COCK-FIGHTING**. The Domestic Fowl appears to have been known to the ancient Britons before the Roman invasion; and when the South Sea Islands were first visited by Europeans, it was found there in the same domesticated state, and there also cock-fighting was found to be a fashionable amusement of the savage natives. The native country of the Domestic Fowl is not certainly known, nor is it certain what the species is in its original state. The ancient Greeks sometimes called it the *Persian Bird*, and hence it has been supposed to be a native of Persia; but there is nothing else to support this opinion, and it seems likely enough that this appellation may at most only indicate its introduction into Greece from Persia. The Jungle Fowl of India, the first species of *Gallus* known in its wild state to naturalists, was for some time supposed to be the origin of the Domestic fowl, but to this opinion there are strong objections in the very peculiar character of some of the feathers which distinguish the Jungle Fowl, and of which no trace ever appears in the Domestic Fowl. More recently, the Bankiva Fowl and other species have been discovered in Java and other islands of the Eastern Archipelago, more nearly resembling the Domestic Fowl, and the distribution of the latter through the islands of the Pacific Ocean is favorable to the belief that it derived its origin from that region; but still the identification of the species remains difficult, and some naturalists incline to the opinion that the Domestic Fowl may be derived from intermixture of distinct wild races.

The **BANKIVA FOWL** (*G. Bankiva*), native of Java, is extremely similar to some of the domestic varieties; indeed, Sir William Jardine says: 'Many Bantams so nearly resemble this bird, that there would be great difficulty in making a distinction. The comb is large and lobed, or dented; the colors are brilliant, steel-blue and chestnut, black and yellowish brown, the hackles abundant and golden orange; some parts of the plumage exhibiting a very fine play of colors. A very similar species, or a variety of the same, but rather larger, is found in some parts of continental India.' Very similar also is the **BRONZED FOWL** (*G. aneus*), found in Sumatra, a bird resplendent in metallic green, purple, and lake; but of which the comb has the upper margin unbroken; the wattles are combined into one attached to the center of the throat; and the neck feathers do not assume the *hackle* character, which appears in the neighborhood of the tail alone. These peculiarities also belong to the **FORK-TAILED FOWL** (*G. furcatus* or *Javanicus*), a species very abundant in the jungles of Java, and often to be seen on their outskirts, nearly two feet in length from the tip of the bill to the extremity of the tail.

A still larger species—if, indeed, these are not rather varieties than species—is the **GIGANTIC FOWL**, **JAGO FOWL**, or **KULM FOWL** (*G. giganteus*) of Sumatra, with the double wattle under the throat, abundant hackles on the head, neck, and upper part of the back, green and reddish yellow the principal colors, and the height considerably more than two feet.—The **JUNGLE FOWL** (*A. Sonneratii*), abundant in the higher wooded districts of India, where it is much sought after by European sportsmen, is about equal in size to an ordinary Domestic Fowl, but is more slender and graceful in its form; the comb of the male is large, and its margin broken; the colors are rich and beautiful; but a remarkable peculiarity is exhibited in the hackle feathers, which are terminated by flat horny plates of a golden orange color, into which the shaft expands, or the shaft thickening and terminating abruptly gives rise to a battledore-like stem and disc, in substance like the tips of some of the feathers of the wax-wing.

Of the Domestic Fowl there are some very curious varieties, of which some naturalists have attempted to constitute distinct species, particularly the **NEGRO FOWL** (*G. morio*), rarely seen in British poultry-yards, remarkable for the black color of the *periosteum* (the outer covering of the bones), and the dull purple of the comb, wattles, and skin; the **SILKY FOWL** (*G. lanatus*), very common in China and Japan, with periosteum and skin of the same dark color as the Negro Fowl, but the flesh remarkably white, the comb and wattles purple, the feathers with webs disunited and silky; and the **FRIESLAND** (probably a mistake for **FRIZZLED**) **FOWL** (*G. crispus*), which has all the feathers standing nearly at right angles to the body.

There are also varieties of the Domestic Fowl remarkable for what may be considered monstrosities—as the want of a tail and of some of the last vertebrae, the presence of an additional spur on each leg (Dorkings, &c.), superabundant combs, crests or tufts of hackle feathers instead of combs, tufts of feathers springing from the lower jaw (the **SIBERIAN FOWL**), &c; and there are many varieties esteemed by keepers of poultry, of which the most important are—1. The **GAME FOWL**, with erect and slender body and showy colors, valued also for the delicacy of the flesh and of the eggs, although the eggs are rather small. It is this breed which is used for cock-fighting; and so excessive is the pugnacity which characterizes it, that broods scarcely feathered are occasionally found to have reduced themselves to utter blindness by

their combats. Some poultry-keepers think it good to have a game-cock in their poultry-yard, on account of the improvement of the quality of the fowls sent to the table; but it is almost needless to say, he must, like the prototype of Robinson Crusoe, be sole monarch of all he surveys. 2. The **DORKING FOWL**, so named from Dorking, in Surrey, where it has long been bred in great numbers for the London market—a breed characterized by an additional spur on each leg; often of a white color, with short legs; one of the most useful of all breeds, both for excellence of flesh and for abundance of eggs. 3. The **POLISH FOWL**, black, with a white tuft, a breed very extensively reared in France, Egypt, &c., little inclined to incubation, but valued for an almost uninterrupted laying of eggs.

4. The **SPANISH FOWL**, very similar to the Polish, but larger, and laying larger eggs, on account of which it is now much valued, and very common in Britain; black, with white cheeks and large red comb. 5. The **MALAY FOWL**, tall and handsome, very pugnacious, but little esteemed. 6. The **HAMBURG**, of very beautiful plumage, and much valued for the quality both of flesh and eggs, as also for extreme productiveness of eggs. 7. The **COCHIN CHINA FOWL**, a large, tall, ungraceful variety, with small tail and wings, for which there was a great rage among poultry-fanciers when it was newly introduced into Britain, and particularly about the year 1852, and which is valuable chiefly on account of its fecundity, eggs being laid even during winter, and the hens incubating frequently. 8. The **BANTAM FOWL** (q. v.), a diminutive variety, rather curious than useful.—Of most of these there are many sub-varieties and *fancy breeds*—gold-penciled, silver-penciled, &c. The common **DUNGHILL FOWL** is apparently a breed produced by the intermixture of others, and perhaps chiefly a less graceful, less spirited, and less pugnacious race of the Game Fowl.

Concerning the treatment of the Domestic Fowl in the poultry-yard, the diseases to which it is liable, &c., see **POULTRY**. The artificial hatching of eggs is noticed in the article **INCUBATION**. Concerning the eggs of the Domestic Fowl as an article of commerce, &c., see **EGG**.

The readiness with which the Domestic Fowl can be induced to go on laying eggs beyond the number proper for a brood, is not nearly equalled in the case of any other domesticated bird, and greatly enhances the usefulness of this species to mankind, whether the eggs are used for food, or, by artificial hatching, made to produce chickens, as is common in Egypt and some other countries. Few hens incubate oftener than once a year, but some lay in the course of a year even more than 200 eggs.

FOWLER'S SOLUTION. See **ARSENIC**.

FOWLING—the killing or taking of birds for the sake of their flesh, feathers, &c.—is very variously practised in different parts of the world. In some places it is one of the principal employments of the people, who greatly depend on it for their subsistence, and prosecute it with the greatest toil and danger; elsewhere, it is in some of its forms a recreation, for the sake of which much expense is incurred by the opulent. The modes in which it is practised depend partly on the habits of different kinds of birds, and partly on the progress of civilization and the arts. The peculiar habits of some birds render it very easy to take or kill them. Nets are much used in the capture of many kinds of birds, particularly of small birds intended for the table: bird-lime is employed for the same purpose, and birds are taken by means of it in greatest numbers near their drinking-places, particularly in hot and dry weather; gins, springs and traps of various kinds are also employed.

The numerous kinds of ducks, geese, and other *Anatidæ*, are, in an economical point of view, among the most important of birds; and the methods employed for their capture are very various and interesting. These, however, we reserve for a separate article, **WILDFOWL**; and refraining also here from any notice of the amusements of the sportsman, we shall proceed to describe the methods adopted in *Rock-fowling*, on which the inhabitants of many northern coasts and islands in a great measure depend for their means of subsistence.

Of all kinds of fowling, it is by far the most adventurous. The objects of pursuit are gannets or solan geese, gulls, terns, guillemots, and other sea-birds, which frequent the most lofty precipices, and breed on their shelves and ledges. The flesh, even of the best of them, is generally coarse, and of a fishy taste, yet it forms great part of the food of the poor people, both fresh, and salted for winter provisions. The flesh of the young is more tender and pleasant than that of adult birds. The eggs of some species are sought after by the same perilous means as the birds themselves. The feathers and oil are articles of commerce. The people of St. Kilda pay part of their rent in feathers and fulmar oil, the rocks being apportioned among its inhabitants as exactly as its soil. Almost every man in the island is a cragsman or rock-fowler, which is pretty nearly the case also in many northern isles. The multitudes of sea-fowl around many of the rocky northern coasts

is prodigious, resembling at a distance—as may be seen at the Bass Rock in the Firth of Forth—the bees around a busy hive. Uninhabited islets are annually visited by fowlers, as Borrera by the people of St. Kilda; and the 'stacks,' or high insular rocks near the shore, are often extremely productive. These are, of course, reached by means of a boat; and whilst landing is often both difficult and dangerous, the climbing of the precipice is still more so. The Norwegian fowlers, or 'bird-men,' carry on such expeditions with a *bird-pole* or *fowling-staff*, about five or six yards long, and a rope of several fathoms. The bird-pole has an iron hook at one end; it has also a flat head; and by means of it the fowler is pushed and guided by his comrades below as he ascends a very steep or precipitous cliff; by means of it, also, he strikes down or draws in birds. The rope is used to fasten two fowlers together, being attached to the waist of each; they aid one another in climbing, pushing, and drawing one another up the rocks, the safety of the one often depending on the strength and courage of the other. The bird-pole is also used with a small net attached to it, in the capture of birds that are flying around. The Norwegian fowlers sometimes remain for days on ledges where birds are abundant, sleeping in holes or clefts, and having food let down to them by a rope from above.

Still more perilous, if possible, is the mode of fowling practised where the precipices cannot be scaled. The fowler is let down by a rope, and hangs in mid-air, often at an elevation of several hundred feet, above rough rocks or roaring waves; and by means of his feet or of a pole, throws himself out to such a distance from the face of the rock as to obtain a view of all its ledges and cran-



The Holm of Noss, Shetland.

nies, to which with astonishing coolness and dexterity, he directs his course, often also catching the birds that fly near him in the air. Speaking of the fowlers of St. Kilda, Wilson (*Voyage Round the Coast of Scotland and the Isles*) remarks: 'How one man (for such is the case), himself standing with the points of his toes upon the verge of a precipice many hundred feet deep, can, with such secure and unerring strength, sustain the entire weight of another man bounding from point to point below him with irregular and frequent springs, is what a stranger cannot understand. . . . But we ascertained that there is never more than a single man above supporting the weight of the one below.'

Each of these couples has two ropes. The rope which the upper man holds in his hands is fastened round the body and beneath the arms of him who descends, while another rope is pressed by the feet of the upper man, and is held in the hand of the lower. The second rope is for giving signals, and for sending up birds when captured. The principal rope used to be made of twisted raw cow-hide; it was so durable as to last for two generations, and was bequeathed as valuable property by father to son. Manilla hemp is now chiefly used instead. The practice differs also as to the number of comrades holding the rope above. In the Faroe Isles, where some of the precipices are 1400 feet in height, the rope is usually held by a number of men. In some of the Scottish islands, fowlers have been adventurous enough to descend the cliffs unaided, fastening the rope for themselves to a stake driven into the ground above. The fowlers of the Faroe Isles sometimes use the pole with net at the end, whilst suspended in the air. It is not unusual for the fowler, when he finds a ledge or recess in the precipice abounding in birds, to disengage himself from the rope whilst he pursues his labors there; but when the precipice overhangs above, he is exposed to a great danger of the rope's escaping from his reach. A case is on record in which the only resource of the fowler was to make a desperate

spring and catch the rope, which hung a few feet before him in the air; and this he succeeded in doing.

The cut represents rock-fowling at the Holm of Noss, a precipitous insular rock, separated from Noss, one of the Shetland Isles, by a chasm of 65 feet wide, and 160 feet deep, over which ropes have been stretched, so that a *cradle* or sparr'd box can be made to pass along them, affording access to the grassy summit of the Holm, where a few sheep are occasionally fed, and where innumerable sea-birds make their nests.

FOWLS OF WARREN. Lord Coke says they are 'the partridge, quail, rail, &c.,' 'pheasant, wood-cock, &c.,' and the 'mallard, heron, &c.,' leaving the ceteras without explanation (*Co. Litt.* 233). Manwood, again, lays it down that there are only two fowls of warren, the pheasant and the partridge (*Manw.* 95). In the Duke of Devonshire v. Lodge (7 B. and C. 36), it was decided that grouse are not birds of warren.

FOX, CHARLES JAMES, a celebrated Whig statesman, was the second son of Henry Fox, first Lord Holland, by Lady Georgiana Carolina, eldest daughter of the Duke of Richmond. He was born, according to Lord John Russell's memoir, on the 24th January 1749 (N.S.), and was educated at Eton and Oxford, spending his vacations on the continent in the gayest wittiest circles of the French capital, and visiting Switzerland and Italy. Notwithstanding the irregular life which he led even as a school-boy, he was very distinguished for ability both at school and college; and so high was his father's opinion of his talents, that at the age of nineteen he had him brought into parliament as member for the borough of Midhurst, a step to which he is said to have been further incited by the fact, that, even at this early age, F.'s energies had found an outlet in gambling and various other forms of dissipation. His precocity in vice, as well as in intellectual development, is said to have been the result of the injudicious fondness of his very unprincipled but very gifted father. Till he attained his majority, F. prudently kept silent in the House, but immediately thereafter he appeared as a supporter of the administration of Lord North, and was rewarded with the office of one of the lords of the Admiralty. In 1772, he resigned that office, and the following year was named a commissioner of the Treasury. From that post he was dismissed, in consequence of a quarrel with Lord North, and passed over to the ranks of the opposition. During the whole course of the American war, he was the most formidable opponent of the coercive measures which were adopted by the government, and the most powerful advocate of the claims of the colonists; acting, to this extent at least, in accordance with the views which for many years before had been urged upon the country by the great Lord Chatham, the father of his future rival Mr. Pitt. The difference between them was, that whereas Lord Chatham urged conciliation, in order to preserve the connection between the two countries, F. foresaw and foretold the necessity and the advantages of complete separation. In 1782, on the downfall of Lord North, F. was appointed one of the secretaries of state, which office he held till the death of the Marquis of Rockingham, when he was succeeded by the Earl of Shelburne, afterwards Marquis of Lansdowne. On the dissolution of the Shelburne administration, the North and Fox coalition was formed, and F. resumed his former office; but the rejection of his India Bill by the House of Lords soon after led to the resignation of his government. It was now that Mr. Pitt came into power, and that the long and famous contest between him and F., who occupied the position of leader of the opposition, commenced. In 1788, he enjoyed a short respite from his public labors. Accompanied by his wife, he visited the continent, and having spent a few days at Lansanne, in the company of Gibbon, who was there engaged in writing his famous history, he set out for Italy. The sudden illness of the king, however, and the necessity of constituting a regency, rendered it undesirable that he should be longer absent from England, and he hastened back to his post.

The regency, the trial of Warren Hastings, the French Revolution, and the events which followed it, gave ample scope to the talents and energies of F., and on all occasions he employed his influence to modify, if not to counteract, the policy of his great rival. He was a strenuous opponent of the war with France, and an advocate of those non-intervention views which find greater favor in our day than they did in his. After the death of Pitt, F. was recalled to office, and endeavored to realize his doctrines by setting on foot negotiations for a peace with France, the results of which he did not live to witness. He died on the 13th September 1806, in his 59th year. In private life, Mr. F. was a genial companion, kindly and sincere in the closer relations of friendship, whilst his conduct to those to whom he was opposed in public was generous, and free from every trace of malignity or enmity. Lord John Russell, in his preface to his *Memorials and Correspondence*, speaks of the singular candor, boldness, simplicity, and kindness of his character; and of his oratorical powers it is enough to record, that Burke called him 'the greatest debater the world ever saw,' and Sir James Mackintosh, 'the most Demosthenian speaker since Demosthenes.' His remains were inter-

red in Westminster Abbey, near to those of Pitt. See, besides the *Life and Times* and the *Memorials and Correspondence*, by Earl (then Lord John) Russell, the *Character of the Late C. J. Fox*, by Dr. Parr (1809), and the interesting *Early History of C. J. Fox*, by G. O. Trevelyan (1880).

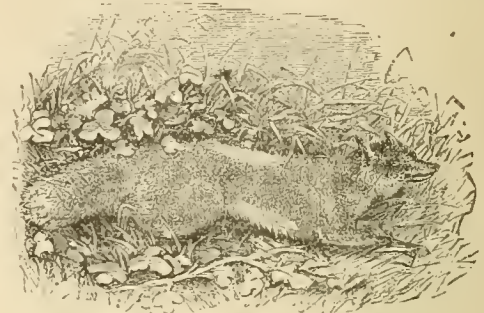
FOX, GEORGE, the originator of the Society of Friends (q. v.), commonly called Quakers, was born at Drayton, in Leicestershire, in 1624, and at an early age was employed in keeping sheep. Subsequently, he was apprenticed to a country shoemaker, but when about 19 years of age, his religious impressions produced such a strong conviction in him, that he believed himself to be a subject of a special Divine call; and abandoning his universal avocations, wandered solitarily through the country, dressed merely in a leathern doublet of his own making, and absorbed in spiritual reveries. After some time, his friends induced him to return home, but F. stayed with them only for a short period, and finally adopted the career of an itinerant religious reformer. About 1646, he left off attending church for divine worship, but did not scruple to interrupt the services when conducted by 'professors,' i. e. formalists, or persons whom he believed not to be genuine Christians. His first efforts at proselytism were made at Manchester in 1648. The excitement caused was very great, and, in consequence, F. was imprisoned for some time as a disturber of the peace. It may be proper to mention here, that the leading doctrines or convictions were the futility of learning for the work of the ministry, the presence of Christ in the heart as the 'inner light,' superseding all other lights, and the necessity of trying men's opinions and religions by the Holy Spirit, and not by the Scriptures. F. next traveled through various of the midland counties, Derby, Leicester, and Northampton, exhorting the people in public places to forsake all vicious practices, drunkenness, swearing, &c., and to cultivate the Christian graces. He had a winning manner and by his extreme earnestness made many converts. His followers were first contemptuously called 'Quakers' in 1650.

According to Fox's own account, given in his *Journal*, 'This was Justice Bennet of Derby, who was the first that called us Quakers, because I bade them tremble at the word of the Lord.' The name has been commonly explained from the Quakers' agitation when 'moved by the Holy Ghost.' In 1655, F. was brought to London, and examined before Cromwell, who quickly saw that there was nothing in Quakerism to excite his apprehensions, and pronounced the doctrines and the character of its founder to be irreproachable. Nevertheless, for some years after this, F. had a hard struggle with his Puritan antagonists. In an age of dogmatism and fanaticism, it was not to be expected that the half-mystical spiritualities and grotesque practical crotchets of the Leicestershire shoemaker could meet with any official toleration. F. was constantly vilified and frequently imprisoned by country magistrates. In 1669, he married the widow of Judge Fell. He then went to America, where he spent two years in propagating his views with much success. On his return to England in 1673, he was imprisoned for some time in Worcester jail, under the charge of having 'held a meeting from all parts of the nation for terrifying the king's subjects.' On his release, he visited Holland, and afterwards Hamburg, Holstein, and Danzig, always endeavoring to persuade men to listen to the voice of Christ within them. He died in London, January 13, 1691. F. was not a man of broad and philosophic genius; he did not enrich the world with the multitude of his thoughts; in fact, there is a conspicuous poverty of intellect and sentiment manifested in his writings, but (as often happens in the case of a mystic) the earnestness and clearness with which, in the opinion of many, one great truth of Christianity was realized, imparted a power and efficacy to his words that genius itself might envy. His doctrine of the universal 'inner light'—defended in a more learned fashion by Barclay (q. v.) in his *Apology for the Quakers*—may be regarded as a protest against the narrow or at least excessive 'scripturalism' of his age, but his understanding was not sufficiently clear and strong to guide him safely in all the consequences which he ventured to deduce from it. Hence have sprung most of the *miseries* of Quakerism. His writings were collected and published in 3 vols., 1694—1706. An edition in 8 vols. has been published at Philadelphia, United States.—Compare Sewel's *History of the Quakers*; Neal's *Puritans*; Marsh's *Life of Fox* (1848); and *Lives* by Janney (Phila. 1853), Watson (Lond. 1869), &c.

FOX, WILLIAM JOHNSON, orator and political writer, the son of a small Suffolk farmer, who afterwards settled as a weaver at Norwich, was born in 1786. He gave early promise of talent, and was sent to Homerton College, to be trained for the ministry of the Independents. He subsequently seceded to Unitarianism, but ultimately shaking off all allegiance to existing Christian churches, he delivered a series of prelections at his chapel in South Place, Finsbury, which marked him out as the leader and organ of English rationalism.

When the Anti-corn-law League enlisted the ablest platform orators of the day in the service of free trade, his bold and impassioned rhetoric greatly contributed to arouse and intensify public feeling. M. Guizot quotes his speeches as the most finished examples of oratory which the great conflict produced. Their effect upon the vast metropolitan audiences to which they were addressed was electric. F. also contributed by his pen to the success of free trade, and his *Letters of a Norwich Weaver Boy* were largely quoted and read. After the abolition of the Corn Laws, he was invited to stand for Oldham, which borough he continued to represent till 1863 since 1847. Like most men who enter the House of Commons late in life, F. did not altogether realize the oratorical promise of his platform and pulpit career. His best parliamentary speeches were upon the education of the people. As a politician he was ever a consistent member of the advanced Liberal party. A succession of illness in his late years interfered with his attendance in parliament. He was among the earliest contributors to the *Westminster Review*, edited for many years the *Monthly Repository*, and largely contributed to various other organs of public opinion. His *Lectures, chiefly addressed to the Working-Classes*, were published in 3 vols. He is the author of a philosophical dissertation on *Religious Ideas*, and other theological works. He died in 1864.

FOX (*Vulpes*), a genus of *Canidae* (q. v.), particularly distinguished from dogs, wolves, jackals, &c., by the pupils of the eyes contracting vertically, and in the form of the section of a lens, not circularly. This takes place whenever the eyes are turned to a strong light, and foxes are all nocturnal animals. Foxes are also generally of lower stature in proportion to their length than the other *Canidae*; they have a roundish head, with a very pointed muzzle, short triangular ears, slender limbs, and a bushy tail



The Common Fox (*Vulpes vulgaris*).

They dig burrows for themselves in the earth, or take possession of holes already existing. They are famous for their cunning, which they exhibit both in their artifices for obtaining prey, and for escaping from danger. They feed on small quadrupeds, birds, eggs, &c.; some of them, however, also partly on fruits and other vegetable substances.—The COMMON FOX (*V. vulgaris*), a native of most parts of Europe, is the only British species, and is still pretty abundant in most parts of the country, although from many parts it would probably have been extirpated ere now, unless it had been in some measure protected with a view to the sport of fox-hunting. The common fox is reddish brown above, white beneath; the outside of the ears black, a black line extending from the inner angle of the eye to the mouth; the legs mostly black, the end of the tail generally white, although specimens sometimes occur in which it is gray, or even black. There are at least three varieties known in Britain, pretty well marked by difference of size and form—the *Greyhound Fox* being more slender and longer-limbed, and the *Cur Fox*—frequent in upland moorish districts—being smaller than the common variety. Other varieties occur in the north of Europe.

The Fox has a gland under the tail, which secretes a very fetid substance, communicating to the whole animal its well-known smell. It breeds once in a year, having usually four, five or six young ones in a litter. Its usual voice is a kind of yelp. Its senses of sight, hearing, and smelling are very acute. Innumerable anecdotes are on record illustrative of its cunning. The difficulty of setting traps so that they shall not be detected and avoided by it, is well known. Foxes are said to have been observed approaching water-fowl by swimming slowly with a turf in the mouth, so as to remain concealed. A most trustworthy person assured the writer of this article, that he saw a fox approach a group of hares that were feeding in a field, with a slow, limping motion, and having his head down as if eating clover, till he was near enough, by a sudden rush, to secure very different food. Foxes captured in hen-roosts have often been known to simulate death, and to submit to being dragged about and very roughly treated without a sign of life, till an opportunity of es-

cape presented itself. When they are driven to their holes, and these are surrounded with traps, they not unfrequently show such a just appreciation of the danger, that they will endure starvation for days and even weeks rather than come out. Even when taken young, the common fox can hardly be tamed; and very few instances are on record of its showing even a little of that attachment to man of which so many animals are capable, and for which the dog is so remarkable. The improbability of any of the domestic races of dog being at all derived from the fox, is noticed in the article DOG. The French *renard* appears in English in *reynard*, the familiar appellation of the fox. The south of Europe produces foxes of smaller size than the common fox, having the fur of the belly black, regarded by some as a mere variety by others as a distinct species (*V. melanogaster*). They are less carnivorous, and to them some of the allusions and fables relate—as of the fox and grapes, &c.—which do not accord well with the habits of the foxes of Britain and of Northern Europe.—The Himalaya mountains produce a species of fox (*V. himalaicus*) very similar to the common fox, but of superior size and brilliancy of colors. The fur is rich and fine.—The BLACK FOX of Northern Asia is also very similar to the common fox, but is entirely of a velvety black color, except the tip of the tail, which is white; its fur is greatly esteemed, brings a high price, and forms an article of export from Kamchatka to China.—The COAL FOX (*V. alopec*) of some parts of Europe, as Switzerland and Bavaria, is by some naturalists regarded as distinct from the common fox. It is of inferior size, more timid, and less troublesome; the tip of the tail is black.—North America has several species of fox of which the RED FOX (*V. fulvus*) very nearly resembles the common fox of Europe, but is of rather larger size, has a shorter muzzle, eyes nearer each other, and a more copiously bushy tail. Its fur is also longer, finer, more brilliantly covered, and much more valuable, forming a considerable article of export from fur countries; in which, as well as in Canada, and in the northern parts of the United States, this species is abundant. The CROSS FOX is a variety of it, distinguished by a longitudinal dark band along the back, crossed by a transverse band over the shoulders. The burrow of this fox 'at first inclines downwards for four or five feet at an angle of about twenty-five degrees, it then inclines upwards a little, which is a security against inundations, and is continued at a depth of about three or four feet from the surface, until it reaches a point where it is divided into two or three galleries.'

Great numbers of these foxes are annually tracked to their burrows, and digged or smoked out of them by American farmers.—The GRAY FOX (*V. virginianus*) is the most abundant species of the southern states, extending, however, as far north as Canada, where it is rare. It is of a gray color, varied with black, is about the size of the common fox, but not so bold, and sometimes eats vegetable substances, such as ears of maize. The gray fox exhibits not a little of that cunning for which the common fox is celebrated, and when pursued by hunters and hounds, has been known to escape by getting upon the rail of a fence and running along it for some distance, so that the scent was lost. This was on one occasion done on the newly-laid rail of a railroad elevated above a swamp. It is not unfrequent for the gray fox, when hard pressed, to take refuge in a tree, particularly if one which has somewhat fallen from the perpendicular presents itself.—There are a number of other species of fox, Asiatic, African, and American; but the most deserving of notice is the ARCTIC FOX (*V. lagopus*), which inhabits the most northern parts of Europe, Asia, and America. It is very plentiful in Iceland, feeding much on ptarmigans, and sometimes on young lambs. Great numbers are found on the shores of Hudson's Bay, particularly during winter, and they have been supposed to migrate thither from still more northern regions; but it has been ascertained that this animal spends the winter even in the most northern regions that have ever been visited by man, braving the cold of Melville Island and Banks's Land, finding abundant food in the hares, marmots, ptarmigans, and other animals which also remain there. The Arctic Fox is rather smaller than the common fox; it is more densely clothed with a woolly fur, which on some parts is two inches in length; the tail is extremely bushy; and even the soles of the feet are thickly covered with hair. The color is pure white in winter, at least in very cold climates; varying to a brownish or bluish color in summer. It is gregarious, and many burrows are often found together. It is extremely cleanly in its habits, and is quite devoid of the offensive smell which belongs to most of the foxes; it is also much less cunning, and much more easily trapped, as well as much more gentle and capable of being tamed. Its flesh has been sometimes eaten by arctic voyagers, with a relish due to the extreme cold of the climate, and the consequent demand of the system for animal food. Its fur is not nearly equal in value to that of the red fox.

FOXES, JOHN, the martyrologist, was born of respectable parents in 1517, at Boston, Lincolnshire. In 1533, he entered as a student at Brasenose College, Oxford; in 1538, he took his

Bachelor's, and in 1543, his Master's degree, and was elected a fellow of Magdalen College. He displayed at an early period an inclination for Latin poetry, and wrote several plays in that language upon scriptural subjects. Of these, the only one that remains, entitled *De Christo Triumphante*, was printed at London in 1551, and at Basel in 1556, 8vo., and 1672.

The religious movements of the times led him to study the great controversy between Popery and Protestantism, and becoming a convert to the principles of the Reformation, he was, July 22, 1545, expelled from his college for heresy. His father being dead, and his mother married again, his stepfather refused him any further aid, and he was, in consequence, reduced to great distress. For a short time, he was employed as tutor to the children of Sir Thomas Lucy of Charlecote, Warwickshire, and afterwards was engaged by the Duchess of Richmond as tutor to the children of her brother, the Earl of Surrey, then a state prisoner in the Tower. In this capacity he remained during the whole reign of Edward VI., but was never, notwithstanding Anthony Wood's assertion to the contrary, restored to his fellowship at Magdalen. On June 23, 1550, he was ordained deacon by Ridley, Bishop of London, and preached the doctrines of the Reformation at Reigate. During the reign of Mary, he retired to the continent. On the accession of Queen Elizabeth, he returned to England in October 1559; and in May 1563, he was inducted into the canonry and prebend of Shipton, in the cathedral of Salisbury. He also enjoyed the living of Cripplegate, which he soon resigned, and for a year he held a stall at Durham. In 1575, when some Dutch Anabaptists were condemned to the flames in London, F. interceded for them with Queen Elizabeth and other persons in authority, but without effect. He wrote numerous controversial and other works, but the one that has immortalized his name is his *History of the Acts and Monuments of the Church*, popularly known as *Foxe's Book of Martyrs*, the first part of which was published at Strasburg in 1554. The first English edition appeared in 1563, in one vol. folio. Sanctioned by the bishops, it was ordered, by a canon of the Anglican Convocation, to be placed in the hall of every episcopal palace in England, and has gone through innumerable editions. It is not a very critical work, as might naturally be supposed, and Roman Catholics deny its trustworthiness. F. died in 1587, in his 70th year, and was buried in the chancel of St. Giles, Cripplegate, London.

FOXES AND FOX-HUNTING. The law with reference to fox-hunting, which is a matter of a good deal of importance in many parts of the country, seems to stand thus in England: 'Though in general all persons who go upon another's lands without permission are trespassers in the eye of the law, yet there are some cases where the trespass is said to be justifiable,' says Mr. Paterson, the most recent writer on the subject, and he quotes Blackstone's dictum to the effect that 'the common law warrants the hunting of ravenous beasts of prey, as badgers and foxes, in another man's land, because the destroying such creatures is said to be profitable to the public' (3 Black. Com. 212). Care must be taken, however, that no damage be done beyond what is necessary for the public good, for that is the ground on which alone the legal character of fox-hunting can be maintained. It was found, moreover, in the *Earl of Essex v. Capel* (1 Chitt. Game L. 114), that though pursuing a fox on another's land be justifiable, yet, if it take to earth, or to a house there, it is not justifiable to dig or break doors for it.

In Scotland, where, from the character of the country, fox-hunting is often impossible, it never has become a national sport to the same extent as in England; and consequently, the rule that one is entitled to enter on the lands of another for the purpose of killing a fox, has been confined to those cases in which he is pursued simply as a noxious beast, and fox-hunting for sport without leave has been held to be punishable as a trespass, and the trespasser held liable for whatever surface-damage he may occasion. In Ireland (by 1 and 2 Will. IV. c. 32, s. 35), persons pursuing with bounds any fox, hare, or deer which has been started elsewhere on another's land, are exempted from summary proceedings for trespass.

FOXGLOVE. See DIGITALIS.

FOXHOUND, a kind of dog much used in Britain for the sport of fox-hunting. It is not quite so large as the staghound, and is perhaps a mixed breed between the staghound or the bloodhound and the greyhound. The color is commonly white, with large patches of black and tan color. Their speed and perseverance are remarkable; they have been known 'to run hard for ten hours before they came up with and killed the fox, and the sportsmen were either thrown out, or changed horses three times.'

FOX-HUNTING, from its exciting nature, as well as from the qualities of daring courage and cool calculation requisite in those who thoroughly follow and appreciate it, has long been termed the king of British national sports.

In Great Britain, there are upwards of 100 hunting establishments, of which by far the greater proportion belong to the

counties south of the Tweed. Fox-hunting establishments—which are in most instances supported by subscription, though sometimes owned by private gentlemen of wealth and influence—are organized and maintained at a very considerable annual cost, the price of a single pack of foxhounds sometimes amounting to several thousand guineas. Every establishment is under the direct superintendence and control of one experienced gentleman, the *master*, and under him again rank the huntsman, whippers-in, earth-stopper, kennel-servants, &c. A 'pack' is composed of from 20 to 60 couples of hounds, the number greatly depending upon the frequency of hunting-days: thus, some packs hunt six days, some five days, others four, and many only two days a week; 30 couple of hounds is a good average; these are carefully reared, fed, and otherwise attended to. The master himself, as a matter of course, has the general superintendence of the servants, hounds, and horses; and in the hunting-field is general director of the proceedings. Next to him come the huntsman and one, or two 'whippers-in' ('whips'). The huntsman, who is practically the most important personage in the field, requires to see that his hounds are properly managed and fed in their kennels; duly led to the place of meeting on hunting-days; and, what is of more consequence still, that they receive fair-play in the field, and find and hunt their foxes in true style.

The huntsman requires to be a man of great nerve and much activity: he should also have a good head, a clear ringing voice, a keen eye, and above all he must be a first-rate horseman, and know thoroughly every point in the country over which he hunts. He has often to restrain heedless riders, and 'keep the field back'; a duty requiring firmness of character, with a quiet and civil manner. With these necessary qualifications, and having so many responsible duties on his shoulders, he is treated with great respect by those for whom he provides sport: he is mounted on the best horses his master can produce, and may be said to conduct and direct the hunt from the moment the fox is found till the moment of his death—from 'find to finish.'

The duties of the first whipper-in, though not so responsible as those of the huntsman, are still considerable: for instance, he takes a certain management of the hounds in kennel, assists in conducting the hounds to the 'meet,' and aids the huntsman in various ways during the run. His knowledge of the management of hounds, and of fox-hunting generally, must at the same time be such as to enable him to occupy the huntsman's place in an emergency. The 'second whip's' principal duty is that of bringing up and urging on lagging hounds in the field, by lashing and 'rating.' In many hunts, however, a second whipper-in is dispensed with.

A considerable range of country is necessary for the full enjoyment of fox-hunting, the best being that which is diversified by pasturage and plantation. Being a nocturnal feeder, the fox quits his burrow or 'earth'—which is generally in a gorse brake, or a plantation or covert of underwood—during the night, and returns to it in the morning, and this fact is taken advantage of by those who hunt him for sport. The day and place of 'the meet' are duly advertised, and on the night before the hunt, the coverts to be 'drawn' next day are visited either by a duly appointed *earth-stopper* or by the gamekeeper, who, knowing that the foxes are from home, proceeds, spade in hand, from one hole to another, filling them up with earth and brushwood as he goes. Thus, the fox, upon returning at dawn to his 'earth,' finds ingress denied, and so betakes himself to some neighboring thicket, or to some unenclosed cover of gorse, rushes, &c., where he makes a temporary lair or 'kennel.' When the earths have been carefully closed, the earth-stopper returns home and informs the huntsman, or first 'whip,' as to their number and locality, and that information forms a guide for the proceedings of the following day. (After hunt is over, the earths are reopened, and as little trace as possible left of the work.) The hour of 'the meet' is usually ten or eleven o'clock A.M., and at the appointed place assemble the whole field, including master, huntsman, whippers-in, hounds, and those gentlemen (and frequently ladies) who intend either to participate in the day's sport, or merely to see the 'hounds throw off.'

When a covert is reached, the huntsman, by a wave of his hand, or a few familiar words, such as 'Eu in! eu in there! good dogs!' 'throws in' his hounds, following immediately after with the first 'whip.' The mounted gentlemen usually remain outside, and take their directions as to stance, &c., from the master, who from this time forward does his best to control and direct their movements. In fact, the master may be said to have the control of the 'field'—that is, the riders—and the huntsman that of the hounds and hunt. The second whip being posted at the covert side, near where it is expected a fox may burst through or 'break,' one or two of the more eager riders are sometimes permitted to jump their horses into the covert, if it be large, to assist in the finding of the fox. Those who remain outside then prepare themselves for their work, and eagerly listen for the first token of the presence of reynard; this is betrayed by a slight but

anxious whimper or whine from the 'challenging' hound—that is, the hound (usually an old and experienced one) that first perceives or 'hits' the scent of a fox—and is soon followed by others, who instantly rush to his side. The huntsman, if he be tolerably certain that the game scented is no other than a fox, at judicious intervals urges on his hounds by familiar expressions, such as 'Yoicks, yoicks, have at him!' 'Push him up!' &c., till the fox is fairly roused from his kennel, and steals away. It sometimes happens, while 'drawing' coverts, that hounds will come suddenly upon a fox, and seize him before he has time to escape. This is termed 'chopping,' and is always to be prevented if possible. If the covert be very thick, a fox may leave his kennel unperceived; and when he does so, he usually runs through or round the covert for a considerable distance before quitting it for the open fields. He may also 'run his foil,' by doubling back and forward on the same path or track, and thus possibly baffle the hounds, even when they 'own his scent.' In large coverts, too, a fox frequently 'hangs'; that is, he remains in it for a long time before going away. The person who first sees the fox 'break cover,' or, in other words, 'views him away,' should always allow him a certain 'law' before giving the 'view halloo,' as a fox will frequently turn or 'head back' into the covert if he hears any unusual noise at the instant of his quitting it. When, however, the person or persons who are watching see that the fox is really off, notice is instantly given to those within the thicket, and those without, by the cry of 'Hou—y! hou—y! Tallyho! Gone away! GONE A-WAY!!' upon which the huntsman blows his horn to collect his hounds; the whipper-in drives out lagging members of the pack, either with his whip or by some cry; the master restrains the more impatient of the riders till the huntsman and hounds have 'settled to' their fox; and then he and the entire field join in the chase, and the first, and frequently the most exciting, part of the day's proceedings has commenced—the fox has 'broke cover,' the hounds have been 'laid on,' and the field has entered on its impetuous 'first burst.'

A certain etiquette is, however, absolutely necessary in allowing the hounds and huntsman to get away *first*; but after that, each rider, with a certain deference to the master, chooses his own place in the hunt, and does his best, independently of his neighbors, to keep at a certain distance, not directly in the line, but to one side and in the rear of the hounds. When a rider happens to



Fox-hunting—'Laying on' the hounds.

be near the pack at the first burst, and gets a good position in following them, he is said to 'get well away with the hounds,' and if well mounted and a skilful rider, his chances of both viewing the hunt and being 'in at the death' are very considerable. And now, as we have already said, begins the grand excitement of the day; the fox being fresh, races away at tremendous speed, followed by perhaps upwards of twenty couple of hounds at full cry. If the day is propitious (a 'southerly wind and cloudy sky' having long retained favor), the scent of the retreating fox lies well, especially at first, when it is called 'burning' or 'breast-high,' and is for many minutes 'owned' by at least all the leading hounds in the pack, though, perhaps, the object of pursuit itself is far ahead, and out of sight; and away streams the hunt over hedges, ditches, and gates, across rivers, railways, arable land, and grass pastures, perhaps for several miles before a single *check* occurs. Now, the foxhound hunts almost entirely by scent, and does not, like the greyhound, depend upon the eye. The fact of scent failing, therefore, at any time during the hunt, throws out the hounds, and prevents them from renewing it, until the scent is recovered, or 'hit off.' When the scent is 'burning,'

hounds run almost mute, though at first, and at intervals afterwards, they usually 'throw their tongues' pretty freely. When all the hounds are giving tongue, they are said to be at 'full cry,' and 'carry a good head,' the scent being on such occasions so thoroughly diffused as to be felt or 'owned' breast high by probably every member of the pack. Sometimes scent becomes so faint as to be hardly perceptible, and when this is the case, the energy of the hounds abates considerably; they then run with their heads close to the ground, and are said to hunt a 'cold' scent. Here, however, a little timely assistance from the huntsman is of the greatest moment in restoring animation to the pack. He waves his cap, blows his horn, and encourages his hounds by well-known expressions, to renewed exertions.

When, as frequently happens from various causes, the scent fails entirely—such as the fox crossing water, running through a drove of sheep, 'heading back' in another direction, running along or lying upon the tops of walls or thick hedges, &c.—the hounds cease 'giving tongue,' suddenly stop, throw up their heads, and are 'at fault.' In this emergency, the 'field' remains at a respectful distance behind, and the huntsman knowing, or at least guessing by experience which way the fox has taken, or the special means he has adopted for foiling the scent, allows his hounds at first, for a few moments, themselves to attempt to regain it; but failing that, and finding that his interference and assistance are necessary, he instantly blows his horn, and calls or 'lifts his hounds' from the place, and 'takes a cast' round and round about the spot where the scent failed, cheering them on the while. Thus, by gradually widening his casts, the scent is very frequently recovered or 'hit off,' a circumstance which is soon made apparent by the whimper of recognition given by the hound that first 'owns it,' followed by the answering tongues of the whole pack. When the hounds, however, fail to 'hit off' the scent, if the day be far advanced, they are taken home, or they are trotted on to some neighboring covert, which is drawn for a fresh fox.

When the fox is killed, either in 'the open' or elsewhere, the rider who is first in at 'the death'—usually the huntsman—springs

The midland counties of England, such as Leicester, Northampton, Warwick, Yorkshire, &c., are the best for hunting purposes in Great Britain; and owe their superiority in a great measure to two causes: 1st, the strict preservation and consequent number of foxes; and 2d, the extensive tracts of pasturage being favorable both for running and scent. The instinct of the fox leads him, as a general rule, to run *down* wind, that his scent may not be blown to the hounds; he also takes advantage of every peculiarity in a country likely to offer him an advantage over his foes.

The fox-hunter must be possessed of considerable courage, united with coolness, and must be a judge of pace and have a good eye in 'riding to hounds,' to avoid tiring or 'overmarking' his horse unnecessarily. Much of the excitement and pleasure of the fox-hunter consists in his successfully leaping the various hedges, ditches, fences, &c., encountered; but at the same time, a really skilful and humane rider, however well mounted, will never knowingly urge his horse at a fence or leap of any kind, unless he is positively certain it is within his horse's power; and if he finds his horse betrays symptoms of distress, he will rather turn his head homewards, and forego the chase, than overtax its courage and strength.

Much useful and entertaining information on fox-hunting occurs in Blaine's *Encyclopædia of Rural Sports* (London, Longmans); *British Rural Sports*, by Stonehenge; Beckford's *Thoughts on Hunting*; *Reminiscences of a Huntsman*; *Nimrod*; *The Field* newspaper; &c.

Fox-hunting is not practised after the English fashion in the northern states of America, but in the southern states from Maryland to Florida, it is a favorite amusement. The object of pursuit, however, is the *Gray Fox* (*Vulpes Virginianus*), and the chase is not so severe, and seldom lasts so long as that of the common fox.

FOX ISLANDS, another name for the ALEUTIAN ISLANDS (q. v.).

FOX RIVER is the name of two considerable streams in the United States of America, both of them rising in Wisconsin.—1. The F. R., or *Pishtaka*, is an affluent of the Illinois, which is itself a tributary of the Mississippi. It is 200 miles long, and is valuable chiefly for its water-power.—2. The F. R., or *Neenah*, after a course of about the same length, falls into Green Bay in Lake Michigan. It is divided into two sections by Lake Winnebago, the upper one being connected by a canal with the Wisconsin, so as to link together the Mississippi and the Great Lakes of the St. Lawrence.

FOX SHARK, or THRESHER (*Alopias* or *Alopecias*), a genus of sharks, containing only one known species (*A. vulpes*), an inhabitant of the Mediterranean and of the Atlantic, and occasionally seen on the British coasts. The snout is short and conical; the spout-holes are very small; the mouth is not so large as that of the white shark, nor the teeth so formidable; but the F. S. is extremely bold and voracious, readily attacking grampuses or dolphins much larger than itself. Its most remarkable peculiarity is the great elongation of the upper lobe of the tail-fin, which is nearly equal in length to the whole body, and into which the vertebral column extends. Of this it makes use as a weapon, striking with great force. It is said to be not uncommon for a whole herd of dolphins to take flight at the first splash of the tail of a fox shark. From the use which it makes of its tail, it has acquired the name of Thresher. It attains a length, tail included, of 13 feet. The body is spindle-shaped.

FOXTAIL GRASS (*Alopecurus*), a genus of Grasses, distinguished by a spiked panicle, two glumes nearly equal, and generally united at the base, enclosing a single floret which has a single palea, with an awn rising from the base. The species are chiefly natives of temperate countries, and about six are British. MEADOW FOXTAIL GRASS (*A. pratensis*), which has an erect smooth culm about 1½–2 feet high, and a cylindrical obtuse panicle abundantly covered with silvery hairs, is one of the best meadow and pasture grasses of Britain, but does not arrive at full perfection till the third year after it is sown. It bears mowing well, and is reckoned a good grass for lawns. It bears drought well. The JOINTED FOXTAIL GRASS (*A. geniculatus*), with an ascending culm bent at the joints, is very common in moist places, and cattle are fond of it, but it is a small grass. The SLENDER



Blood Hunter clearing a stone wall in good style (from Blaine's *Encyclopædia of Rural Sports*).

off his horse, with a 'Who! whoop!' lashes the hounds off, and cuts off the head, feet (*pads*), and tail (the *brush*). He then flings the carcass to the hounds, who tear it to pieces, and devour it in a very few minutes. The brush is usually presented to any lady who may happen to be in at the death, or is claimed as a trophy by one or other of the gentlemen present. The *pads* likewise are distributed amongst those who may wish to preserve mementos of the chase. As a general rule, the huntsman, and several of the best mounted in the field, manage to be in, either at or immediately after the death, though instances are not wanting when, during unusually protracted runs, the hounds have left every rider far behind, and have followed and killed their fox miles away from the spot where the last horseman had given in. A strong fox will frequently 'live' before hounds for an hour or an hour and a half; but cases have been known when this has been far exceeded, and when the run has extended to thirty or even forty miles, and has lasted all day, and even into the night. Young foxhounds begin their career by what is termed *cub-hunting*; but this, however necessary it may be for teaching them, is considered inferior sport to regular hunting.



Foxtail Grass (*Alopecurus pratensis*):
a, glume; b, floret.

FOXTAIL GRASS (*A. agrestis*) is an annual or biennial, of little value except for light sandy soils, on which it is sometimes sown. A foreign species (*A. nigricans*), a native of the continent of Europe and of Siberia, has been introduced into Britain, and appears likely to prove valuable. It has somewhat creeping roots, is a little larger and stronger than *A. pratensis*, and is rather earlier.

FOY, MAXIMILIEN SEBASTIEN, a distinguished French general and orator, was born at Ham, 3d February 1775. In 1791, he was one of the volunteers who hastened to defend the frontiers of their country against foreign invasion, and during the next nine years served with distinction under Dumouriez, Moreau, and Massena. In 1800, he was raised to the rank of adjutant-general in the division of Moncey, in the army of the Rhine, which marched through Switzerland into Italy, where he commanded the vanguard of the army in 1801. In 1805, he commanded the artillery of the second division in the Austrian campaign. In 1807, Napoleon sent him to Turkey at the head of 1200 artillerymen, to assist Sultan Selim against the Russians and British. After the revolution in which Selim was dethroned, F., under the direction of the French ambassador, General Sebastiani, defended Constantinople and the Strait of Dardanelles so effectively, that Duckworth, the British admiral, was obliged to retire with loss. From 1808 to 1812, F. was general of division of the army in Portugal. His talents were exhibited to advantage in conducting the retreat of the French army across the Douro. F. was present at all the battles of the Pyrenees, and at Orthez, in 1814, was dangerously wounded. In the campaign of 1815, he commanded a division on the field of Waterloo, where he was wounded for the fifteenth time. In 1819, he was elected deputy by the department of Aisne. In the chamber, he was the constant advocate of constitutional liberty, and showed great rhetorical talent and knowledge of political economy. He distinguished himself particularly by his eloquence in opposing the war against Spain in 1823. F. died at Paris, November 28, 1825. Madame Foy published, in 1827, from her husband's papers, a *Histoire de la Guerre de la Péninsule*. In the previous year appeared his *Discours*, with a biography.

FOY'ERS, a stream rising in the Monadleadh Mountains, in the middle of Inverness-shire. It runs 12 miles north, and falls into the east side of Loch Ness, nearly opposite Mealfourvounie Mountain. It has two celebrated falls within a mile and a half of its mouth, where the stream rushes through a deep, narrow ravine in the hills, skirting the east side of the loch. The upper fall is 30 feet high. The stream then descends 30 feet in a quarter of a mile. The lower fall (specially called *The Fall of Foyers*), is 90 feet high. It is one of the finest cascades in Britain.

FOYLE, LOUGH, an inlet of the Atlantic, on the north coast of Ireland, between the counties of Derry and Donegal. It is triangular in form, 16 miles long from north-east to south-west, 1 mile wide at its entrance, and 9 miles broad along its south side. A great part is dry at low water, and its west side alone is navigable. Vessels of 600 tons ascend the west side of the lough, and its chief tributary the Foyle (which comes 16 miles from the south), to Londonderry. On the east shore is a flat strand with a sandy beach, on which, in 1827, was measured a line of 41,640, which was afterwards extended by triangulation to about 53,200 feet, and formed the base line of the Ordnance Survey of Ireland.

FRA BARTOLOMEO. See BACCIO DELLA PORTA.

FRACASTORO, GIROLAMO, an Italian savant and philosopher, famous for the universality of his learning, was born of an ancient family at Verona in 1483. At the age of 19, he was appointed professor of logic in the university of Padua. But his knowledge embraced the most divergent sciences, and on account of the eminence in the practice of medicine, he was elected physician of the Council of Trent. His Latin verse also exhibits remarkable elegance. He died in 1553. A bronze statue was erected in his honor by the citizens of Padua, while his native city commemorated their great compatriot by a marble statue. His writings in prose and verse are numerous. The chief are—*Syphilis sive Morbi Gallici* (Verona, 1530, in 4to; Paris, 1531 and 1539, in 8vo; London, 1729, in 4to, and 1746, in 8vo; Italian edition, Verona, 1739, in 4to, by Tiraboschi; Naples, 1731, by Pietro Belli); *De Vini Temperatura* (Venice 1534, in 4to); *Homocentricorum sive de Stellis, De Causis Criticorum Dierum Libellus* (Venice, 1535, in 4to); *De Sympathia et Antipathia Rerum De Contagionibus et Contagiosis Morbis et eorum Curatione* (Venice, 1546, in 4to; Lyon, 1550, 1554, in 8vo). The collective works of F. appeared for the first time, Venice, 1555, in 4to.

FRA'CTED, heraldically, signifies broken asunder.

FRACTION. In Arithmetic, a fraction is any part or parts of a unit or whole, and it consists of 2 members, a denominator and a numerator, whereof the former shows into how many parts the unit is divided, and the latter shows how many of them are taken in a given case. Thus $\frac{3}{4}$ denotes that the unit is divided into four parts, and that three of them are taken; and more generally $\frac{a}{b}$ denotes that the unit is divided into b parts, and that a of

them are taken. A fraction is called *proper* when the numerator is less than the denominator, and *improper* when the numerator is greater than the denominator. In Algebra, any quantity $\frac{a}{b}$ is called a fraction, although a and b are not necessarily representatives of whole numbers, as they would require to be if the fraction be an arithmetical fraction. The algebraical fraction $\frac{a}{b}$ just means that any quantity affected by it is to be multiplied by a , and divided by b . This definition, however, through the greater generality of algebra, includes that of an arithmetical fraction. The rules for the addition and multiplication of fractions are the same in algebra and arithmetic. To add two or more fractions together, we must bring them to a common denominator, and add the numerators for a new numerator, and take the common denominator for the new denominator. Thus if $\frac{a}{b}$, $\frac{c}{d}$ be two frac-

tions, then $\frac{a}{b} + \frac{c}{d} = \frac{ad}{bd} + \frac{cb}{bd} = \frac{ad+bc}{bd}$, the fractions being brought to a common denominator by (as a general rule) multiplying each numerator by every denominator, except its own, and multiplying all the denominators for the common denominator.

To subtract two fractions, we bring them to a common denominator, and subtract their numerators for the new numerator. Thus $\frac{a}{b} - \frac{c}{d} = \frac{ad-bc}{bd}$. To multiply two fractions together, the rule is, to multiply the numerators together for a new numerator, and the denominators together for the new denominator. Thus $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$. The reasons for all these rules are obvious. The rule of division is to invert the divisor, and proceed as in multiplication. This follows from the consideration, that to divide is the inverse of to multiply, and that to divide by $\frac{a}{b}$ must be the same thing as to multiply by $\frac{b}{a}$.

FRACTIONS, CONTINUED. If $\frac{A}{B} = a + \frac{a_1}{B}$, and $\frac{B}{a_1} = b + \frac{b_1}{a_1}$, and $\frac{a_1}{b_1} = c + \frac{c_1}{b_1}$, and... $\frac{k_1}{l_1} = m + \frac{m_1}{l_1}$, and $\frac{l_1}{m_1} = n + \frac{n_1}{m_1}$, &c.

$$\text{Then } \frac{A}{B} = a + \frac{1}{\frac{b}{c} + \frac{1}{\frac{d}{\dots} + \frac{1}{\frac{m}{n} + \dots}}}$$

This expression for the value of $\frac{A}{B}$ is called a continued fraction.

If we consider the fractions (1) $\frac{a}{1}$, (2) $a + \frac{1}{b}$ or $\frac{ab+1}{b}$, (3), $a + \frac{1}{b + \frac{1}{c}}$ or $\frac{(ab+1)c+a}{bc+1}$ formed by taking into account parts only of the denominator in the continued fraction, we obtain a series of fractions converging to the value of $\frac{A}{B}$. These converging fractions are always approximating to the value of $\frac{A}{B}$, and are alternately greater and less than it. Throughout the series, the 1st, 3d, 5th, 7th, &c., are each below the true value, while the 2d, 4th, &c., are above it; or *vice versa*, according as the original fraction is improper or proper. It can be shown that the successive converging fractions approach nearer and nearer to the true value of the continued fraction. Converging fractions are of great use in the summation of infinite series.

the queen of Naples and the British admiral, Sidney Smith, whose influence had not sufficed to rescue him from death, although on his capture he produced papers bearing the royal seal, which vouched for his right to the rank of colonel in the royal forces.

FRAGA, a town of Spain, in the province of Saragossa, 63 miles west by south from Saragossa, on the left bank of the Cinca, which is crossed by a suspension bridge. The town stands on a slope, and is poor and half-ruinous, with ill-paved streets. The environs abound in pomegranates and figs. The small green figs of this district are celebrated as particularly delicious, and when dried form the chief article of export. F. is supposed to occupy the site of the ancient *Gallica Flavia*. Pop. 5028.

FRAGA'RIA. See **STRAWBERRY**.

FRAME, in Gardening, the covering of any kind of hotbed, flued pit, or cold pit, used for the cultivation of plants not sufficiently hardy for the open air. Frames are of various materials, but generally of wood or iron and glass, and are made in one piece or in sashes according to the size of the hotbed or pit.

FRAME-BRIDGE, a bridge built of timbers framed together in such a manner as to obtain the greatest possible amount of strength with a given quantity of material.

The fundamental principle upon which all such construction is based, is that the timbers shall be so arranged that the weight put upon them shall exert a pulling or crushing strain, instead of a transverse strain, and if possible, that the greatest strain shall act as a direct pull in the direction of the fibres of the wood. The construction of a frame-bridge is very similar to that of a roof, excepting that in the bridge a considerable outward thrust upon the abutments is generally permissible, while the walls of a house will not stand this; and that for the bridge a nearly level way on the top is desirable, while for a roof a steep incline is not objectionable, or is even desirable. Fig. 1 represents a simple and

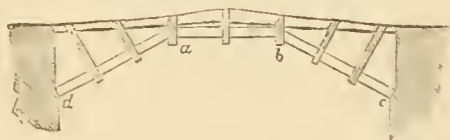


Fig. 1.

useful form of frame-bridge. It will be seen at once that a weight upon the bridge will exert a pulling strain upon the horizontal timber *ab*, and a crushing strain upon *bc* and *ad*, as well as upon the upper timbers, and that the main support is in *ab*, which must be torn asunder before *ad* and *bc* can be bent or displaced to any considerable extent.

The celebrated frame-bridge of Schaffhausen, constructed in 1757 by Grubenmann, a village carpenter, was built exactly in the manner of a roof with a horizontal pathway superadded. It was composed of two arches, one 193 feet, the other 172 feet span. It was merely laid upon the piers, and did not abut against them to exert any outward thrust, as will be seen by fig. 2. The weight on the bridge is transmitted by the oblique beams, which by analogy we may call *rafters*, to the tie-beam *ab*, where it exerts a

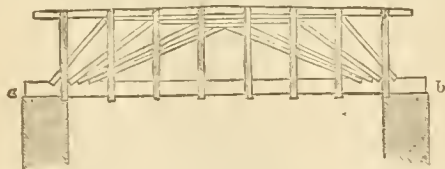


Fig. 2.

horizontal pulling strain. These rafters are framed into the tie-beam so as to abut firmly against it in the same manner as Roof-rafters (see **ROOF**). This kind of frame-bridge is very common in Switzerland, where timber bridges abound; and it has doubtless originated from the fact, that most of the bridges have been built by the local carpenters, who are accustomed to the construction of roofs of considerable span for the commodious square-built wooden cottages with overhanging roofs, so common in that country. Frame-bridges of more complex structure are sometimes built; in some of these, the timbers are framed so as to present an arched form. In these cases, the structure is very similar to those described and figured under **CENTERING**. The serious defect of all such bridges is their liability to decay from exposure to moisture, &c., especially at the joints, where water is apt to lodge and remain, from want of free circulation of air to evaporate it. In the bridge of Schaffhausen above described, it was found that when it had stood but 26 years, the oak-beams, where they rested on the masonry at *a* and *b*, fig. 2, were rotted and the frames began

to settle. This was remedied by a carpenter named Spengler, who raised the whole structure upon piles by means of screw-jacks, and replaced the decayed wood. Means should be adopted to admit the free circulation of air in those parts where the timber rests upon the masonry, and to prevent water from settling in the timber joints. The covered bridges of Lucerne and other parts of Switzerland are well known as objects of special interest to tourists, who usually imagine that the roofs are made for the comfort of travelers, but their main object is the preservation of the bridge.

FRAMING, the jointing, putting together, or building up of any kind of artificers' work. The framing of timber generally is described under **CARPENTRY**, and special kinds of framing under **CENTERING**, **DOOR**, **FLOORS**, **FRAME-BRIDGE**, **PARTITIONS**, **ROOFS**, &c. In such trades as mathematical, optical, philosophical, and other complex instrument-making, the workmen who does flat-filed work, and fits all the parts, and puts the whole instrument together, is called the *framer*, and his work *framing*.

In the watch-trade, the man who frames all the parts together, and builds up the watch, is called a *finisher*, and his work is called *finishing*, though it corresponds with what is called framing in other trades.

FRA'MLINGHAM, or 'Strangers' Town,' a town in the east of Suffolk, on the left bank of the Ore, 14 miles north-north-east of Ipswich. It consists of a large market-place, from which a few streets irregularly branch out. The church is built of black flint and stone, and contains the monuments of Thomas Howard, third Duke of Norfolk, and of his duchess, and of the unfortunate Henry Howard, Earl of Surrey, and of his countess. Here are the remains of a castle with thirteen square towers, where Queen Mary retired after the death of her brother, Edward VI. Pop. (1871) 2569.

FRANC, a French silver coin and money of account, which (since 1795, when it supplanted the *livre Tournais*) forms the unit of the French monetary system, and has also been adopted as such by Belgium and Switzerland. The franc is coined of silver, nine-tenths fine, and weighs five grammes, its value being about 94*d*. One pound sterling = 25.2 francs. The franc is divided into 100 centimes, but the old division into 20 sous is still made use of in common life. There are in France silver coins of 1, 2, 5, 10, 20, and 50 centimes; and gold pieces of 20 and 40 francs. Italy has also adopted the French money-system, only that the franc is called *Lira nuova*.

FRANCAVI'LLA, a town of Italy, in the province of Lecce, is situated on an elevation 22 miles south-west of Brindisi. It is well built, has a college, three hospitals, and several convents; has manufactures of woollens, cottons, and earthenware, and, with its dependent villages, has a population of 17,300.

FRANCE, the most westerly portion of Central Europe, extends from 42° 20' to 51° 5' N. lat. and from 8° 15' E. long. to 4° 54' W. long. It is bounded on the N. by the Channel and the Straits of Dover, which separate it from England, by Belgium, the grand duchy of Luxembourg, and the Rhenish provinces of Prussia; on the E. by the lately annexed German provinces of Alsace and Lorraine, by several of the Swiss cantons, and by Italy; on the S. by the Mediterranean and the dominions of Spain, from which it is separated by the Pyrenees; and on the W. by the Atlantic (the Bay of Biscay). The greatest length of F., measured from Dunkirk in the north to the Col de Falguères in the south, is about 620 miles; and its greatest breadth, from east to west, measured from the new boundary, line in the Vosges to Cape St. Matthieu, in Finisterre, is about 550 miles. Its circumference, inclusive of sinuosities, is estimated at nearly 3100 miles, or 5000 kilometres, of which nearly the half is composed of maritime coast-lines, which are subdivided in the proportion of about 600 kilom. on the Mediterranean, 950 kilom. on the Atlantic, and about 940 kilom. on the northern frontiers.

The superficial area of F., including the two Savoy provinces, and Corsica, a department of the republic, but excluding the departments of the Bas-Rhin and the other territories lost to F. by the treaty of peace concluded with Germany in 1871, is reckoned at about 204,000 sq. miles. The possessions of F. which are situated in non-European parts of the world, have a total superficial area of 240,000 square miles. Algeria, with its 122,500 square miles, is here included; but in French official statistics, Algeria is ranked separately from the other colonies as a more immediate dependency. F. is divided into eighty-seven departments, most of which have been named from the rivers or mountains by which they are intersected. The foregoing table gives the names of the ancient provinces of F., with the corresponding departments, their chief towns, areas in hectares, and the population for 1872. The pop. of F., exclusive of Algeria and the colonies, was found by the census of 1881 to amount to 37,321,186.





Old Provinces.	Chief Towns.	Departments.	Area in Hectares.	Population in 1872.
1. ILE DE FRANCE.....	Paris.....	1. Seine..... 47,500 2. Seine-et-Oise..... 560,337 3. Seine-et-Marne..... 538,575 4. Oise..... 583,067 5. Aisne..... 735,747 6. Ardennes..... 525,747 7. Marne..... 818,008 8. Marne (Haute)..... 625,403 9. Aube..... 602,212 10. Meuse..... 621,618 11. Meurthe-et-Moselle..... 650,000 12. Vosges..... 550,000 13. Nord..... 667,803 14. Pas de Calais..... 660,136 15. Somme..... 615,983 16. Seine-Inferieure..... 603,463 17. Eure..... 591,251 18. Calvados..... 551,766 19. La Manche..... 577,178 20. Orne..... 610,068 21. Finisterre..... 667,068 22. Morbihan..... 681,704 23. Côtes-du-Nord..... 711,073 24. Ille-et-Vilaine..... 672,818 25. Loire-Inferieure..... 687,411 26. Vendée..... 671,658 27. Sèvres (Deux)..... 559,995 28. Vienne..... 697,301 29. Maine-et-Loire..... 712,503 30. Mayenne..... 516,300 31. Sarthe..... 620,397 32. Charente..... 588,803 33. Charente-Inferieure..... 716,814 34. Indre-et-Loire..... 611,369 35. Loir-et-Cher..... 635,092 36. Eure-et-Loir..... 586,921 37. Loiret..... 676,512 38. Nièvre..... 686,619 39. Allier..... 712,272 40. Creuse..... 579,455 41. Cher..... 740,125 42. Indre..... 741,661 43. Vienne (Haute)..... 551,733 44. Corrèze..... 580,621 45. Cantal..... 574,146 46. Puy-de-dôme..... 800,679 47. Loire..... 477,018 48. Rhône..... 581,356 49. Ain..... 584,822 50. Saône-et-Loire..... 855,018 51. Côte-d'Or..... 876,956 52. Yonne..... 730,916 53. Saône (Haute)..... 531,000 54. Jura..... 503,364 55. Doubs..... 522,895 56. Rhin (Belfort Dist.)*..... 250,000 57. Isère..... 841,230 58. Drôme..... 653,557 59. Alpes (Hautes)..... 553,478 60. Ardèche..... 551,227 61. Loire (Haute)..... 495,784 62. Lozère..... 516,666 63. Gard..... 582,807 64. Hérault..... 630,935 65. Tarn..... 576,821 66. Garonne (Haute)..... 629,601 67. Aude..... 631,607 68. Aveyron..... 882,171 69. Lot..... 398,406 70. Dordogne..... 915,000 71. Tarn-et-Garonne..... 371,764 72. Lot-et-Garonne..... 534,628 73. Gironde..... 1,083,552 74. Les Landes..... 985,273 75. Gers..... 627,870 76. Pyrénées (Hautes)..... 464,531 77. Pyrénées (Basses)..... 752,513 78. Ariège..... 478,401 79. Pyrénées (Orientales)..... 411,376 80. Vancluse..... 359,610 81. Rhône (Bouches-du-)..... 601,960 82. Alpes (Basses)..... 630,919 83. Var..... 729,628 84. Corse..... 524,741 85. Savoie..... 612,074 86. Savoie (Haute)..... 451,482 87. Alpes Maritimes..... 429,874	2,220,060 580,180 341,400 306,804 552,139 330,217 380,157 251,196 255,687 284,725 365,137 392,983 1,447,764 761,158 557,015 790,022 377,874 454,012 541,776 398,250 612,963 490,352 622,295 589,532 602,206 401,446 331,243 320,598 518,471 350,637 446,603 367,520 465,653 268,801 282,622 353,021 339,917 390,812 274,663 335,392 277,693 322,447 302,746 231,967 566,463 550,611 470,247 363,390 548,344 374,510 863,908 303,088 287,634 291,251 56,781 575,784 320,417 118,898 380,277 308,732 135,190 420,131 429,878 352,788 479,362 285,927 402,474 281,404 490,141 221,610 319,289 705,149 300,528 284,717 235,156 426,700 240,298 191,656 263,451 554,911 159,332 293,737 358,507 397,958 273,037 199,037	
2. CHAMPAGNE.....	Châlons-sur-Marne.....			
3. LORRAINE.....	Nancy.....			
4. FLANDERS.....	Lille.....			
5. ARTOIS.....				
6. PICARDY.....				
7. NORMANDY.....	Rouen.....			
8. BRITTANY.....	Rennes.....			
9. POITOU.....	Poitiers.....			
10. ANJOU.....	Angers.....			
11. MAINE.....	Le Mans.....			
12. ANJOUAIS.....	La Rochelle.....			
13. TOURAINAIS.....	Tours.....			
14. ORLEANNAIS.....	Orleans.....			
15. NIVERNAIS.....	Nevers.....			
16. BOURBONNAIS.....	Moulins.....			
17. MÂRCHÉ.....	Guéret.....			
18. BERRY.....	Bourges.....			
19. LIMOUSIN.....	Limoges.....			
20. AUVERGNE.....	Clermont.....			
21. LYONNAIS.....	Lyon.....			
22. BURGUNDY.....	Dijon.....			
23. FRANCHE COMTE.....	Besançon.....			
24. ALSACE.....	Belfort.....			
25. DAUPHINE.....	Grenoble.....			
26. LANGUEDOC.....	Montpellier..... Toulouse.....			
27. GUIENNE.....	Bordeaux.....			
28. GASCONY.....	Périgueux.....			
29. BEARN and NAVARRE.....	Pau.....			
30. FOIX.....	Foix.....			
31. ROUSSILLON.....	Perpignan.....			
32. AVIGNON.....	Avignon.....			
33. PROVENCE.....	Marseille.....			
34. CORSICA.....	Bastia.....			
35. SAVOIE.....	Chambery.....			
36. NICE.....	Nice.....			

Paris.....	2,226,000	Toulouse.....	136,600
Lyon.....	372,900	Nantes.....	122,000
Marseille.....	357,500	St. Etienne.....	120,200
Bordeaux.....	221,000	Rouen.....	104,800
Lille.....	178,000	Le Havre.....	102,600

France has commercial stations on the Gaboon and Ogowe in Africa, four stations on the Red Sea, and in 1882 was establishing stations on the Congo and on the Somali coast, and was making claims to the protectorate of the north-west coast of Madagascar. Its recognized foreign dependencies without Tunis, are as below :

	Area in Hectares.	Population in 1870.
In Africa—		
Algeria.....	32,000,000	2,870,000
Senegal and its Dependencies.....	undefined	200,000
Ile de Réunion and Ste Marie.....	250,000	180,000
Nossi-Bé and Mayotte.....	50,000	20,000
In Asia—		
East Indian Possessions.....	50,000	270,000
Cochin-China.....	2,200,000	1,500,000
In America—		
Martinique.....	98,000	165,000
Guadeloupe and its Dependencies.....	165,000	185,000
Guiana.....	1,000,000	27,000
St. Pierre and Miquelon.....	20,000	5,000
In Oceania—		
Marquesas, Tahiti, &c.....	117,000	35,000
New Caledonia.....	900,000	41,000

The total superficial area of the French colonies, including Algeria, and reckoning the districts under French protection, is estimated, as has been said, at 240,000 square miles, and the population at about 6 millions; but of the latter number the great majority are natives and savages, or belong to only half-civilized races. The methods employed in taking the census vary, moreover, in the different colonies. To the above-mentioned dependencies has to be added the regency of Tunis, which in 1881 concluded with France a treaty by which it became practically a French protectorate. Tunis has an area of about 45,000 sq. m., and a pop. of 2,100,000.

Population.—The population of F. has not exhibited the same rate of increase as other first-class European powers during the present century, for while the population of Great Britain has nearly doubled within the last fifty years, that of F. scarcely shows an increase of 40 per cent. for the same period. In 1875, the birth-rate was only 2·64 per 100 inhabitants, a rate lower than in any other European country.

The following table shows the condition of the population from the beginning of the century to the date of the census of 1876:

Year of Census.	Number of Population.	Annual Increase.
1801.....	27,349,003	149,941
1806.....	29,107,425	351,685
1811.....	30,461,875	90,292
1826.....	31,858,937	279,415
1831.....	32,569,223	171,787
1836.....	33,540,901	194,337
1841.....	34,217,719	135,362
1846.....	35,400,486	236,553
1851.....	35,783,170	76,537
1856.....	36,039,364	51,236
1861.....	37,382,225	268,572
1866.....	38,067,094	136,186
1872.....	36,102,921	
1876.....	36,905,788	128,310

The decline of population between the census of May 1866 and of May 1872 is 1,964,273, of which 1,597,228 is due to the loss of the different territories annexed to the German empire. The remainder is due partly to losses in the war, and partly to an abso-

* From 1871 until 1878, the portion of the department of Haut-Rhin remaining to France was called *Territoire de Belfort*. Subsequently the old name *Haut-Rhin* has been officially resumed.

By the treaties with Germany of February and May 1871, F. lost 1,447,466 hectares of land, and 1,597,228 inhabitants, comprised within 1689 communes, and distributed over five departments. These losses included the whole of the old department of the Bas-Rhin, two arrondissements with a fraction of the third (Belfort) of the department of the Haut-Rhin, the greater portion of the department of the Moselle, together with a number of cantons and communes in the department of the Meurthe and Vosges. The portions of the two departments of the Meurthe and Moselle remaining to F. have been incorporated into one.

Chief Cities.—The largest cities of France in 1881 were as follows:

Paris.....	2,226,000	Toulouse.....	136,600
Lyon.....	372,900	Nantes.....	122,000
Marseille.....	357,500	St. Etienne.....	120,200
Bordeaux.....	221,000	Rouen.....	104,800
Lille.....	178,000	Le Havre.....	102,600

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The decline of population between the census of May 1866 and of May 1872 is 1,964,273, of which 1,597,228 is due to the loss of the different territories annexed to the German empire. The remainder is due partly to losses in the war, and partly to an absolute decrease in the population of 73 departments. Between 1872 and 1876 there was a decrease in 20 departments, most of all in Seine-et-Oise.

Coast, Islands, and Frontier.—The north-north-west coast is generally irregular, indented with numerous bays, the principal of which is the Bay of St. Malo, the archipelago of Brehat, &c. The west-south-west coast is more lofty and precipitous, and is interspersed with isolated rocks and promontories; while south of the Loire it is low, and lined with salt marshes to the foot of the Pyrenees, where it again assumes a rocky character. Here lie the islands of Ushant (Ouessant), Belleisle, Noirmoutier, Isle d'Yeu, Ré, Oléron, &c. The coast of the Mediterranean, which is broken by lagoons or shore-lakes, is low till it has passed Toulon, after which it becomes bolder. The only islands off the shore are the Hyères, near Toulon; the larger island of Corsica (q. v.) lies north of Sardinia. The Mediterranean here forms two bays or gulfs, as

the Gulf of Lyons and the Gulf of Genoa, which belongs only in part to France.

The land frontiers of F. are formed on the side of Spain by the Pyrenees; on that of Italy and Switzerland, by the Alps and Jura chain; on the north-east, the frontier line is unprotected by natural boundaries, and since the loss of Alsace and Lorraine is no longer defended, as before the war of 1870-1871, by strong fortresses.

Plains, Mountains, and Rivers.—The chief plains are those of Burgundy, and of the oceanic district, embracing the lower basins of the Seine, Loire, and Garonne. France has four great mountain chains—the Pyrenees (q. v.), which separate the French territory from Spain; the Cevenno-Vosgian range, formed of the Cevennes (q. v.), running east and west between the Rhone and Loire, and the Vosges, running north and south between the Moselle and the new boundary line; the Alps (q. v.), which separate the Swiss territory from the provinces of Savoy and Nice; and the Sardo-Corsican range, which belongs, as the name implies, to the islands of Sardinia and Corsica. The highest peaks in the Pyrenees are the Maladetta and Mont Perdu (10,886 feet and 10,994 feet); in the Cevenno-Vosgian range, the greatest height (the Widderkalm) does not greatly exceed 7000 feet. The French portion of the Alps now includes several of the highest mountains and most elevated passes of the range, as Mont Blanc, 15,744 feet; Mont Iseran, 13,272 feet; Mont Cenis, 11,457 feet; and the pass of Little St. Bernard, 7190 feet, &c. In Corsica, the highest peak rises to an elevation of 9000 feet. The grand water-shed of F. is the Cevenno-Vosges chain, which determines the direction of the four great rivers, the Seine, the Loire, the Garonne, and the Rhone; the first three of which flow north-west into the Bay of Biscay or the English Channel, and the fourth into the Gulf of Lyons. Besides these, the more important streams are the Moselle, Meuse, and Scheldt or Escaut (all of which soon leave France, and flow into the Netherlands, or Germany); the Somme and Orne (belonging to the basin of the Seine); the Vilaine and the Charente (belonging to the basin of the Loire); the Oise, the Aube, the Yonne, and the Marne, which are the chief affluents of the Seine; the Sarthe, the Loiret, the Allier, and the Maine, of the Loire; the Dordogne, the Lot, the Tarn, and the Adour, of the Garonne; and the Saône, the Isere, and the Durance, of the Rhone.

The entire extent of river navigation in F. amounts to 5500 miles, or 8,900,000 metres, while the 99 larger canals, which have been constructed either to connect these river-courses or to supply entirely new channels of water-communication, extend over a length of 2900 miles, or 4,700,000 metres. The most important of these works are the canals connecting Nantes, and Brest, and the Rhone with the Rhine, and those of Berry, Nivernais, and Bourgogne. F. possesses only one lake of any importance. Le Grand-Lieu, a little to the south of Nantes, which has an area of about 14,300 acres; but the country abounds in salt marshes or ponds, more especially in the districts of Gascony, Roussillon, and Languedoc.

F. is peculiarly rich in mineral springs, of which there are said to be nearly 1000 in use. Of these, more than 400 are situated in the group of the Pyrenees, where there are 93 establishments for their systematic use. It is estimated that there are, moreover, fully 4000 springs not hitherto employed.

Geology, &c.—F. presents a great variety of geological formations, but although we meet with an almost complete succession of all the stratified and non-stratified formations, they are distributed with great inequality. Thus, for instance, while nearly one-third of the soil is composed of tertiary formations, a mere fractional part only is made up of coal-beds. A belt of primary rocks, forming the skeleton of some portions of the Vosges, Alps, and Pyrenees, and of the great plateaux of Brittany and La Vendée, encircles the great central basin in which rises the volcanic formation of the mountains of Auvergne, with their extinct craters, lava-streams, &c. The spaces between this external breast-work and its volcanic nucleus is occupied by secondary and tertiary formations. Alluvial deposits are met with in all the valleys, but they occur in extensive beds only in the neighborhood of Dunkirk and Niort, and on the borders of the Mediterranean. According to M. Maurice Block's estimate, the physical and agricultural character of the soil of F. may be comprised under the following heads:

	Hectares.
Mountainous districts, heaths, and commons..	9,944,839
Rich land	7,276,369
Chalk or lime districts	9,788,197
Gravel, stony, and sandy	15,951,618
Clay, marshy, miscellaneous	9,807,577
	52,768,600

The same writer further subdivides the soil of F. according to its actual employment under the following heads:

Per cent. of
the whole area

Arable lands	48.3
Meadow lands	9.7
Vineyards	3.7
Cultivated lands	17.8
Roads, streets, public walks, &c.	3.7
Forests and unproductive lands	16.8

Climate.—F. possesses one of the finest climates in Europe, although, owing to its great extent of area, very considerable diversities of temperature are to be met with; thus, for instance, the north-east parts of the country have a continental, and the north-west parts an oceanic climate, resembling those of Germany and Great Britain; while the Mediterranean districts are exposed at times to the ravages of the burning winds which have passed over the deserts of Africa, and to the destructive north-west wind known as the *mistral*, which often does great injury to the fields near the mouths of the Rhone and Var. The mean annual temperature of different parts of F. has been estimated as follows by Humboldt: Toulon, 62° F.; Marseille, 59.5°; Bordeaux, 56°; Nantes, 55.2°; Paris, 51.2°; Dunkirk, 50.5°.

Products.—Of the vegetable products of F., which, from varied climatic and geognostic relations, are necessarily characterized by great abundance and diversity, the most generally cultivated are the cereals, the vine, chestnuts, olives, culinary fruits and vegetables, hops, beet-root for the manufacture of sugar, tobacco, madder, chicory, flax, &c. The dairy industry has progressed of late very rapidly. In 1833 France imported 1,200,000 kilogrammes of butter, and exported only 1,000,000. Since 1880, she exports from 34 to 35 millions of kilogrammes per annum, and receives in return (especially from England) more than 100 millions of francs. Wheat is largely imported, though its cultivation has increased during the last fifty years; that of rye, barley, and maize has exhibited little variation; while the growth of potatoes has been most extensively augmented during the same period. The following table shows the fluctuations to which these alimentary substances have been subjected:

EXTENT OF LAND OCCUPIED IN 1815, 1830, 1845 AND 1869.

	1815. Hectares.	1830. Hectares.	1845. Hectares.	1869. Hectares.
By Wheat	4,591,677	5,011,704	5,743,136	6,900,000
" Rye	2,500,000	2,500,000	2,500,000	2,100,000
" Barley and Oats	1,100,000	1,100,000	1,200,000	1,400,000
" Maize	514,513	593,000	730,000	600,000
" Potatoes	600,000	800,000	925,000	100,000

QUANTITY YIELDED IN 1815, 1830, 1845, AND 1869.

	1815. Hectolitres.	1830. Hectolitres.	1845. Hectolitres.	1869. Hectolitres.
By Wheat	39,460,971	52,782,098	71,963,280	108,000,000
" Rye	25,700,000	32,440,000	30,000,000	24,000,000
" Barley and Oats	14,600,000	17,600,000	18,400,000	90,000,000
" Maize	5,630,000	6,600,000	8,000,000	10,000,000
" Potatoes	21,600,000	54,835,167	77,900,000	100,000,000

The mean annual yields of these productions may be estimated as follows: Wheat, 73,000,000 hectolitres; rye, 22,000,000 hectolitres; barley and oats, 40,000,000 hectolitres; maize, 9,100,000 hectolitres; potatoes, 95,000,000 hectolitres.* The subdivision of farms, the short leases (of less than 10 years) on which the majority are let, and the small number of the great land-owners who reside on their estates, have hitherto tended to check the progress of agriculture in France. Agricultural exhibitions have been held since 1850; 360,000 francs are annually given in prizes, &c.; and there are now nearly one thousand agricultural associations in different parts of France.

The manufacture of sugar from beet-root, which took its origin during the great wars of the early part of the century, has been prosecuted with much vigor during the last 50 years, and about 150 millions of kilogrammes† are annually manufactured. Since the appearance of the vine-disease, beet-root has been extensively employed in the manufacture of alcohol. In 1873, there were 415,204,000 kilogrammes of beet-root sugar produced. The cultivation is almost limited to the north and east; hemp and flax are grown chiefly in the northern, but also in the south-western departments.

The entire production of hemp was estimated in 1842 at 67,507,076 kilogrammes, worth 86,287,300 francs; and that of flax at 36,875,400 kilogrammes, worth 57,507,400 francs. Since that period, there has been little difference in the home production, but an enormous increase in the importation of foreign flax and hemp; the value of the hemp (not to speak of jute) imported in 1873 amounting to 16 millions of francs, and of the flax, 76,700,000 francs. The cultivation of the mulberry-tree derives importance from its bearing on the production of silk. In 1858, the

* The hectolitre equals 2.75 bushels.

† The kilogramme equals 2.2 lbs. avoirdupois.

department du Gard had monopolized nearly half the culture of these trees, which in its aggregate amount has continued unchanged. From its connection with the mulberry, we here refer to the production of silk, which began at the opening of the 17th c., and which in 1790 had reached such vast dimensions that the produce at that period was already 6½ million kilogrammes of cocoons, worth 16½ million francs. Since that period, it has exhibited great variations. From 1840 to 1853, the production continued steadily to increase from 17 to 26 millions of kilogrammes; but the diseases to which the silkworm has been liable since that period reduced the yield of silk to so great an extent, that in 1857 it scarcely amounted to 7 millions of cocoons. The disease gradually abated; still, in 1876, the production of cocoons fell to 2½ millions of kilogrammes, rising again in 1877 to near 12 millions (value 57 millions of francs). The exports of silk and silk manufactures in 1880 from France to the United Kingdom alone had a value of more than £10,000,000.

The vine has, from a very early period, constituted one of the principal sources of the agricultural wealth of France. The choicest wines are grown in the Bordelais, Burgundy, and Champagne, but some excellent kinds are produced on the banks of the Loire and in some of the southern departments. The breadth of soil devoted to this culture fluctuates, but may be stated at about 2,000,000 hectares. The mean produce for every hectare was, in 1788, 21 hectolitres 21 litres; in 1829, 27 hectolitres 20 litres; in 1850, 32 hectolitres 35 litres. Some time ago, the fungus known as the *oidium* attacked the vine, and inflicted such serious damage on the plant, that in 1854 (the worst year), the hectare yielded 5 hectolitres, instead of the average quantity of 23 hectolitres. A new and very destructive vine-disease, occasioned by the ravages of an insect which has been called the *Phylloxera vastatrix*, appeared in the south-east of F. in 1865, and by 1873 had established itself in 12 departments. In 1877, 28 departments had suffered, and in 1880, above 40. The following are annual yields of wine:

	Hectolitres.		Hectolitres.
1808	28,000,000	1874	63,146,000
1829	30,973,000	1877	56,000,000
1848	51,622,150	1880	29,000,000

The average yearly produce of the vineyards of F. is estimated at about 50 millions of hectolitres (about 1000 millions of gallons). Of this, about 1/3 is made into brandy. F. consumes nearly all the wine raised on her soil; the annual exports being on an average little more than 2 millions of hectolitres, valued at about 218 millions of francs.

The principal forest-trees are the chestnut and beech on the central mountains, the oak and cork tree in the Pyrenees, and the fir in the Landes. The destruction of the national forests has been enormous within the last two centuries, but measures have been taken in recent years to plant wood, in order to protect those mountain slopes which are exposed to inundations from alpine torrents, and to provide a supply for the ever-increasing demand of wood for fuel. About one-seventh of the entire territory of F. is still covered with wood. Turf taken from the marshy lands is extensively used, more especially in the rural districts, for fuel.

Animals.—F. is not so well stocked with domestic animals as her great resources might warrant us in assuming that she ought to be. During the 50 years intervening from 1812 to 1862, the numbers of horned cattle were almost doubled in France. In 1872, according to the census report for that year, there were in F., in round numbers, 2,880,000 horses, 500,000 asses, 300,000 mules, 11,000,000 horned cattle, 25,000,000 sheep, 5,000,000 swine, and 2,250,000 dogs. There were in the same year about 2,390,000 hives of bees, valued at about 20 millions of francs; the mean annual returns are, for honey, 6,670,000 kilogrammes, and for wax, 1,620,000 kilogrammes. Poultry constitutes an important item of farm-produce in F., estimated at 45½ millions of francs; while the eggs and feathers yield 35½ millions of francs: the number of fowls in 1872 was 58,000,000. The wild animals are fast diminishing from the soil of F.; the lynx is rarely seen, even among the higher alpine regions, but wolves are still numerous in the mountainous districts of the central departments; while the chamois and wild-goat, as well as the marmot, ermine, and hamster, are found among the Pyrenees, Alps, and Vosges. The wild-boar, roebuck, fox, squirrel, polecat, and marten are to be met with in the woods. The red and fallow deer are scarce; hares and rabbits abound, and game generally is plentiful. The wanton destruction of small (singing) birds having been found to be conducive to the excessive increase of noxious insects, stringent municipal enactments are now being put into force for the protection of those birds.

Fisheries.—The French government expends between three and four millions of francs annually in aiding those engaged in the great fisheries. The value of the exports of fish from F. (12 millions of francs) is little more than half the value of the imports. There are no official reports of river and other fresh-water fishing in F., or of the minor fisheries carried on along the coasts, which

constitute the principal means of occupation and support of the majority of the local population. Pilehards and mackerel are caught in large quantities off Normandy and Brittany. The west coasts have extensive oyster and mussel beds; tunnies and anchovies are caught on the shores of the Mediterranean. The total annual value of the French fisheries was given in 1881 at £3,250,000. French boats fish in the North Sea and along the English east coast; at the Newfoundland fisheries; and off the coast of Iceland. Pisciculture (q. v.) is successfully prosecuted in France. About 85 per cent. of French oysters are derived from four or five breeding grounds. Nearly 100 millions of oysters are annually produced.

Mineral products.—The chief mineral products of F. are coal and iron, on which about 250,000 men are employed. F. possesses several very considerable coal-beds, situated principally in the east-south-east and north. The supply hitherto has not equalled the demand; although in several years of the decade 1870—1880, it rose to the enormous amount of 170 millions of quintals.* Notwithstanding this home-supply, it was found necessary to import many millions of quintals to meet the increased annual demand, which, before the late war, had risen above 200 millions of quintals, while in 1852 it was still under 120 millions. The iron mines of F. are of excellent quality, but their distance from the fuel necessary for the working of the mineral renders them of relatively small value. In 1879 there were 150 mines in operation, from which 40 millions of quintals were taken; more than half of this quantity being obtained from the five departments of Haute-Marne, Haute-Saône, Cher, Moselle, and Nord. F. imports iron from Switzerland, Germany, Belgium, and England. Argentiferous galena, a little silver and gold, copper, lead, manganese, antimony, and tin occur, but hitherto their working has not proved very productive. The department of Charente-Inférieure yields the largest amount of salt, the mean annual produce being 1½ million of quintals (2½ millions of francs), which is fully one-third of the entire annual produce of the whole country. F. derives about 41 millions of francs from its quarries of granite and freestone, its kaolin, marbles, sands, lithographic stones, millstones, &c. Granite and syenite are found in the Alps, Vosges, Corsica, Normandy, and Burgundy; porphyry in the Vosges, and basalt and lava for pavements in the mountains of Auvergne. Marble is met with in more than 40 departments; alabaster occurs in the Pyrenees; the largest slate-quarries are situated near Cherbourg and St. Lô.

The following list gives an approximative estimate of the value of the chief products of French industry:

	Millions of Francs.
Linen fabrics.....	250
Cotton ".....	650
Wollen ".....	950
Silk ".....	1000
Mixed ".....	330
Jewelry, watchmaking.....	35
Gilt-ware.....	12
Minerals, mines, salt, &c.....	600
Articles of food—as sugar, wines, &c.....	364
Skins, leather, oils, tobacco.....	556
Bone, ivory, isinglass, &c.....	30
Chemical products.....	80
Ceramic arts.....	86
Paper, printing.....	60
Forests, fisheries.....	98

Industry, Trade.—The principal seats of industry are as follows: For textile fabrics, the departments Le Nord, La Sarthe, Maine-et-Loire, Seine-Inférieure, Le Calvados, Seine-et-Oise, Ile-et-Vilaine, &c. F. stands unrivalled for her silk manufactures, the finest of which are at Lyon, Tours, and Paris; while St. Etienne is the special seat of the ribbon trade. Alençon, Baillén (fabricating the so-called *Valencienne*), Lille, Arras, Caen, and Bayeux are all famous for their laces and blonds, which alone occupy 250,000 persons. Rheims stands conspicuous for its *merinos* and fine flannels; Amiens and Nancy for their fine printed woollen goods; Lodève and Elbeuf for army cloths. Gloves are made at Grenoble, Paris, &c.

The best carpets are made at Aubusson, Abbeville, and Amiens. Paris is the seat of industry for some of the most costly fabrics, as Gobelin tapestry, shawls of great value, watches, clocks, articles of *vertu*, carriages, philosophical instruments, &c. Sèvres stands unrivalled for its china and glass. St. Gobain and St. Quirin manufacture looking-glasses of the largest size.

The trade of F. is inferior only to that of England and the United States. The great emporiums of trade are Paris, Lyon, St. Etienne, Lille, Rheims, Nîmes, Toulouse, St. Quentin, Orleans, Avignon, Montpellier, &c.; and the most active maritime ports are Marseille, Cette, Havre, Bordeaux, Nantes, Rouen, Calais

* The quintal equals 1·97 cwt.

Dunkirk, Boulogne, Dieppe, &c. These centers of trade have all suffered at different periods during the present century, from the political disturbances under successive governments; but notwithstanding these drawbacks, the commercial activity of the country had made rapid strides within the last 30 years before the war of 1870-1871. The following table shows the value of the total imports and exports of France in millions of francs during the five years preceding 1880:

Years.	Imports.	Exports.	Total.
1876.....	3988	3575	7563
1877.....	3756	3484	7240
1878.....	4460	3369	7829
1879.....	4594	3163	7757
1880.....	4907	3400	8307

The total exports from France (without counting her colonies) to Great Britain in the years 1876-1880 varied from £45,823,324 (1147 millions of francs) in 1877, to £38,459,096 (961 millions of francs) in 1879; while the imports into France from Great Britain ranged from £29,000,273 (725 millions of francs) in 1876, to £26,558,333 (664 millions of francs) in 1879. France, with her colonies, is reckoned the second best customer of England. The staple exports from France to the United Kingdom are, in order of importance: silk manufactures, woollen manufactures, sugar, butter, wine, leather manufactures, eggs, brandy; and these constitute two-thirds of the exports hitherto. The staple imports of British produce into France are woollen manufactures, cotton manufactures, coals; and these constitute the bulk of the imports. The others, including wrought iron and copper, have an annual value of not more than half a million sterling.

The merchant navy of France numbered, in 1880, 15,058 vessels of 919,293 tons. Of 36,425 large vessels, with a tonnage of 11,963,346 tons, that entered French ports in 1880, 10,194 sailed under the French flag. The *cabotage*, or internal and coasting traffic, is a great source of financial wealth to the state, to which all rivers and canals belong.

Railways, &c.—According to the official report, the railways, in operation in the year 1881 measure 26,000 kilomètres, or 16,250 miles. With the exception of about 200 miles, the railways of F. are held by six companies, which are under the superintendence of the state, from which they receive subsidies of about 500,000,000 francs. In 1880 their earnings were as follows:

	Francs.
Paris-Mediterranean.....	329,522,062
Paris-Orleans.....	167,074,763
Northern.....	147,015,262
Western.....	125,731,612
Southern.....	92,177,642
Eastern.....	120,360,876

The total receipts of all the lines were, for 1858, 334,769,469 francs; number of passengers conveyed by rail 37,952,398. In 1865, the number was 81,533,061; and in 1869, 111,164,284. In 1882, the profits on government lines was 3,500,000 francs. By a clause in the treaty of 1871, the whole of the lines in the Eastern Company in Alsace-Lorraine, about 700 kilomètres in length, were sold to the imperial government of Germany for 325 millions of francs.

The creation of the first highroads in F. is referred to Philippe Auguste; and their more perfect organization in the 16th and 17th centuries, to Henry IV. and Louis XIV. Under Napoleon I. there were 125 highroads, extending in all over 30,000 kilomètres; and at the present time there are upwards of 600 national roads (35,000 kilom.), 265,000 departmental roads (45,000 kilom.).

Postal Service.—The postal service in F. goes back to the year 1464, when Louis XI. placed it under the direction of the state. Since 1849, a system of low prepayment for letters has been established. At the present time, letters weighing from under 10 to under 100 grammes require stamps from 15 centimes to 1 franc 20 centimes, according to weight. The whole receipt of the postal service for the year 1879 was 104,770,000 francs; while, for 1869, before the war, it was 94,199,359 francs; the expenses in the meanwhile have risen from 63 million francs in 1869, to above 76 millions of francs in 1879.

Electric Telegraphs.—The first electric telegraph was constructed in F. in 1844, and F. is now intersected by a close network of wires, which flash communications between Paris, as the central focus, and every part of the empire. In 1880, there were 41,220 miles of lines, including submarine and subterranean lines. The number of inland telegraphic messages sent in 1880 was 14,914,940, and 157,895 international telegrams.

Constitution, Government.—On September 4, 1870, the emperor, Napoleon III., was declared to be no longer the head of the state, and France was proclaimed a republic. At the close of 1872, the supreme power was vested in a National Assembly, with whom rests the nomination of the chief officer of the state, bearing the title of 'President of the French Republic;' and nominated for seven years. This officer, as chief of the executive power, but

under responsibility to the National Assembly, is authorized to promulgate and insure the proper execution of all laws and ordinances transmitted to him by the president of the Assembly. By the law of February 25, 1875, the National Assembly is to consist of two bodies—the Chamber of Deputies and the Senate. The members of the former are elected by universal suffrage; the senate consists of 300 members, of whom 225 are elected by the departments and colonies, and 75 by the National Assembly. The budget for 1882 was charged 11,374,990 francs for the administrative expenses of the National Assembly and the authorized indemnities of the deputies.

To the President of the Republic belongs, in accordance with the principles that have regulated the respective domains of legislative and executive power in F. under all forms of government, the right of appointing the judges, commanding the forces, and maintaining relations and settling treaties with foreign states, in respect to which acts he is responsible to the assembly. He appoints and dismisses the ministers of state, who are also responsible to the assembly, and he may reside at the seat of the National Assembly, and, provided he gives notice of his intentions, may take part in its deliberations. His salary was fixed in 1873 at 600,000 francs (£24,000), with an extra allowance of 162,000 francs for household expenses. The office of president was held till 1873 by M. Thiers; from 1873 till 1879 by Marshall MacMahon; and thereafter by M. Grévy.

The ministry is presided over by eleven ministers of state, each of whom has a definitely limited sphere of administrative duty and authority; and in addition, the president is assisted in the government by a Council of State, 'Conseil d'Etat,' which, according to a decree of the National Assembly, is to consist in all of 43 members, 15 of whom may be nominated by the president, while the remaining 28 are selected by the Assembly. The functions of this body are restricted to giving advice on bills presented to the National Assembly by the president or the ministers.

Departments, &c.—F. is at present divided into 86 *departments*, comprising 362 *arrondissements*, 2865 *cantons*, and 35,985 *communes*. Each department is presided over by a *préfet*, nominated by the president of the republic on the presentation of the minister of the interior; each *arrondissement* by a *sub-préfet*; each *canton* by a member at the general council of the *département*, which meets annually for whatever period may be decreed by the head of the state; and every *commune* has its *maire* and municipal council. Every chief town of a *canton* has its commissary of police; in the larger towns, there must be one of these officers to every 10,000 inhabitants. The administration of justice is presided over by a special minister of state, who is keeper of the seals. A supreme tribunal serves as a court of appeal from the lower courts. The tribunals of commerce and police, together with those of the several departments, take cognizance of the various civil and criminal cases specially falling within their several spheres. There are 357 tribunals of the *arrondissements*, or *tribunaux de première instance*, which are divided into six classes; 2681 police courts; 216 tribunals of commerce; 26 courts of appeal divided into four classes; a *Cour de Cassation*, divided into three chambers, which confirms or annuls the sentences of the police and assize courts; and a *Haute Cour de Justice*, which gives final judgment in all cases of offence against the state. Assizes are held every three months in 59 towns; and, independently of the ordinary judicial magistrates, the courts of assize are composed of juries of twelve men, chosen in accordance with certain prescribed regulations.

In the maritime and commercial towns there were, under the empire, 85 councils of *prud'hommes* (experienced men), with summary jurisdiction in matters to the amount of 200 francs. These councils, which are composed of master-workmen elected annually, decide on cases of dispute, chiefly in regard to questions of wages, and differences between masters and men. The state is charged 35½ millions of francs for the expenses incident to the ministry of justice, according to the budget for 1882. There are 387 departmental prisons, 21 central houses of detention, 2 political prisons at Doullens and Belleisle, and numerous penitentiaries and reformatories for the young. All these prisons, excepting the two for political offenders, are in part self-supporting. The only hulks, *bagues*, still remaining are at Toulon, where convicts of a certain class undergo their sentences, but the principal penal settlement is in French Guiana (q. v.).

Religion, Churches.—No person can be molested in F. on account of his religious opinions, provided the manifestation of them does not disturb the public peace as established by law. The public exercise of any special form of religion must, however, be preceded by the official authorization of the *préfet*, or in special cases, by higher authority. The recognized forms of faith are—the Roman Catholic, the Protestant (including the Reformed and Lutheran), the Jewish, and, for Algeria, the Mohammedan. The clergy attached to these religions receive their pay from the state, and are exempt from military service. The Roman Catholic

Church embraces the great majority of the people. Of the 37,000,000 which constitute the present population of F., 1,500,000 appertain to the two Protestant churches, 150,000 to the Jewish persuasion; and 25,000 to non-recognized but tolerated denominations, the Anabaptists comprising nearly one-third of this number.

At the breaking out of the Revolution, the annual revenues of the church amounted to 150,000,000 of livres, and its debts to 133,000,000. The state appropriated to itself the funds of the church in 1879, and assumed the responsibility of maintaining public worship. The following table gives a summary of the expenses incurred by the state for the maintenance of religion since the Consulate.

Years.	Catholic Religion.	Protestant Church.	Jewish Form of Faith.	Moham. Rel. in Algeria.
	Francs.	Francs.	Francs.	Francs.
1803.....	4,059,006	22,363		
1813.....	16,628,868	695,000		
1823.....	26,138,445	577,829		
1835.....	33,523,319	849,763	79,995	3,000
1847.....	37,630,008	1,240,229	108,836	3,000
1854.....	42,223,329	1,328,891	149,428	568,024
1859.....	44,994,100	1,408,436	189,400	630,200
1873.....	51,500,000	1,400,000	273,000	500,000

The archbishops and bishops of the church of F. are to be nominated by the President of the Republic, and canonically inducted by the pope. There are 88 Roman Catholic prelates—18 archbishops, and 70 bishops. The archbishop of Paris receives 50,000 francs per annum; the other archbishops, 20,000 francs; the bishops, 15,000 francs. Six French prelates hold the rank of cardinals, to which dignity they are nominated by the pope on the presentation of the president. Every archbishopric has 3, and every bishopric 2 vicars-general, the whole number being 190. Their salaries vary from 3500 to 4500 francs. There are 709 canons belonging to the various cathedral chapters, receiving from 1600 to 2400 francs per annum; 3437 curés or parochial beneficed clergy, who are canonically inducted by the bishops, under the approval of the state; and 31,586 curates or *desservants*. The curés receive from 1200 to 1500 francs; the curates, 200 francs. The curés may be assisted by a certain number of vicariats, who receive from 350 to 500 francs; there are at present 9000 authorized by the state. There are in F. 105 Reformed consistories, and 44 belonging to the Lutheran Church. The central council of the Reformed churches holds its sittings at Paris. Synods composed of the delegates of five churches may assemble with the authority of the state to regulate the celebration of the services of their church; but their meetings cannot last longer than six days, and their decisions must be submitted for the approbation of the government. There is a Protestant seminary for the Reformed at Montauban. Besides the sums inscribed in the budget for the maintenance of religion, the departments are charged with special annual subsidies, which have risen of late years in a rapid ratio, especially under the empire.

Public Instruction.—Public instruction is presided over in F. by a special ministry. Nearly half the expenses connected with it are defrayed by the state, and the remainder by the departments. There are 15 academies located in the following towns—Aix, Besançon, Bordeaux, Caen, Clermont, Dijon, Douai, Grenoble, Lyon, Montpellier, Nancy, Paris, Poitiers, Rennes, Toulon. These academies are divided into the five faculties of theology, law, medicine, sciences, and literature, and supplemented by various superior and preparatory schools. The professors are paid partly by the state, and partly by fees. There are 81 normal schools intended to train teachers for the higher departments of instruction. Secondary instruction has received an immense impetus during the present century. In 1872, there were 41,800 free and public schools for boys, and 17,500 public schools for the use of girls, and the entire number of scholars exceeded four millions. In 1872, the number of people unable to read or write between the ages of 6 and 20 was 2,082,328; above 20, 7,702,362. The departments share very unequally in the diffusion of education, the census of 1872 showing a percentage of ignorance ranging from 6 to 60 in the 87 departments; and it may be observed that the proportion of the educated is highest in the N. and E. of France.

F. supports numerous colleges and schools for instruction in special branches of knowledge: as L'Ecole des Chartes; des Langues Orientales; des Beaux-Arts, founded in 1671 by Louis XIV.; de Dessin, founded in 1766 by Louis XV.; the Conservatoire de Musique, founded in 1784; L'Ecole de Rome, founded by Louis XIV., and L'Ecole d'Athènes, founded in 1846; L'Ecole des Ponts et Chaussées, for the instruction of engineers of public works; L'Ecole des Mines (1783); the Conservatoire National des Arts et Métiers, for the application of science to the arts and trades; the Central School des Arts et Métiers; and the national

schools for arts and trades. There are numerous agricultural, forest, farming, and veterinary schools, besides the Ecole Polytechnique, specially designed to prepare youths for the public services; and military and naval colleges at St. Cyr, Saumur, Paris, Vincennes, Brest, Toulon, and St. Denis.

Literary and Scientific Institutions.—Among the literary and scientific institutions of F. the first is L'Institut de France (q. v.). The Museum of Natural History, known formerly as the Jardin du Roi, is one of the finest in the world. The Bureau des Longitudes and the Observatoire, at Paris and Marseille, have occupied the first rank among scientific institutions since their foundation. These establishments are all maintained at the cost of the state. Paris possesses several libraries belonging to and supported by the state, but freely opened to the public. The most important of all is that now known as La Bibliothèque Nationale. See LIBRARIES. There are 338 public libraries in the provinces, to all of which access is afforded in the most liberal spirit. F. is rich in public galleries of painting, statuary, and articles of *artu*. The expenses of secondary and primary education, literary and scientific institutions, national archives, &c., are charged in the budget for 1882 at 106,152,000 francs.

Theaters.—The theater, like all other public institutions, is under the surveillance of the state, which contributes to the maintenance of the drama; above 8 millions of francs being inscribed on the budget of 1882 for the support of the fine arts (since 1882 under a separate ministry).

Charitable Institutions.—F. is rich in institutions of charity, many of which are remnants of the old system of church relief; but the *crèches*, of which there are several hundreds, and which are, in fact, free nurseries, are a modern form of charity, which originated (in 1844) with M. Marbeau at Paris. The public hospitals and infirmaries are maintained by special endowments, a percentage on the receipts at theaters and other places of amusement, and by subsidies from the government and local communes. Public charities for the relief of paupers derive their resources either from departmental or municipal funds, and are administered by the *bureaux de bienfaisance*, by the *dépôts de mendicité*, and by numerous other local institutions; besides which, the state contributes between 8 and 9 millions of francs (for 1876, 8,485,810 francs) for charitable purposes.

Taxation Finances.—The public revenues are obtained in F. from direct and indirect taxation, and comprised in the budget, voted by the National Assembly, under the heads of ordinary resources and special resources; the former including direct and indirect taxes, from stamps, the produce of forests, telegraphs, Algeria, &c.; and the latter, departmental funds, special imposts, &c. The following table shows the financial report of the public receipts and expenditure for different years from 1815 to 1881:

Years.	Receipts, in francs.	Expenditure, in francs.
1815.....	743,830,200	798,590,859
1824.....	994,971,962	992,583,233
1830.....	1,031,796,054	1,095,142,115
1840.....	1,234,483,099	1,363,711,102
1850.....	1,431,622,471	1,472,537,238
1859.....	1,766,080,877	1,773,919,114
1871.....	2,190,120,590	2,161,262,952
1881.....	2,762,480,817	2,736,208,789

Public Debt.—In 1812, the date of the Restoration, the interest of the debt was 63 million francs; under the Bourbons it rose to 200 millions; and from 1830 to 1848, Louis Philippe increased it to 244 millions. During the three years of the second republic, 5 millions were paid off; but the second empire (1852—1869) added nearly 120 millions to the annual burden. The increase of the debt during the empire arose from a succession of loans raised by borrowing directly from the mass of small capitalists, without the intervention of large banking-houses. The amount of the national debt of France is very variously given according to what is included under that head; but if we take the funded debt bearing *rentes* or interest, the amount of such *rentes* in January 1870, before the war, is stated at 358 million francs = about £14,000,000, representing a capital of 11,500 million francs, or £460,000,000. The loans and other obligations incurred to meet the expenses of the war of 1870—1871, including the indemnity of 5 milliards of francs to Germany, nearly doubled this sum. The total expenditure arising from the war and the foreign occupation has been finally stated at 9820 millions of francs; yet in spite of this enormous strain on the exchequer, the national wealth of France has increased since the war. In 1876 provision had to be made for paying, as annual interest of the total debt, over 1150 millions of francs. This was calculated to correspond to a capital sum of 23,403 millions (nearly 23½ milliards) of francs.

The continual deficits from the close of the first empire in 1815 to the close of the second empire in 1870, have been covered by loans, bearing interest or *rentes* at the rate of 3, 4, 4½, and 5 per cent. The budgets voted annually by the representatives of the nation have almost invariably shown a small assumed surplus;

while the *compte définitif* for the corresponding period, when published some years afterwards, has without exception exhibited a large deficit. The actual state of accounts with regard to national income and expenditure is not published till after the lapse of six or seven years; so that in 1877 the most recent final account (*budget réglé*) was that for the year 1869.

The following table shows the rate at which the deficits have increased since 1814:

Periods.	Amount of Deficits. Francs.
Bourbon Monarchy, from 1815 to 1830.....	22,550,000
Reign of Louis Philippe, from 1830 to 1848.	997,866,000
Second Republic, from 1848 to 1852.....	359,374,000
Second Empire, from 1852 to end of 1869....	2,138,539,500

The total value of the French money in circulation is 12,630,657,996 francs. According to the act of monetary union effected between France, Belgium, Switzerland, and Italy, the emission of coined pieces is to be at the rate of 6 francs for every inhabitant, which, taking into account the presumed increase of population to the year 1880, when the term of the treaty expires, gives for France the sum of 239 millions; for Belgium 32, for Italy 141, and for Switzerland 17 millions of francs. The amount of specie in reserve in the bank in January 1873, was 790,000,000 francs; the amount of notes in circulation by the bank and its branches was 2,858,619,270 francs. The maximum amount of notes in circulation has been fixed at 3,000,000,000 francs, by the decree of the National Assembly of July 1872.

Army.—Standing armies date in F. from the time of Charles VII. The law of 1832 regulated the system of recruiting by conscription, on the footing which, with few modifications, it has subsequently occupied. By the law of 1872, substitution and enlistment for money are prohibited, and the principle of universal liability to arms is laid down, in accordance with which every Frenchman must be for five years in the 'active army,' for four years in the reserve of the same, for five years in the territorial army, and for six years in the reserve of the territorial army. Besides the ordinary physical causes of exemption, there are various others admitted, arising from family, social, or individual conditions; while, moreover, young men who pass the necessary examination, may obtain exemption by enlisting as volunteers for one year only, and defraying the cost of their maintenance and clothing. The returns for 1871 gave the strength of the French army as follows: Peace-footing—404,192 men; war-footing—757,727 men. In 1881, after extensive reorganization, the total military force of France comprised (1) an active army (including gendarmerie, &c.) of 704,714 men; (2) the reserve of 510,294 men; (3) the territorial army of 582,523 men; (4) the reserve of the territorial army, 625,633 men—giving a total of 2,423,164. The ministry of war required, according to the budget of 1882, a sum of 571,400,000 francs. F. is divided into 18 military commands, or *corps d'armée*, each under a field-marshal, which are subdivided into districts commanded by generals of division, and into lesser circles, corresponding with the departments, and under generals of brigades. The fortified *chefs-lieux* are at Arras, Bayonne, Besançon, Bourges, Brest, Cherbourg, Grenoble, Langres, La Rochelle, Le Havre, Lille, Lyon, Marseille, Montpellier, Nantes, Perpignan, St. Omer, Toulon, and Toulouse. Since the annexation of Metz and Strasbourg by Germany, Avignon, Perpignan, Quiberon, and Rouen have taken their place. The *Garde Nationale* (q. v.), formerly a supplement to the regular army, was created in 1789, but owing to its proved incompetence during the Communistic outbreak in 1871, it was decreed that it should gradually be abolished.

Navy.—In 1881, the French navy numbered 27 vice-admirals (4 in reserve), 35 rear-admirals, 103 captains of first-class men-of-war, 203 captains of frigates, 763 lieutenants, and 374 ensigns. The sailors afloat and on shore numbered 28,500, which, together with engineers, &c., brought the grand total of those employed in the fleet to about 65,000. The inscription for the navy owes its systematic organization to the great minister Colbert (1681). At present, all persons engaged in any maritime avocation between the ages of 18 and 50 are liable to inscription, but the service is only compulsory for three years. There are 170,000 names on the rolls. Of these, 130,000 may be called out in time of war. The fleet consisted in 1881 of 59 iron-clads, 264 unarmored screw steamers, 62 paddle-steamers, and 113 sailing vessels. Amongst these are included torpedo-boats and gun-boats. The iron-clads carry 450 guns. There are 22,400 marines in peace, 28,000 in war, and 25,500 customs and coast-guard men. F. has 6 depôts for marine artillery, 3 foundries, and 2 manufactories for projectiles. There are special hospitals, schools, and libraries for the use of the navy; and 5 maritime districts, subdivided into 12 arrondissements, at which are administrative courts for the settlement of all naval questions.

Money, Weights, and Measures.—For the money, weights, and measures now used in F., see FRANC, METRE, LITRE, GRAMME.

Colonies.—Algeria (which, according to the constitution of 1852, is not a colony, but an integral part of F.) is treated of in a separate article. In the larger French colonies, the administrative power is vested in a governor, who exercises supreme military command, and is assisted by a general council, specially charged to vote the budget of the province. Three officers act under the orders of the governor—viz., the 'ordonnateur,' director of the interior, and procurator-general. There is also in each colony a colonial controller, who presides over the financial and other departments of general administration.

See *Statistique génér. méthodiq. et compl. de la France*, by J. H. Schmitzler *Diction. et Annales de l'Administ. Franc.*; *Bulletin des Lois* (1878); *Statistique de France* (1878); *Dictionnaire général de la Politique*, by M. Maurice Block (1882).

History.—Gallia (Eng. *Gaul*) was the ancient name under which F. was designated by the Romans, who knew little of the country till the time of Cæsar, when it was occupied by the three races of the Aquitani, Celtae, and Belgæ, who respectively inhabited the south-west, the west and central, and the north and north-east parts. There were also some tribes of Germans, Ligurians, and Greeks, but the latter never penetrated far beyond the shores of the Mediterranean, where they planted colonies, the most important of which was Massalia (Marseille). Under Augustus, Gaul was divided into four provinces, which, under subsequent emperors, were dismembered and subdivided into seventeen. In the decline of the Roman power, Gaul was ravaged by neighboring hordes, and in the 5th c. it fell completely under the power of the Visigoths, Burgundians, and Franks. In 486 A.D., Clovis, a chief of the Salian Franks, raised himself to supreme power in the north.

His dynasty, known as the Merovingian, ended in the person of Childeric III., who was deposed, 752 A.D., after the kingly power had already passed into the hands of the former Marie du Palais, Pepin d'Heristal, and, after him, into those of Charles Martel and Pepin le Bref. The accession of Pepin gave new vigor to the monarchy, which, under his son and successor Charlemagne, crowned emperor of the West in 800 (768—814), rose to the rank of the most powerful empire of the West. Christianity, civilization, and letters were protected during his reign, and before his death he had stretched the limits of his empire from the Eider and the German Ocean to the Ebro and the Mediterranean, and from the Atlantic to the Baltic. With him, however, this vast fabric of power crumbled to pieces, and his weak descendants completed the ruin of the Frankish Empire by the dismemberment of its various parts among the younger branches of the Carolingian family. Intestine wars desolated the land, and foreign assailants threatened it on every side. In 911 A.D., the ravages of the Northmen had assumed so persistent a character, that Charles le Simple was glad to purchase immunity from their encroachments by the cession of the territory subsequently known as Normandy. Anarchy reigned paramount; the various governors established an hereditary authority in their several governments, and the crown was by degrees deprived of the noblest part of its appanages. The power of some of the vassals surpassed that of the kings; and on the death of Louis V. the Carolingian dynasty was replaced by that of Hugues, Count of Paris, whose son, Hugues Capet, was elected king by the army, and consecrated at Rheims, 987 A.D. At this period, the greater part of F. was held by almost independent lords, and the authority of the Capetian kings extended little beyond Paris and Orleans. Louis le Gros (1108—1137) was the first of the race who reinstated order. He promoted the establishment of the feudal system, abolished serfdom on his own estates, secured corporate rights to the cities under his jurisdiction, and gave efficiency to the central authority of the crown. A greater degree of general order was thus secured, while a new element in the state was generated by the foundation of a free burgher class. Louis carried on a war against Henry I. of England; and when the latter allied himself with the Emperor Henry V. of Germany against F., he brought into the field an army of 200,000 men, whose ready appearance afforded the first instance of the existence of a common national feeling of patriotism, ready to respond to the appeal of the sovereign. The *oriflamme* is said to have been borne aloft for the first time on this occasion as the national standard. Louis VII. (*Le Jeune*), who took part in the second crusade (1137—1180), was almost incessantly engaged in war with Henry II. of England. His son and successor, Philippe Auguste (1180—1223) recovered Normandy, Maine, Touraine, and Poitou from John of England, and increased the power of the crown in various other parts of France. He took an active personal share in the Crusades, and permitted the pope to organize a cruel persecution against the Albigenses in the southern parts of the country.

Philippe was the first to levy a tax for the maintenance of a standing army, and in his reign a chamber of peers, of six secular and six ecclesiastical members, was instituted, to act as a council of state. Many noble institutions date their origin from this reign, as the university of Paris, the Louvre, &c. By the

amendment of the administration of justice, the right of appeal to the royal courts was established, and the arbitrary power of the great vassals crippled. Improvements in the mode of administering the law were continued under his son, Louis VIII. (1223—1226), and his grand-son, Louis IX. (1226—1270), who caused a code of laws (*Établissements de St. Louis*) to be promulgated. St. Louis also effected many modifications in the fiscal department, and, before his departure for the Crusades, secured the rights of the Gallican Church by a special statute, in order to counteract the constantly increasing assumptions of the papal power. Under his son, Philippe III. (1270—1285), titles of nobility were first conferred by letters-patent. He added Valois and the *comtés* of Toulouse and Venaisin to the crown. Philippe IV. (1285—1314), surnamed *Le Bel*, acquired Navarre, Champagne, and Brie by marriage. With a view of securing support against the secular and ecclesiastical nobility, with whom he was constantly at war, Philippe gave prominence to the burgher element in the nation, and on 28th March 1302, he, for the first time, called together the *États généraux*, or general estates, at which the *tiers état*, or burgher class, appeared together with the nobles and clergy. These changes were, however, accompanied by arbitrary innovations in the fiscal and other departments of the government, which were effected with reckless haste and violence. With a view of securing to the crown the great fiefs, he abrogated the right of females to succeed to landed property. His tyrannical persecution of the Templars showed the extent to which the regal power could be stretched; and under his successors Louis X. (1314—1316), Philippe V. (1316—1321), and Charles IV. (*Le Bel*). (1321—1328), the last direct descendant of the Capetian line, the rule of the kings of F. became even more unlimited, whilst the court was given up to every species of luxurious indulgence known to the age. Philippe VI., the first of the House of Valois (1328—1350), a distant relative of Charles IV., and the nephew of Philippe IV., succeeded in right of the salic law. His reign, and those of his successors, Jean (1350—1364) and Charles V. (*Le Sage*). (1364—1380), were disturbed by constant wars with Edward III. of England, who laid claim to the throne in right of his mother, a daughter of Philippe le Bel. The war began in 1339; in 1346, the battle of Crécy was fought; at the battle of Poitiers (1356), Jean was made captive; and before its final close after the death of Edward (1377), the state was reduced to bankruptcy, the nobility excited to rebellion, and the mass of the people sunk in barbarism.

Falsification of the coinage, onerous taxation, and arbitrary conscriptions, brought the country to the verge of irretrievable ruin, while the victories of England humbled the sovereign, annihilated the French armies, and cut down the flower of the nation. The long and weak minority of Richard II. diverted the English from the prosecution of their groundless claims to the kingdom of F., which revived somewhat from the effect of its long and disastrous warfare; but during the regency for the minor, Charles VI. (*Le Bien Aimé*), (1380—1422), the war was renewed with increased vigor on the part of the English nation, who were stimulated by the daring valor of Henry V. The signal victory won by the English at Azincourt in 1415; the treason and rebellion of the French princes of the blood, who governed the larger provinces; the ambition of the several regents, the ultimate imbecility of the king, the profligacy of his queen, and the love of pleasure early evinced by the dauphin; all combined to aid Henry in his attempts upon the throne. But the premature death of Henry, the persevering spirit of the people, and the extraordinary influence exercised over her countrymen by the Maid of Orleans, concurred in bringing about a thorough reaction, and, after a period of murder, rapine, and anarchy, Charles VII. (*Le Victorieux*) (1422—1461) was crowned at Rheims. He obtained from the Estates General a regular tax (*taille*) for the maintenance of paid soldiers, to keep in check the mercenaries and marauders who pillaged the country. The policy of his successor, Louis XI. (1461—1483), the first king entitled 'His most Christian Majesty,' favored the burgher and trading classes at the expense of the nobles, while he humbled the power of the crown-princes. He was a crafty ruler, who managed the finances well, and succeeded, by policy and good-luck, in recovering for the crown the territories of Maine, Anjou, and Provence; while he made himself master of some portions of the territories of Charles the Bold, Duke of Burgundy. Charles VIII. (1483—1498), by his marriage with Anne of Brittany, secured that powerful state and consolidated the increasing power of the crown. With him ended the direct male succession of the House of Valois. Louis XII. (1498—1515), (*Le Père du Peuple*) was the only representative of the Valois-Orleans family. The tendency of his reign was to confirm the regal supremacy, while the general condition of the people was ameliorated. He and his successor, Francis I. (1515—1547), of the Valois-Angoulême branch, wasted their resources in futile attempts to establish their hereditary claims to Lombardy, and were thus perpetually embroiled with the House of Austria. A concordat with the pope, signed in 1516, secured the nomination of the Gallican bishops to the king. In this reign, the Assembly

of Notables and Deputies superseded the General Estates. The defeat of Francis at the battle of Pavia, in 1525, and his subsequent imprisonment at Madrid, threw the affairs of the nation into the greatest disorder, and embarrassed the public finances to a most ruinous extent. Arts and literature were encouraged in this reign, and in that of the succeeding monarch, Henri II. (1547—1559), who continued the disastrous Italian war. In the latter reign began the persecutions of the Protestants, which were carried on with still greater cruelty under Henri's three sons, Francis II. (1559—1560), Charles IX. (1560—1574), and Henri III. (1574—1589), the last of this branch of the Valois.

The massacre of St. Bartholomew (1572) was perpetrated under the direction of the queen-mother, Catharine de' Medici, and the confederation of the League, at the head of which were the Guises. The wars of the League, which were carried on by the latter against the Bourbon branches of the princes of the blood-royal involved the whole nation in their vortex. The succession of Henri IV. of Navarre (1589—1610), a Bourbon prince, descended from a younger son of St. Louis, allayed the fury of these religious wars, but his recantation of Protestantism in favor of Catholicism, disappointed his own party. The early part of his reign was perpetually disturbed by the mutinies of the troops and the rebellions of the nobles. By degrees, however, Henri, through the astute counsels of his minister Sully, and by his own personal popularity, raised the power of the crown higher than ever, while he began a system of thorough administrative reform, which was only arrested by his assassination by the fanatic Ravaillac. During the minority of his son, Louis XIII. (1610—1643), Cardinal Richelieu, under the nominal regency of Marie de' Medici, the queen-mother, ruled F. with a firm hand, although his oppression of the Protestants at home, and his co-operation with them abroad, in endeavoring to humble the House of Austria, entailed long and costly wars with little fame on France. Cardinal Mazarin, under the regency of the queen-mother, Anne of Austria, exerted nearly equal power for some time during the minority of Louis XIV. (1643—1715). The wars of the Fronde, the misconduct of the parliament, and the humbling of the nobility, gave rise to another civil war, but with the assumption of power by young Louis, a new era commenced, and till near the close of his long reign, the military successes of the French were most brilliant, and the boundaries of F. were enlarged very nearly to what they were before the war of 1870—1871. The military glory of the kingdom was maintained by a host of gallant commanders, amongst whom stood conspicuous the names of Turenne, Vauhan, Luxembourg, Catinat, Vendôme, Boufflers, and Créquy, while, by the far-sighted policy of the minister Louvois, a well-organized army and a newly-created navy made the power of F. formidable to all neighboring nations. The progress of the people in the arts of peace was not less marked. At the close of his rule, the oppressive war-taxes, the prodigality of the court, the luxurious lives of the clergy, and the absolutism and bigotry of the aged monarch, combined to undermine the foundations of national prosperity and freedom, and at his death the state was left trammelled with a debt of 3500 millions of livres, and his youthful heir Louis XV. (1715—1775), succeeded to a heritage whose glory was tarnished, and whose stability was shaken to its very foundations. The long inglorious reign of Louis XV. presents nothing worthy of notice except the gradual rise of those sentiments of infidelity and license which prepared the overthrow of all the ancient institutions of the country. The regency of the profligate Orleans paved the way for the miseries which followed, while his corrupt financial administration brought the nation into the most overwhelming monetary embarrassments. In this reign, Corsica was added to France.

The thorough disorganization of the state, and the neglect of the fleet and army, prevented all attempts at conquests either on sea or land. The colonies were left a prey to the attacks of other powers, while the capricious change of policy which the king's mistress, Madame Pompadour, forced upon the government, brought contempt upon the country. The peace of Paris, 1763, by which the greater portion of the colonial possessions of F. were given up to England, terminated an inglorious war, in which the French had expended 1350 millions of francs. The close of this unhappy reign was still further disturbed by the cabals of the Jesuits, who were finally banished in 1764. In 1774, Louis XVI., a well-meaning, weak prince, succeeded to the throne. His first ministers, Maurepas, Turgot, and Malesherbes, had not the vigor to carry out the reforms which their sense and patriotism suggested to them, and they were soon compelled to yield to the intrigues of the nobility, and resign their places. They were succeeded by the financier Necker, who endeavored, by economy and method, to arrest the impending bankruptcy of the state, and succeeding ministers made futile attempts to diminish these financial disorders by new forms of taxation, which were generally opposed either by the assembly or the court. The American war of freedom had disseminated republican ideas among the lower orders, while the Assembly of the Notables had discussed and made

known to all classes the incapacity of the government, and the wanton prodigality of the court. The nobles and the *tiers état* were alike clamorous for a meeting of the States; the former wishing to impose new taxes on the nation, and the latter determined to inaugurate a thorough and systematic reform. After much opposition on the part of the king and court, the *Etats Généraux*, which had not met since 1614, assembled at Versailles on the 25th of May 1789.

F. was at that moment ripe for a revolution. Although the nobility was exceedingly numerous (as not only did the children of a noble belong to this class, but its numbers were constantly being increased by creation), there were great differences in the rank and dignity attached to the order; thus, in 1789, there were only 44 secular peers, independently of the princes of the blood, and the six originally created ecclesiastic peers; but the lower grades of nobility were so numerous that their numbers stood in the ratio of 1 to 150 of the entire population. Nevertheless, every grade of nobility exempted its holder from the payment of the ordinary land-tax, or *taille*, from the charge of maintaining the public roads (*corvée*), from military conscription, from receiving billets of soldiers, &c. The nobles paid the *capitation* tax, but in a very unequal proportion, although the landed property was vested almost entirely in their hands. They, in fact (together with the clergy), monopolized the principal share of the national revenues, and left to the lower classes the burden of labor and of paying the taxes. At the outbreak of the Revolution, the French nobility were sunk in profligacy, and fallen to the lowest stage of demoralization.

The clergy kept pace with the nobles in general depravity, and while their aggregate revenues amounted, according to Necker, to 130,000,000 of livres, and their landed property stood in the relation of 1 to 5½ of that of all other proprietors, their contributions towards the maintenance of the state were inadequate and irregular. The open profligacy and excesses of many of the higher members of the hierarchy, moreover, brought the whole order into disrepute. Francis I. had wrung from the church a tithe, known as the *décime pascaline*, and every five years the clergy were expected to present their so-called *dons gratuits ordinaires*, of from 15 to 18 million of livres; while on occasions of need they from time to time made extraordinary *dons gratuits*, which, however, were usually repaid at long intervals. The *tiers état* were crushed by the weight of an unjust taxation, which was rendered more obnoxious by the system of farming out some of the taxes. The most tyrannical of these was the tax on salt. The municipal institutions which had been permitted to flourish under some of the Valois princes in the middle ages, were almost entirely abolished, and the officers of towns, like those of the state and the courts of justice, were either hereditary or open to purchase. The *tiers état*, which included professional men, and all who were not either members of the noble or clerical orders, saw themselves utterly excluded from all participation in the privileges and duties of free citizens, at the very time when the extensive circulation of the writings of the philosophers of the 18th c., as Voltaire, Malesherbes, Rousseau, and Montesquieu, had habituated men's minds to the discussion of questions of political independence, equal rights, and universal freedom.

The resistance made by Louis and his advisers to the reasonable demands of the Deputies on the 17th June 1789, led to the constitution of the National Assembly—a measure which was followed, on the 23d of June, by a declaration of the inviolability of the members. The king retaliated by ordering a large body of troops under arms, dissolved his ministry, and banished Necker, whom he had shortly before recalled under the pressure of public opinion. The consequence was the outbreak of insurrectionary movements at Paris, where blood was shed on the 12th July. On the following day, the national guard was convoked; and on the 14th, the people took possession of the Bastille. The provinces repeated the acts of Paris, and everywhere national guards and revolutionary municipal councils were called together. On the 4th of August, feudal and manorial rights were abrogated by the National Assembly, which gave expression to a solemn declaration of the equality of human rights. The royal princes and all the nobles who could escape sought safety in flight. The royal family having attempted in vain to follow their example, tried to conciliate the people by the feigned assumption of republican sentiments; but on the 5th October, the rabble, followed by numbers of the national guard, attacked Versailles, and compelled the king and his family to remove to Paris, whither the Assembly also moved. The next two years witnessed the solemn inauguration and the subsequent retraction of various constitutional schemes; the princes of the blood and the ancient noblesse raised corps of émigrés in different parts of the country, but their efforts could not arrest the spread of republicanism.

The king alternately made concessions to the republicans, and cherished schemes for escaping from their surveillance, but each month added to his humiliations and to the audacity of those surrounding him. A war with Austria was begun in April 1792; and the defeat of the French was visited on Louis, who was con-

fined in August with his family in the Temple. The advance of the Prussians into Champagne threw Paris into the wildest excitement. The National Assembly dissolved itself in September. In December, the king was brought to trial, and called upon to answer for repeated acts of treason against the republic. On the 20th January 1793, sentence of death was passed upon him; and on the following day he was beheaded. Revolts burst out in every part of France. England, Holland, Spain, Naples, and the German States combined together against the republic. Christianity was now formerly deposed, and the sacredness of the republic and the worship of reason solemnized. Marie Antoinette, widowed queen was guillotined; the dauphin and his surviving relatives suffered every indignity that malignity could devise. A reign of blood and terror succeeded. Danton and Robespierre, after having condemned countless numbers to the guillotine, suffered each in turn a similar fate. After the destruction of the Terrorists, a reaction was gradually established; the people were wearied of bloodshed, and anxious for peace and order at any cost. The brilliant exploits of the young general, Napoleon Bonaparte, in Italy, turned men's thoughts to other channels. In 1795, a general amnesty was declared, peace was concluded with Prussia and Spain, and the war was carried on with redoubled vigor against Austria. The Revolution had reached a turning-point. A Directory was formed to administer the government, which was now conducted in a spirit of order and conciliation. In 1797, Bonaparte and his brother-commanders were omnipotent in Italy. Austria was compelled to give up Belgium, accede to peace on any terms, and recognize the Cisalpine Republic. The glory of the French arms was re-established abroad, but at home the nation were still suffering from the shock of the Revolution. The Directory repudiated two-thirds of the national debt, and thus almost ruined the commerce and credit of France. Under the pretext of attacking England, a fleet of 400 ships and an army of 36,000 picked men were equipped; their destination proved, however, to be Egypt. Whither the Directory sent Bonaparte; but the young general resigning the command to Kleber, landed in E. in 1799, and at once succeeded in supplanting the Directory, and securing his own nomination as Consul, conjointly with Siéyes and Roger Ducos. In 1800, a new constitution was promulgated, which although, in appearance purely constitutional, in reality vested the whole executive power in Bonaparte, who showed consummate skill in re-organizing the government, to which he imparted a systematic efficiency and a spirit of centralization, that secured a thoroughly practical administration.

Having resumed his military duties, he marched an army over the Alps, attacked the Austrians unawares, and decided the fate of Italy by his victory at Marengo. In 1801, the peace of Lunéville was concluded, and the boundaries of F. were extended to the Rhine. England was the only country which refused to recognize the legality of the various Italian and German conquests of F.; and with the exception of a brief period of peace, this country remained the implacable foe of Bonaparte from the days of the Consulate to his defeat at Waterloo. Every period of respite from war was employed by the First Consul in reinstating trade and industry, and in obliterating both in private and public life the stains left by the Reign of Terror. In 1804, on an appeal by universal suffrage to the nation, Bonaparte was proclaimed emperor. The pope came to Paris to crown him and his wife Josephine; a new nobility was rapidly created, and the relatives and favorites of the emperor received vanquished kingdoms and principalities at his hands. For a time, Napoleon's influence with the weakened powers of the continent succeeded in maintaining an injurious system of blockade against England; and, except in the Peninsula, his arms were everywhere victorious. By his marriage with the Archduchess Maria Louisa, daughter of the Emperor of Germany, Napoleon seemed to have given to his throne the prestige of birth, which alone it had lacked. He now availed himself of the freedom afforded by the peace with Austria to expand the material prosperity of the country, by encouraging trade, constructing roads, bridges, and canals in every part of the empire, and by consolidating his government, and organizing a complete code of laws and a systematic mode of administering them. But this period was the poorest in respect to the literary and scientific development of the nation, who were too much trammelled by police supervision and military discipline to exercise freedom of thought and intellect, and this interval of comparative repose was soon interrupted by the ambitious designs of Napoleon on Germany, which led to a declaration of war against Russia in 1812. From this time to his final defeat in 1815, the emperor rapidly receded from the lofty station he had won for himself. The disastrous Russian campaign, in which his noble army was lost amid the rigors of a northern winter, was soon followed by the falling away of his allies and feudatories. Napoleon himself was still victorious wherever he appeared in person, but his generals were beaten in numerous engagements; and the great defeat of Leipsic compelled the French to retreat beyond the Rhine. The Swedes brought reinforcements to swell the ranks of his enemies on the

east frontier, while the English pressed on from the west; the senate, and his ministry betrayed his cause, and the allies threw themselves on Paris, which, in the absence of the emperor, capitulated after a short resistance, March 30, 1814.

Napoleon now abdicated in favor of his young son, and retired to the island of Elba, the sovereignty of which had been granted to him. His wife and son removed to Vienna; his family were declared to have forfeited the throne; F. was reduced to her former limits, and the provinces she had acquired were restored to their national rulers. On the 3d May, Louis XVIII. (the brother of Louis XVI.) made his entry into Paris. The conduct of the Bourbons did not conciliate the nation; they returned loaded with debts, and surrounded by the old nobility and clergy, who had not renounced their former privileges, and who looked upon the generation of Frenchmen who had arisen during their absence as their natural enemies. A narrow spirit influenced the weak policy of the king, which led to the establishment of a strict censorship, the extension of the powers of the police, and the persecution of all the adherents of the Empire; while the lower classes and the army, who were alike sensible of the humiliating reaction which had followed the former excitement of war and conquest, were treated with an indifference, and even contempt, by the returned emigrés, to which they were wholly unaccustomed. On the 1st March 1815, Napoleon left Elba, and landed in France. Crowds followed him; the soldiers flocked around his standard; the Bourbons fled, and he took possession of their lately deserted palaces. The news of his landing spread terror through Europe; and on the 25th March, a treaty of alliance was signed at Vienna between Austria, Russia, Prussia, and England, and preparations at once made to put down the movement in his favor, and restore the Bourbon dynasty. At first, the old *prestige* of success seemed to attend Napoleon; but on the 18th June, he was thoroughly defeated at Waterloo; and having placed himself under the safeguard of the English, he was sent to the island of St. Helena, in conformity with the generally acknowledged sentiment, that it was necessary to the peace of Europe to remove him finally and definitely from the scene of his former power. The second restoration gave occasion to many pledges of a more liberal policy on the part of Louis, but few of them were fulfilled, and a general and sullen discontent reigned among the people, who were again deprived of all voice in the administration, or in the election to offices, and were harassed by the petty tyranny of the priests, who were the favorite advisers of the crown. In 1821, Napoleon breathed his last at St. Helena; and in 1824, Louis XVIII. died without direct heirs, and his brother, the Duc d'Angoulême, succeeded as Charles X. The same ministerial incapacity, want of good faith, general discontent, and excessive priestly influence characterized this reign, which was abruptly brought to a close by the revolution of 1830, and the election to the throne of Louis Philippe, Duke of Orleans, as king, by the will of the people. Legitimist insurrections disturbed the nation; one *émeute* succeeded another; attempts upon the king's life were frequent; but the progress in material prosperity made the government popular with the *bourgeoisie*, or middle classes, and for a time it held its ground.

The warlike propensities of the nation found an outlet in the war in Algeria (q. v.) with Abd-el-Kader. But the determined resistance of the king to the growing desire for electoral reform, led at last to open insurrection in Paris; and Louis Philippe having abdicated (February 24, 1848), a Republic was proclaimed under a provisional government. An insurrection of the Red Republicans in Paris (June 1848), was only put down after great slaughter. Louis Napoleon (q. v.) was elected President of the Republic in December 1848; but by the famous *coup d'état* of December 2, 1851, he violently set aside the constitution, and assumed dictatorial powers; and a year after (2d December 1852), was raised, by the almost unanimous voice of the nation, to the dignity of Emperor as Napoleon III. His rule was one of complete absolutism, under which, however, France made great advances in the development of her natural resources, and in manufactures. Assuming the character of an adjuster of the wrongs of nations, Napoleon proclaimed himself a mediator in the Danish and Austro-Prussian wars, and the defender of the Italians against Austria, of the Pope against the people of Italy, and of the Mexicans against the government of the United States of America. By his help the Italians were relieved from the Austrian yoke, and the pope was left master of Rome; but in Mexico his intervention only led to greater bloodshed, and ended ignominiously for the glory of F., and fatally for the cause and life of his protégé, the Austrian Prince Maximilian (q. v.). Attempts to gain a Prussian alliance ended in humiliating repulses. Although the brilliant success of the Paris Exhibition of 1867 seemed to afford evidence of the personal and national consideration in which the emperor was held, his political credit had already then lost its importance. At home, the great financial embarrassments of his government were arousing the discontent of the people; and to avert the growing disaffection, Napoleon offered (1869) to adopt a constitu-

tional form of government, and to make some concessions in regard to freedom of the press. It was soon found that the responsibility of the ministry was fictitious; and that the emperor availed himself of its protection to cloak his own acts of personal government. The result of the appeal made to the nation in 1870, on the plea of securing their sanction for his policy, was not what he had anticipated; and the 50,000 dissentient votes given by the troops in this plébiscite, revealed a hitherto unsuspected source of danger. Confident in the efficiency of the army, and anxious to rekindle its ardor, he availed himself of a pretext to declare war against Prussia. The course of events in the short but terrible Franco-German conflict of 1870—1871 electrified Europe by its unexpected character, revealing at once the solidity of Prussian strength and the hollowness of imperial power in F. Within a fortnight of the emperor's appearance at the head of his troops at Metz, July 28, 1870, the strength of the French army was annihilated, Alsace and Lorraine were occupied by Germans, and the Chamber of Deputies in Paris was clamoring for his abdication.

On September 2, Napoleon, with his army of 90,000 men, surrendered at Sedan, and on the 4th, Paris was in rebellion, the senate dissolved, the Empress Regent a fugitive on her way to England, and F. proclaimed a Republic amid tumultuous excitement. Before the close of September, Strasburg, one of the last hopes of F., had capitulated, and Paris was completely invested by German troops; and on 5th October, the Prussian king had taken up his headquarters at Versailles. The fall of Metz, with 200,000 men, completed the disasters of the year. In January 1871, the united efforts of the different branches of the Provisional Government of Defence, respectively installed at Paris and Tours, succeeded in bringing about an armistice, after the besieged Parisians had for four months been hourly exposed to the fire of the enemy, cut off from all communication with the outer world except by balloons and carrier-pigeons, and finally threatened by famine. With the concurrence of Prussia, the French nation now proceeded, by a general election of representatives, to provide for the exigencies of the country. The First National Assembly of the French Republic met at Bordeaux in February. After receiving from the Provisional Government of Defence the resignation of the powers confided to them in September 1870, the Assembly undertook to organize the Republican Government, and nominated M. Thiers chief of the executive power of the state, with the title of President of the French Republic, but with the condition of responsibility to the National Assembly. On the 1st of March the preliminaries of peace were finally ratified at Bordeaux, the chief conditions being that the province of Alsace (except Belfort) and part of Lorraine, including Metz, should be ceded to the German empire, and that F. should pay a war indemnity of 5000 millions of francs, and continue to be occupied by German troops till the money was all paid. This enormous obligation was discharged in September 1873, and during the same month, F., after an occupation of three years, was finally relieved from the presence of foreign troops. In the spring of 1871, the peace of F. was seriously threatened by a successful outbreak at Paris on the part of the Communists (q. v.), who after great bloodshed and grievous damage to public and private property, were quelled by the regular army, which had sided with the government, and on 20th of May order was restored in Paris. Since then, F. has been successfully trying to obliterate some of the numerous misfortunes resulting from the war, and commerce and national prosperity have very rapidly revived. The ex-emperor Napoleon died in 1872, at Chislehurst, where he had resided with his family since his liberation in March 1871. In 1873 M. Thiers resigned the office of President of the French Republic, and was succeeded by Marshal MacMahon, who soon had his presidential powers confirmed to him for a period of seven years, generally known as the Septennate. The ministry of the Duc de Broglie was composed mainly of Legitimists, Orleanists, and Bonapartists, and in its time ultramontanism and Bonapartism made progress. The fusion of the Orleanists and Legitimists, though earnestly attempted, was completely foiled by the obstinacy of the Duc de Chambord.

Several ministries succeeded that of De Broglie, and there were fears of a *coup d'état* on the part of the president. But the elections of 1877 returned a large republican majority to the Chamber of Deputies; and MacMahon, yielding to the national will, summoned M. Dufaure, who chose a thoroughly republican ministry. In 1879, the Senate also became predominantly republican. Reactionary prefects were removed; and, on the whole, the republican form of government was greatly consolidated during MacMahon's tenure of office, and continued to secure more and more the confidence of the French people. The national vigor and prosperity were manifested in a successful International Exhibition at Paris in 1878. Early in 1879, MacMahon, disapproving of certain military changes, resigned office, and M. Grévy (q. v.) became president. There have been many changes of ministry (M. Gambetta, long known to be the most important statesman in France, formed a ministry in November 1881, and resigned in January

1882), but the current of policy has been steadily republican. An amnesty was granted to the Communist prisoners. At the instance of M. Ferry, a decree was issued by which Jesuit schools were closed; all unrecognized religious orders declining to submit to the conditions necessary for state sanction, were dissolved; and some 7400 inhabitants were thus expelled from 384 monasteries. Much controversy turned on the proposal, supported by M. Gambetta, to make the department the electoral unit of area (introducing *scrutin de liste*), instead of the *arrondissement* (with *scrutin d'arrondissement*) as heretofore. Nominally to punish certain Tunisian Kroumir tribes for incursions into Algerian territory, France sent an expedition to Tunis in 1881, and compelled the Bey to sign a treaty by which Tunis became virtually a French protectorate (see TUNIS). The native tribes continued to offer much armed opposition to the French terms, and prolonged campaigns in the interior of the country were rendered necessary. At the same time, some of the Algerian tribes rose in insurrection.

FRANCE, ISLE OF. See MAURITIUS.

FRANCESCO DI PAULA, founder of the order of the *Minims*, was born in 1416 at Paula or Paolo, a village of Calabria. At the age of 12, he was the inmate of a Franciscan convent; and at 14 he retired to a cave, where he inflicted on himself every species of self-mortification. The fame of his piety having attracted to his cell several emulators of his austere life, he received permission to erect a convent, and the new community received from Pope Sixtus IV. the title of the Hermits of St. Francis. To the usual conventual vows, F. added one of the most rigorous abstinence—flesh, eggs, and milk being strictly forbidden the entire year, except in illness. Popular report having attributed to F. several wonderful cures, Louis XI. of France, being ill, summoned him to his presence. F. was received with the highest honor, and attended the king on his death-bed. Charles VIII. and Louis XII. induced him to settle in France, and built him convents at Plessis-le-Tour and Amboise. F. died in 1507, and was canonized in 1519.

FRANCHE COMTÉ, an old province in the east of France, in the basin of the Rhone, comprised what now forms the departments of Doubs, Haute-Saône, and Jura, and had for its capital Besançon.

FRANCHISE, in English law, is a royal privilege, or branch of the crown's prerogative, subsisting in the hands of the subject. Franchise properly means freedom, and by an easy transition, the privileges of the freeman; whence it came to signify the privileges just defined. Being derived from the crown, franchises must arise from royal grant, or in some cases may be held by prescription, which presupposes a grant. The subjects of franchise being the peculiar property of the crown, correspond with what in Scotland are called regalia. Gifts of waifs, estrays, wrecks, treasure-trove, royal fish, and forfeitures, are franchises; so are the rights of forest, chase, park, warren, and fishery. A county palatine (see PALATINE) is the highest species of franchise. So the crown may create a liberty or bailiwick independent of the sheriff of the county. It is likewise a franchise for a number of persons to be incorporated, with a power to do corporate acts; and each member of such corporation is also said to have a franchise. The right to hold a fair or market, or to establish a ferry and to levy tolls therein, is also a franchise. Franchises may be extinguished by re-union with the crown, or may be lost by *misuser* or by *non-user*.

FRANCHISE, in its political acceptance, is the right of the individual to exercise a certain limited portion of the general sovereignty of the state. A franchise in this sense is possible only in a free state—in a state in which the governed, as a whole, are identical with the governors. Where legislation is effected by the votes of the people themselves, as it was in the small states of antiquity, the franchise is exercised by each individual directly. Where representation has been introduced, the franchise is the right which the citizen has of voting for his representative. The extent or value which ought to belong to the franchise will be measured by the amount of the sovereignty which it expresses. But this sovereignty finds forms of actual expression, in the amount of power and influence which is conceded to the individual by the society of which he is a part. A theoretically just franchise, then, would be one which corresponded accurately to the social position of each individual. An approximation is all that is possible in dealing with the mass, and one of the questions which is at present most keenly discussed amongst speculative politicians is, by what test shall this approximate estimate of social value be brought most nearly to the truth. Mill proposed intelligence, as indicated by instruction, as the sole measure of individual sovereignty, and, consequently, as the basis of the franchise. Others have proposed wealth; whilst by a third class of speculators it is contended that, in the case of each individual, there are various elements of social importance which must be taken into account in determining the political value which is his due.

By most recent writers on the theory of government, however, the idea of all citizens being entitled to an equal suffrage, however great might be the disparity of intelligence, wealth, manhood, and other elements which go to make up social importance, is repudiated as a scientific absurdity. See Mill's work on Representative Government; also PARLIAMENT.

FRANCIA, DR. JOSE GASPAR RODRIGUEZ, Dictator of Paraguay, was the son of a small landed proprietor, of French or Portuguese origin, and was born near the town of Asuncion in 1757 or 1758. He was intended for the church, studied at the university of Cordova de Tucuman, where he took his degree as a doctor of divinity or of canon law, and was for some time a theological professor. Subsequently he adopted the profession of law, to the practice of which he continued to devote himself for a period of thirty years, gaining much reputation for learning, skill, honesty, and independence of character. When he had attained the age of fifty-two or fifty-three, the revolution which shattered the Spanish yoke in South America broke out in Buenos Ayres. Paraguay at first offered active opposition to the revolutionists, but ultimately sought to obtain independence for itself. F. took a leading part in the movement, and was made secretary of the independent junta set up, but he soon resigned his post. The conviction, however, being strong in the public mind that F. alone could properly direct the affairs of the new republic, he was, in 1813, appointed joint-consul along with General Yegros. The latter, however, was a man apparently without much intellect or energy, and F. was really sole ruler from the first. In 1814, he was appointed dictator for three years, at the expiry of which time the dictatorship was given him for life; and the absolute control so conferred he exercised until his death in 1840. Under F., the condition of Paraguay rapidly improved, and the system of non-intercourse, political or commercial, with other nations, which he enforced, however much it may seem to prove him devoid of administrative sagacity, was undoubtedly attended with good results to his country. So strict were the regulations against foreign intercourse, that ingress to, or egress from, Paraguay was next to impossible; and F.'s treatment of some foreigners who did get in (among others the famous savant Bonpland), and of others who were prevented entering, savored of harshness, and even barbarism. Yet his administrative talent was of a high order. He improved agriculture, making two crops of corn grow where only one had grown before. He introduced schools, promoted education, repressed superstition, and enforced strict justice between man and man in his law-courts. His death was regretted by the people as a public calamity—the best proof that he was no vulgar tyrant. See Rengger and Longchamp's *Assai Historique*, &c. (Paris, 1827); *Francia's Reign of Terror* (London, 1839), by J. P. and W. P. Robertson, two young Scotchmen whom F. turned out of the country; and T. Carlyle's essay in the *Edinburgh Review* (1843).

FRANCIS, OF ASSISI, founder of the Franciscan order, and a saint of the Roman Catholic Church, was one of the most extraordinary men of his age, and merits a detailed notice, as illustrating in his career all the most remarkable characteristics of the religious life of the middle age. He was born in 1182, of the family called Bernardini, at Assisi, where his father was engaged in trade. His baptismal name was John; but from his familiarity with the Romance, or language of the troubadours, in his youth, he acquired the name of *Il Francesco* ('The little Frenchman'). In his early years, he was remarkable for his love of gaiety and ostentatious prodigality; but even then his bounty to the poor was one of the largest sources of his wastefulness. He engaged eagerly in exercises of chivalry and of arms; and in one of the petty feuds of the time, he was taken prisoner, and detained for a year in captivity at Perugia. An illness which he there contracted turned his thoughts from earth; and although he again engaged in military pursuits, a second illness at Spoleto decided his career for life. He now resolved to fulfil literally the counsels of the gospel, and he especially devoted himself to poverty, which, in the mystic language thenceforth familiar to him, he designated as 'his bride.' Under an impulse which he received while listening to a sermon, he took a vow never to refuse alms to a beggar. He made a pilgrimage to the tomb of St. Peter at Rome, and there offered to God all that he possessed on earth. On his return to Assisi, he exchanged his clothes with a poor mendicant; and disregarding all remonstrance and ridicule, he ever afterwards continued to wear the meanest attire. He gave to a priest who was rebuilding a ruined church the price of his horse, which he sold for the purpose, and even sought to appropriate to the same use the moneys of his father, which, however, the priest refused to accept. To avoid his father's anger, he took refuge in a cave, in which he spent a month in solitary prayer, and from which he returned more than ever confirmed in his enthusiasm. His father having in vain confined him in a dark room of his own house, cited him before the magistrates, and, on F.'s declining all civil jurisdiction in such a case, before the bishop, in order to compel

him to renounce his inheritance. F. abandoned all, even to the very clothes he wore, and then declared that 'till now he had been the son of Bernardini, but that henceforth he had but one Father, him that is in heaven.' Thenceforth, no humiliation was too low for F.; he begged at the gates of monasteries; he discharged the most menial offices; he served the lepers in the hospital at Gubbio in their most revolting necessities, and with the most tender assiduity. He worked with his own hands at the building of the church of St. Damian, and at that of Sta. Maria degli Angeli, which he afterwards called his 'Portiuncula,' or 'little inheritance,' and as the last act of self-spoilation, and the final acceptance of the gift of poverty, he threw aside his wallet, his staff, and his shoes, and arrayed himself in a single brown tunic, of coarse woollen cloth, girt with hempen cord. This was in his 26th year, in 1208.

His enthusiasm by degrees excited emulation. Two of his fellow-townsmen, Bernard Quintavalle and Peter Cattano, were his first associates. They were followed, although slowly, by others; and it was not till 1210, that, his brotherhood having now increased to eleven in number, he drew up for them a rule, selected in the true spirit of religious enthusiasm, by thrice opening at random the gospels upon the altar, and taking the passages thus indicated as the basis of the young institute. (Milman's *Latin Christianity*, iv. 264.) The new brethren repaired to Rome, where their rule was approved (though at first only *visu voce*) by Pope Innocent III. in 1210.

The two following years were spent by the brotherhood in preaching and exhorting the people through the rural districts of their native and the adjoining provinces; and F. himself returned to Assisi in 1212, at which time he finally settled the simple constitution of his order, the church of Sta. Maria degli Angeli being assigned to them as their home. In common with the older forms of monastic life, the Franciscan institute is founded on the three vows of chastity, poverty, and obedience; but of these the second was, in the eyes of F., the first in importance and in spiritual efficacy. In other orders, the practice of poverty consisted in the mere negation of riches. With F., it was an active and positive principle. In other orders, although the individuals could not possess, it was lawful for the community to hold property in common. F. repudiated all idea of property, alike for his order and for its members; he even disclaimed for them the property in those things which they retained for personal use—the clothes which they wore, the cord with which they were girded, the very breviary from which they chanted the divine office. The very impossibility, to human seeming, of these vows, was their strength. Numbers crowded to the standard of Francis. He told them off in parties to different provinces of Italy. Five of the brotherhood repaired to Morocco to preach to the Moors, and, as the first martyrs of the order, fell victims to their holy daring. Success removed all the hesitation with which the institute at first was regarded, and in 1216, the order was solemnly approved by Pope Innocent. From this date it increased with extraordinary rapidity. At the first general assembly, held in 1219, 5000 members were present; 500 more were claimants for admission. F. himself inaugurated the future missionary character of his brotherhood by going (1223) to the East, and preaching the gospel in the presence of the sultan himself; but the only fruit of his mission was a promise from the sultan of more indulgent treatment for the Christian captives, and, for the Franciscan order, the privilege which they have since enjoyed, as guardians of the Church of the Holy Sepulchre. It is after his return to Italy that his biographers place the celebrated legend, which, to friends or to enemies, has so long been a subject of veneration or of ridicule—his receiving, while in an ecstasy of prayer, the marks (*stigmata*) upon his own person of the wounds of our Divine Redeemer.

The scene of this event is laid on Monte Alverno, a place still sacred in the traditions of the order; and the date is September 17, 1224. Two years later, St. F. died, October 4, 1226. On the approach of his last hour, he requested that he should be carried upon a bier to the church, where he had himself placed on the bare ground, thus realizing in his own death the most literal extreme of the doctrine which he had made in life the basis of his system. He was canonized by Pope Gregory IX. in 1228.

The works of St. F. (folio, Pedeponti, 1739) consists of letters, sermons, ascetic treatises, proverbs, moral apothegms, and hymns. The latter are among the earliest metrical specimens of the Italian language. They are exceedingly simple, and full of the tenderest expressions of the Love of God. His prose is often more poetical than his poetry itself, abounding in allegory and poetical personification. Few writers have ever turned the love and admiration of external nature to a purpose so beautifully devotional. 'Of all the saints,' says Dean Milman, 'St. Francis was the most blameless and gentle.' No saint, it may be added, has been the subject of more exaggerated panegyric from the writers of his order; and one of the works in his praise—a parallel between St. F. and our Divine Redeemer—is disowned by the Roman Catholic community as a most reprehensible exaggeration, the fruit of an affectionate,

but most misdirected zeal for the memory of the founder of the Franciscan order.

See the Bollandist, *Acta Sanctorum*, October 4; St. Bonaventure's *Life of St. Francis*, with Wadding's notes; Helyot, *Hist. des Ordres Religieux*, tom. vii.; Butler's *Lives of Saints*, October 4; Milman's *Latin Christianity*, vol. iv.; Gieseler's *Church History*, vol. iii.; Hase's *Franz von Assisi*; Mrs. Oliphant's *F. of Assisi* (1871).

FRANCIS, SIR PHILIP, son of the Rev. Dr. Philip Francis, author of a well-known translation of Horace, was born at Dublin, October 22, 1740, and educated at St. Paul's School, London, where he had for a school-fellow Henry S. Woodfall, afterwards the printer of the *Public Advertiser*, and the publisher of the *Letters of Junius*. In 1756, he obtained a place in the office of Mr. Fox, then secretary of state, which he retained under his successor Mr. Pitt. In 1760, he became secretary to the Earl of Kinnoul, who had been appointed British ambassador to Portugal; and on his return to England in 1763, he received an appointment in the War-office. Ten years later, he was sent out to India, as a member of the council for the government of Bengal, with a salary of £10,000. Here he came into collision with the governor-general, Warren Hastings, and so far did the quarrel proceed, that a duel was the consequence, in which F. was severely wounded. In December 1780, he resigned his situation, and returning to England, entered parliament for the borough of Yarmouth, in the Isle of Wight, in 1784. He never obtained a reputation as an orator, but his great abilities and extensive information always commanded the respect and attention of the House.

The prosecution of Hastings, begun in 1786, was hailed by him with malignant joy, and it must be confessed that he displayed a most ungenerous alacrity and activity in furthering the designs of the committee of impeachment. In his political opinions, F. was a decided and consistent Whig, at a time when Whiggism meant very much the same as the Radicalism of a later period. He exulted at the success of the French Revolution, was an active member of the association of 'Friends of the People,' and ably supported the efforts of Fox and Grey for a reform in the representation of the nation. He withdrew from parliament in 1807, and died December 22, 1818. F. wrote upwards of twenty political pamphlets. He has also been considered by many to have the best claim to the authorship of the *Letters of Junius* (q. v.).

FRANCIS I., king of France, son of Charles, Comte d'Angoulême, was born at Cognac, September 12, 1494, and in his youth manifested an ardent love for literature, especially for the romances of chivalry, whence, probably, he drew his brilliant but erroneous views of a kingly character. At the age of twenty, he married Claude, daughter of Louis XII., and succeeded his father-in-law, January 1, 1515. His first act after mounting the throne, was to set about the reconquest of Milan, which had been wrested from his predecessor two years before, and at the head of 40,000 men, among whom were such great warriors as the Constable Bourbon, Bayard, Lautrec, and Trivulzio, F. crossed the Alps, and attacked the Swiss allies of the Milanese at Marignano, ten miles from Milan. Here a sanguinary battle, afterwards called the 'battle of the giants,' ensued (13th September 1515), in which F. obtained a complete victory—the Swiss losing 12,000 men. In accordance with his chivalrous propensities, F. accepted knighthood on the field from the renowned Bayard. After some further successes, F. returned to Paris in the month of February 1516. On the death of Maximilian, emperor of Germany, in January 1519, F. and Charles of Spain became rival candidates for the imperial crown. The election of the latter excited the anger of F., who immediately prepared for war, and endeavored to secure the alliance of Henry VIII. of England. An interview took place in 1520 between the two monarchs on the famous *field of the cloth of gold*, between Guines and Ardres, but it led to no result, and shortly after, Henry formed an alliance with the pope and the emperor against Francis. The papal troops drove the French out of Italy; and the soldiers of Henry and the emperor invaded France on the north, while, to complete his perplexities, the Constable Bourbon, who was discovered to be conspiring against his sovereign, fled to Charles, who gladly accepted the sword of the renegade warrior. F. gallantly faced the dangers that now threatened his kingdom. A large army was sent to Italy under the command of Bonnivet, who, however, proved incapable, and was forced to retreat across the Alps. In the course of this retreat, Bayard lost his life. The imperialists now advanced into Provence, but, on the approach of the French king, withdrew into Italy, whither they were followed by F., who overran Lombardy, but was totally defeated and taken prisoner at the battle of Pavia, 24th February 1525.

Charles carried his captive to Madrid, and only granted him his liberty on the hardest conditions. F. had to renounce the suzerainty of Flanders and Artois, the duchy of Burgundy, and all his Italian possessions and prerogatives, to promise the restoration of Bourbon to his former dignities, and to surrender his two sons

as hostages. He obtained his freedom, March 17, 1526; but regarding the conduct of Charles as utterly base, his first act, on his return to his dominions, was a refusal to fulfil the pledges he had given. Pope Clement VII. absolved him from his oath; England, Rome, Venice, Florence, and Genoa—all of whom were growing alarmed at the immense power of Charles—withdrew from the imperial alliance, and sided with his antagonist. The war in Italy now recommenced. On the 5th May 1527, Bourbon's 'black banditti' stormed and sacked the 'Eternal City,' and captured the pope. F. now sent troops into Naples, which, after a series of brilliant successes, were almost wholly cut off by disease, mainly through the negligence of the king, who failed to supply them with the means of subsistence. About the same time, F. sent a challenge to Charles to decide their quarrel by single combat. The challenge was accepted, but the duel never came off. At last, a peace was concluded at Combray, in July 1529, much to the advantage of the Spaniards. In 1534, however, war broke out between F. and the Duke of Milan; and in the following year the former overran Savoy, to which he laid claim by the absurd pretensions. The conduct of Charles at this period was marked by the greatest moderation, but he was ultimately involved in hostilities with his inveterate opponent. Little definite result ensued, but the war was marked by a circumstance regarded as horrible in those days—viz., an alliance between Christians and Turks. F. formally entered into a league with the Sultan Soliman, who went so far as to land troops in the south of Italy, but the French king shrunk from a practical co-operation with the arch-enemy of Christendom. By the efforts of Pope Paul III., a treaty was concluded for ten years at Nice between Charles and F., 18th June 1538. In point of fact, however, peace lasted only four years, and in 1542, F., insatiable of glory, launched five different armies against the emperor. The battle of Cerissoles, 14th April 1544, in which the French were completely victorious, partially wiped out the dishonor of the defeat at Pavia, but a second alliance of F. with the Turks renewed the indignation of Christendom. Charles, and Henry king of England, marched upon Paris, and F. was compelled to make peace at Crepy, 18th September 1544. His political rôle was now finished. He died at Rambouillet, March 31, 1547. It is not difficult to estimate the character of this monarch. Gay and voluptuous (it was the physical consequences of an amour which cost him his life), he was still capable of heroic impulses and acts of splendid generosity. But no amount of 'chivalry' could compensate for the lack of political sagacity; it could not even save him from deeds of cruelty. His persecution of the Vaudois and other 'heretics' has left a dark stain on his memory, which all his patronage of arts and letters will not efface. F. was himself a writer of verses; but these were so bad that even French critics pronounce them almost intolerable.

FRANCIS I. (STEPHEN), Emperor of Germany, born in 1708, was the eldest son of Leopold, Duke of Lorraine. On the death of his father, in 1729, F. succeeded him in the dukedom, which, in 1735, he ceded to Stanislaus Leszcynski, father-in-law of Louis XV., to revert after his death to the crown of France. In lieu of Lorraine, he obtained the grand duchy of Tuscany, whose native rulers, the Medicean family, were about to die out. In 1736, he married Maria Theresa of Austria, the only daughter and heiress of the Emperor Charles VI. In 1740, Charles died, and Maria Theresa succeeded him; she made her husband co-regent with herself, but gave him little share in the administration. F. fought bravely for his wife's rights in the wars carried on against Frederick the Great. In 1745, he was elected to the once important dignity of Emperor of Germany, and crowned at Frankfurt. The famous Seven Years' War (1756—1763) now broke out between Austria and Prussia; but the cares which it imposed fell mainly upon his leonine consort, Maria Theresa. F. died at Innsprück, 18th August 1765. His son Joseph succeeded him in the imperial dignity, but Maria Theresa retained in her hands the sovereignty of the Austrian dominions till her death.

FRANCIS II., Emperor of Germany and I. of Austria, the eldest son of Leopold II. Grand Duke of Tuscany, and of Maria Louisa, daughter of Charles III., king of Spain, was born at Florence, in February 1768. In 1790, his father became Emperor of Austria by the death of his brother Joseph, but died only two years after, when the crown devolved upon Francis. The French Revolution was now exciting the alarm of the old European dynasties; F. concluded an alliance with Prussia against the new republic; and the armies of the allies marched to the frontiers of France, but soon recoiled before the fiery enthusiasm of the republican troops. In 1794, F. placed himself at the head of the army of the Netherlands, which, on the 26th of April, defeated the French at Cateau and Landrecy; and on the 22d of May, gained the bloody battle of Tournay; but on the whole the fortune of the war was against him; and the triumphs of young General Bonaparte in Italy forced him to conclude the treaty of Campo Formio (October 17, 1797). Only two years afterwards, however,

F., in alliance with Russia and England, again took up arms, and was at first successful; but the recall of the brave Russian general, Suwaroff, and the return of Bonaparte from the East, quickly altered the state of matters. The great victories won by Moreau at Hohenlinden, and by Bonaparte at Marengo, paralyzed the powers of Austria, and F. was compelled to sue for peace, which was obtained by the treaty of Lunéville in 1801, by which the whole of the left bank of the Rhine was ceded to France. In 1805, the aggressions of France once more excited the jealousy of Austria. F. entered into a new alliance with Russia; and the contest was renewed, but ended more disastrously than ever for the Austrians. The French victories of Ulm and Austerlitz, and the capture of Vienna, completely humiliated F., who, at the peace of Presburg (December 1805), was obliged to surrender the Venetian states and the Tyrol. The German empire was now dissolved, after lasting for 1000 years, and F. assumed the title of Emperor of Austria, King of Bohemia and Hungary.

In 1809, he recommenced the war with Napoleon, and obtained more success, or perhaps we should say, encountered less loss than on previous occasions. The tremendous battle of Aspern was a victory, though not a decisive one, and did much to restore the prestige of the Austrian arms. Still Napoleon again got possession of Vienna, and dictated terms of peace from the palace of Schönbrunn in October of the same year. In 1810 the French emperor married F.'s daughter, Maria Louisa. A permanently friendly alliance now seemed to be concluded between the two empires; and during the Russian campaign in 1812, the Austrians rendered the French some slight assistance. In 1813, Austria resumed its neutrality; but, after having exerted himself fruitlessly to mediate between France and Russia, F. suddenly joined the allies, helped to win the battle of Leipsic, and followed the Russians and Prussians to Paris in 1814. His subsequent career does not present any points of special importance. He labored honestly and indefatigably for the welfare of his subjects, encouraging the making of roads and canals, and the introduction of manufactures; but his horror of everything revolutionary, excited by his early recollections, and by the cruel death of his aunt Marie Antoinette, and kept alive by his long wars with France, had rendered him an absolutist in politics, and a lover of that system of centralization to which Austria continues to cling. F. died on the 2d of March 1835.

FRANCIS JOSEPH, the present Emperor of Austria, born 18th August 1830, is the eldest son of the Archduke Francis (son of the Emperor Francis I.), and Sophia, a princess of Bavaria. F. was taught to speak all the various languages of his heterogeneous dominions, and only the year before the Hungarian revolution addressed the Magyar nobles at Pesth in their own language—a circumstance which secured him a certain transient popularity. In 1848, he served under Radetzky in the Italian wars. The Emperor Ferdinand having, in the hour of his extremity, made certain constitutional promises to the nation, the archduchess, F.'s mother, who during the whole year had directed the schemes of the anti-revolutionary party, resolved that the fulfilment of these promises should be evaded by a change of sovereign. Ferdinand accordingly abdicated in favor of his nephew (2d December 1848), and F. assumed the government as Emperor of Austria, and King of Hungary and Bohemia. Hungary, however, which had lost all faith in the House of Hapsburg, rose in arms, and refused to accede to the change of succession; and Italy again tried the fortune of war. The progress of the struggle between F. and the constitutionalists of Hungary is described in the biographies of Kossuth, Bem, Dembinski, Batthyani, &c. Suffice it to say that Austria triumphed in Italy, and also in Hungary, through the alleged treachery of Görgei and the help of Russia. F. now devoted himself, with characteristic persistency, to the re-establishment of 'order,' that is to say, of despotism.

He dissolved the national guard, and took away the freedom of the press, and on January 1, 1852, abolished the constitution of his uncle, which had been a dead-letter from the beginning. In 1853 he nearly lost his life by assassination, and in the Crimean War forfeited the respect of all the belligerents by his indecisive attitude. The *concordat* of 1855, by which certain extraordinary privileges were conferred on the bishops of the Roman Catholic Church, was another step backwards. Meanwhile the dissatisfaction of Lombardy, Venice, and Hungary hourly increased. Sardinia encouraged the national feeling in Italy, and at last, in 1859, F. hurried thoughtlessly into a war with that kingdom, which ended in the cession of Lombardy. For the war with Denmark, see SLESVIG; for the war with Prussia, and the subsequent work of reconstructing the empire, see GERMANY. F. was crowned as king of Hungary at Pesth in 1867. He was present at the opening of the Suez Canal in 1869. See also AUSTRIA, HUNGARY.

FRANCISCANS, ORDER OF, also called MINORITES or LESSER BRETHREN, a religious order of the Roman Catholic Church, founded by St. Francis of Assisi. For an account of the estab-

lishment of the Franciscan order, and its earliest fortunes, see FRANCIS OF ASSISI. The subsequent progress of the order was equally wonderful. In less than half a century it reckoned no fewer than 33 'provinces,' the aggregate number of convents in which exceeded 8000, while the members fell little, if at all, short of 200,000. Some idea, indeed, of the extraordinary extension of this remarkable institute may be formed from the startling fact, that, in the dreadful plague of the Black Death in the following century, no fewer than 124,000 Franciscans fell victims to their zeal for the care of the sick, and for the spiritual ministrations to the dying! But this marvelous external progress was accompanied by serious internal controversies and divisions. In the original scheme of the institute, its great fundamental characteristic was poverty, which St. Francis proposed to render in his order not only more perfect theoretically, but more systematic in its practice, than it existed in any of the contemporary institutes. For the accomplishment of this design, the rule which he drew up contained a few brief and simple, but, understood literally, very effectual provisions; but the difficulty of their literal observance led, even in the life time of St. Francis, to an attempt in the general assembly of the order to introduce some important modifications and, though the authority of the founder was sufficient to prevent the adoption of these modifications during his lifetime, and although his last will contained a special clause prohibiting not merely all change of the rule, but even all interpretation of it, the attempt was renewed with still more determination under Brother Elias, his successor in the office of general of the order. The great subject of controversy was the nature and extent of the obligation of religious poverty, as vowed in the order. Francis desired that it should be understood in the most rigorous sense; and, in his scheme of poverty, neither the individual brethren nor the entire community could acquire or retain any right of property even in things of necessary use.

The rigorous party in the order sought to carry out this principle to the fullest extent; and they contended that it was unlawful for the order to acquire a right of property in houses, convents, or even churches; restricting their right in everything which they possessed to the simple use. Several successive popes sought, by explanatory decrees, to settle the dispute; and for a time a compromise was received, by which it was understood that the right of property in all *de facto* possessions of the order was vested in the see of Rome; but the foundations of the real controversy lay deeper than this. They regarded the practice, far more than the theory, of poverty; and the disputes to which they led eventuated not only in the formation of fresh off-shoots from the body in the new religious orders, to be named hereafter, but also in a large, and, for a time, formidable, secession from the church in the sect of the Fraticellians. See FRATICELLIANS.

The supreme government of the Franciscan order, which is commonly said to be the especial embodiment of the democratic element in the Roman Catholic Church, is vested in an elective general, who resides at Rome. The subordinate superiors are, first, the 'provincial,' who presides over all the brethren in a province; and secondly the 'guardian,' who is the head of a single convent or community. These officers are elected only for two years. The provincial alone has power to admit candidates, who are subjected to a probation of two years (see NOVITIATE); after which they are, if approved, permitted to take the vows of the order. Those of the members who are advanced to holy orders undergo a preparatory course of study, during which they are called 'scholars'; and if eventually promoted to the priesthood, they are styled 'fathers' of the order; the title of the other members being 'brother' or 'lay-brother.'

A very important feature, however, of the organization of the Franciscan, as it subsequently became of other orders, is the enrolment of non-conventual members, who continue to live in society without the obligation of celibacy; and in general, are only bound by the spirit, and not the letter, of the rule. They are called 'Tertiaries,' or members of the Third Order of St. Francis. See TERTIARY. It is impossible to overestimate the value of this institution in the disorganized social condition of that age. The Tertiaries were bound, as the very first condition of enrolment, to restore all ill-gotten goods; to be reconciled with all those with whom they had been at feud; to devote themselves to the practice of works of Christian charity; to avoid all unnecessary expenditure; to renounce the use of personal ornaments; to hear mass daily; to serve the sick and the hospitals; to instruct the ignorant; and, in a word, to practise as far as possible in the world the substance of the virtues of the cloister. The institute, in this form, undoubtedly exercised a powerful influence in medieval society. It counted members in every rank, from the throne to the cottage; and, although it was in some instances deformed by abuses and superstitious practices, the aggregate results were undoubtedly beneficial.

The Franciscan order has been the parent of many other religious institutes. The earliest of these is that of the 'Observantists,' or 'brethren of more strict observance.' The origin of this body

has been already indicated. The party in the order which contended for the more rigid observance of the rule, after a protracted struggle—in which disaffection to the church itself was often strongly exhibited—obtained a separate organization, which may be said to have been finally settled at the time of Leo X. The less rigid party, under the name of 'Conventuals,' obtained a distinct general, and an authorization for their mitigated observance of the rule. Their churches and convents admit greater richness of architecture and decoration; and they are at liberty to acquire and retain, in the name of the order, the property of these and similar possessions, all of which are renounced by the Observant Franciscans. The latter community comprises nearly 150 provinces. Their constitution is that of the original rule, as already explained. A second off-shoot of the Franciscan order, and in the same direction of rigorism, is that known as the 'Capuchins,' founded by Matteo di Basio, a Franciscan brother of the Observant rule, in the early part of the 16th century. Believing himself divinely called to revive the old spirit of his order, and learning that the modern habit of the brethren was different from that of St. Francis, he began with externals, and procured for himself, and obtained the papal permission to introduce (1528) the peculiar habit, with a pointed hood or cowl (capute), from which the name of the reformed order is derived. Along with this habit, however, Matteo adopted a very rigorous and mortified course of life, in which he was joined by others of the brethren; and the reform spread so rapidly among the community, that in the year 1536 a general chapter of the new congregation was held. They were subject, however, to the jurisdiction of the general of the Franciscan order. One of the first generals of the new reform was Bernardino Ochino, afterwards notable by his defection to Calvinism. After the Council of Trent, the Capuchins multiplied rapidly, though they were not introduced in France till the end of that century. A similar reform, to which the name of 'Recollets' was given (introduced in Spain by John de Guadalupe, in 1500), was approved by Clement VII. in 1532; and many of the new brethren were among the first Spanish missionaries to the New World. A further development of the rigoristic spirit is the congregation of 'Discalced' or 'Barefooted' (q. v.) Franciscans. The author of this reform was a Spanish Capuchin, Peter of Alcantara. In his capacity of provincial of Estremadura, Peter introduced many reforms; and in 1555 obtained the approval of Pope Julius III. for a new rule, which was afterwards confirmed by Pius IV.

The notice of the Franciscan institute would be incomplete without the mention of the several orders of nuns; as those of St. Clare, the Capuchin nuns, the Urbanist nuns, &c., which formed part of the same general organization. None of these, however, calls for any detailed explanation, or presents any very characteristic features.

The Franciscan order, in these several branches, has at all times maintained its popularity in the Roman Catholic Church. When Helyot, in the beginning of the 18th c., published his great *History of Religious Orders*, the Franciscan order numbered nearly 120,000 friars, distributed over above 7000 convents, and nearly 30,000 nuns, occupying about 900 convents. Since the French Revolution, the number has of course been very much diminished, the order having been suppressed in more than one kingdom; but it is still one of the most numerous in the Roman Catholic Church. Many of the foreign missions are mainly supplied by the Franciscans, and they possess convents in almost every part of the world.

As a literary order, the Franciscans have chiefly been eminent in the theological sciences. The great school of the Scotists takes its name from John Duns Scotus (see SCOTUS), a Franciscan friar, and it has been the pride of this order to maintain his distinctive doctrines both in philosophy and in theology against the rival school of the Thomists, to which the Dominican order gave its allegiance. See THOMISTS. In the Nominalistic controversy, the Thomists were for the most part Conceptualists; the Franciscans adhered to the rigid Realism. See NOMINALISM. In the Free-will question, the Franciscans strenuously resisted the Thomist doctrine of 'predetermining decrees.' Indeed, all the greatest names of the early Scotist school are the Franciscans, St. Bonaventure, Alexander de Hales, and Ockham. The single name of Roger Bacon, the marvel of medieval letters, the divine, the philosopher, the linguist, the experimentalist, the practical mechanician, would in itself have sufficed to make the reputation of his order, had his contemporaries not failed to appreciate his merit. Two centuries later, the great Cardinal Ximenes was a member of this order. The Popes Nicholas IV., Alexander V., Sixtus IV., the still more celebrated Sixtus V., and the well-known Ganganelli, Clement XIV., also belonged to the institute of St. Francis. In history, this order is less distinguished; but its own annalist, Luke Wadding, an Irish Franciscan, bears a deservedly high reputation as a historian. In lighter literature, and particularly poetry, we have already named the founder himself as a sacred poet. Jacopone da Todi, a Franciscan, is one of the most characteristic of the medieval hymn-writers; and in later times, the celebrated Lope de Vega closed his eventful career as

a member of the third order of St. Francis. We may add that in the revival of art the Franciscan order bore an active and, it must be confessed, a liberal and enlightened part. See Wadding, *Annales Minorum Fratrum*, 8 vols.; see also Milman's *Latin Christianity*, vol. v.

FRANCISCO, SAN. See SAN FRANCISCO.

FRANCKE, AUG. HERM., a distinguished German philanthropist, founder of the Orphan Asylum and several educational institutions at Halle, was born at Lubeck in 1663. Having studied languages and theology with great application and success, he first attracted attention by his academical biblical lectures in Leipzig, begun about 1685. These were more distinguished for piety, warmth, and zeal, than for attention to the strict and dry orthodoxy then in vogue; and the reception they met with from the public brought on F. envy and persecution as a heretic. He thought proper to yield to the storm, and withdrew in 1690 to Erfurt. In 1692, he obtained the professorship of Oriental languages in the newly instituted university at Halle, where he subsequently held a professorship of theology. He also received the pastoral charge of the suburb of Glaucha. The ignorance and poverty of his parishioners gave the first impulse to his benevolent labors. To the neglected poor and children that came to him for alms, he gave instruction on stated days, and as others joined, paying a school-fee of a penny a week, and the numbers rose to some sixty, he divided them into classes, and thus laid the first foundation of his educational establishments. At the same time the thought suggested itself of an orphan asylum, and in 1698 he laid the foundation of a special building for the asylum. Some years after, he erected a *Pedagogium*, a Latin school, and a boarding establishment connected with it. In 1714, there were 1075 boys and 700 girls receiving instruction from 108 teachers under the direction of Francke. He also had a missionary institution for the East Indies. To erect and maintain all these establishments required large sums of money; and it is surprising how F. succeeded in obtaining it without assistance from government. But so high was his reputation for disinterested benevolence, and in such a practical way did he set about his undertakings, never appealing for the charitable aid of others till he had first effected something himself, that contributions flowed in from all parts of Germany, and even from abroad. F. also instituted an apothecary's shop and bookselling in connection with his other operations, and thus obtained a considerable income for their support. Nor amidst all these voluntary labors did he neglect his duties as professor and pastor; he preached and lectured regularly, and also found time to study and write. He died June 8, 1727.

Francke's Institution, as it now exists in Halle, embraces the orphan house and schools erected by F., together with others since added; the number of pupils amounting in all to upwards of 3500. Book-selling, printing, and a laboratory for the preparation and distribution of medicines are also carried on in connection with education. The revenues consist of the profits of this industry, of the income from some property in land and funds, and of an allowance of £6000 from the state. The education imparted retains its religious character, but the excessive number of prayers and the otherwise conventual and ascetic character of the discipline have been diminished.

FRANÇOIS, ST., is the name of two towns in the French West Indies.—1. St. F., in Guadeloupe stands on the Grande Terre, the more easterly of the twin islands into which the colony is divided by an arm of the sea known as Salt River. It contains about 6600 inhabitants, about 5600 of them having been slaves down to 1848, the epoch of emancipation under the French Republic.—2. St. F. in Martinique possesses a good harbor on the east coast. Of a population of 5966, 4272 had been slaves.

FRANCOLIN (*Francolinus*), a genus of birds of the family *Tetraonidae*, closely allied to partridges. They are natives of Europe, Asia, and Africa. One species only, the EUROPEAN F. (*F. vulgaris*), is found in the most southern parts of Europe.

FRANCONIA (Ger. *Franken*). This name was first applied to those districts on both sides of the Maine which were originally peopled by colonies of Franks, under Thierry, the eldest son of Clovis, who inherited the Germanic possessions of his father on the death of the latter in 511. Under the Merovingian and Carolingian dynasties, this province acquired a certain degree of preponderance in the state, and enjoyed the privilege of electing the king of the Germans within its own territories, and crowning the sovereign by the hands of its archbishop (Mayence), who was primate of the empire. In 911, Conrad, the Count or Duke of Franconia, for there is some doubt which of these titles was at that time borne by the ruler of the province, was raised to the throne; and a century later, after the ducal dignity had been recognized in F., the choice of the electors again fell upon the Franconian House, which, by its direct and collateral branches, gave kings and emperors to Germany from 1024, when Conrad II. began his reign, till 1250, when the indirect line of the Hohen-

stauffen family became extinct. During its connection with the crown, F. increased in extent and importance, while its great spiritual principalities of Mayence, Spire, Worms, and Würzburg acquired both wealth and political influence.

In the course of the following 200 years, the province underwent various modifications, and was sub-divided into numerous territories, as those of the Rhenish County-palatine, Nassau, Katzenelnbogen, Hainau, the landgraviate of Hesse, &c., until the name of F. was limited to the eastern portions of the ancient duchy, which included Würzburg, Fulda, Bamberg, Nürnberg, Hohenlohe, &c. In 1512, Maximilian I. re-established the circle of F., which then embraced the sees of Bamberg, Würzburg, and Eichstädt, Baireuth and Anspach, and several counties and cities. With the dissolution of the empire, the name of F. disappeared from among the political divisions of Germany; but since 1837 it has been revived in the kingdom of Bavaria (q. v.), where those portions of the ancient Franconian province, which in modern times have been known as the circles of the Upper Maine, Rezat, and Lower Maine, are now designated Upper, Middle, and Lower Franconia. Upper F. includes the north-east portion of Bavaria. It is watered by numerous rivers, as the Maine, Raab, Saale, &c., and is intersected by the Fichtelgebirge and by the hilly ranges of the Böhmer-Franken-, and Steiger-Wald. The valleys produce good crops and fruit, and the district is rich in minerals. Pop. (1880) 575,357; capital, Baireuth. Middle F., which abuts upon Württemberg, is intersected by branches of the Franconian Jura chain, but has few rivers of importance besides the Regnitz and Altmühl, which are connected by the great Ludwig Canal. It produces good wine, but is principally celebrated for its hop-gardens. Anspach and Nürnberg are the principal towns. Pop. (1880) 643,817. Lower F., with Aschaffenburg, which occupies the north-west part of Bavaria, is the richest and best cultivated of the Franconian circles, and is celebrated for the excellence of its wines, the Steiner and Leister. The district is noted for its mineral springs at Kissingen, Brückenau, Orb, and Wipfeld. Pop. (1880) 626,305; capital, Würzburg. Small portions of F. were ceded to Prussia in 1866. The pop. of the three F.s in 1875 was 1,758,048.

FRANC-TIREURS, bands of French soldiers that sprang into existence during the progress of the Franco-Prussian war (1870—1871). They did not form part of the regular army, and at first their military organization was very imperfect; but this defect was afterwards in some measure remedied. They exercised a species of guerilla warfare, attacking small detachments of the enemy, as also single travelers, baggage-trains, &c., their attacks being too often characterized by those savageries incident to this mode of warfare. They consisted mostly of the rural population; but their birth, education, clothing, arms, age, and even their aim, were almost in every case different. At first, they were not recognized by the Germans as having any military standing at all, and when seized they were shot; but after a time, when they received a better organization and co-operated with the regular French army, such recognition was accorded them.

FRANEKER, a handsome town of the Netherlands province of Friesland, on the canal between Harlingen and Leeuwarden. It was formerly the seat of a university founded in 1585 by the Frisian states on the suggestion of Prince William Louis, Count of Nassau, which ranked among its professors the eminent names of Vitringer, Schultens, Hemsterhuis, Valckenauer, and others. It was, however, abolished by Napoleon in 1811, and in 1816 was transformed into an atheneum, to which a physiological cabinet and botanic garden belong. There is here a remarkable Planetarium (q. v.), made in 1774—81 by Eisinga. Pop. (1879) 7222.

FRANGIPANI, an illustrious and powerful Roman House, which traces its origin to the 7th c., and attained the summit of its glory in the 11th and 12th centuries. In the early annals of Rome, several members of this family occupied important public offices, and seem to have taken a prominent lead in all matters of moment. In 987, Crescenzo Frangipani successfully vindicated the prerogatives of the Roman people against the encroachments of Pope John XV. The rivalry of the F. House with that of the Pietro Leoni, not only occasioned repeated civil wars in the state but likewise several schisms in the church. The lustre of their race was finally outshone by the two great patrician families, Colonna and Orsini, whose magnificence, power, and pretension far exceeded those of the greatest citizens of Rome. Two of the last of the F. who merit mention are Giovanni, who captured Conradin of Hohenstaufen, and delivered him, in 1268, to his sanguinary enemies; and Latino, Grand Inquisitor and Cardinal and Bishop of Ostia and Velletri. The origin of the name Frangipani is attributed to the family's benevolent distribution of bread in time of famine.—The Croatian family of the same name claim descent from the great original Roman House.

FRANK, FRANKING LETTERS. On the introduction of the uniform penny-postage on all inland letters in 1840 (3 and 4 Vict. c. 96), the privilege formerly enjoyed by peers and members of

the House of Commons, and many official persons, of 'franking,' as it was called, that is, sending and receiving letters duty free, was abolished; the statute 7 Will. IV. and 1 Vict. c. 32, by which this privilege had been recently regulated, being repealed by s. 68 of the first-mentioned act. The privilege was claimed by the House of Commons in 1660, when the post-office was first legally established (see *POST-OFFICE*), but it was afterwards dropped upon a private assurance from the crown that it should be allowed to members. The postmaster-general accordingly constantly issued a warrant directing the allowance, till the privilege was expressly conferred by statute 4 Geo. III. c. 24. In the days of franking, each member of either House of Parliament was entitled to send ten letters every day, not exceeding an ounce in weight each, to any place in the United Kingdom, and to receive fifteen, free. As it was not necessary that the letter should be either written by or to the privileged person, the privilege was greatly abused; and most persons whose memories reach back to the period when it existed, will remember family arrangements for taking advantage of it, by which the whole correspondence of the kindred, connections, and even the intimate acquaintances of a peer, or a member of parliament, was in general carried on duty free.

Up to the passing of the last-mentioned statute (12th July 1837), all that was requisite was that the member should write his name or title on the corner of the letter. From this time, however, till the abolition of the privilege, it was required that the whole address should be written by the member; that he should add not only his name, but the name of the post-town, and the day of the month; and what was most troublesome of all, that the letter should be posted on the day on which it was written, or the following day, and in a post-town within 20 miles of which the person franking was then actually resident. By this cruel regulation (7 Will. IV. and 1 Vict. c. 35, s. 9), the kindly custom of giving frank to friends, or leaving them with them for future use, was rudely interfered with, and the public mind reconciled to the final abolition of what many regarded as a time-honored abuse.

FRANKALMOIGNE (Lat. *libera elemosyna*, free alms) was a gift of lands to those who were consecrated to the service of God. By the ancient common law of England, a man could not alien lands which came to him by descent without consent of his heir, but he might give a part to God in free alms. It was an old Saxon tenure, and continued under the Norman revolution, through the great respect that was shown to religion and religious men. This is the tenure by which almost all the ancient monasteries and religious houses held their lands, and by which the parochial clergy and very many ecclesiastical foundations held them at this day. The statute of 12 Car. II. c. 24, which abolished the old tenures, specially reserved tenure in frankalmoigne. The condition on which lands in frankalmoigne were held was, that masses and divine services should be said for the grantor and his heirs, but no particular service was specified. At the Reformation, the nature of the services was changed, but the tenure was suffered to continue. A tenant in frankalmoigne did no fealty to his overlord, and in the event of failure to perform the service, the latter was not entitled to distrain, but might complain to the ordinary or visitor. In this respect, this tenure differed from tenure by divine service, i. e., where lands were given on condition of performing a specified service, as say a mass on a particular day, or distributing certain alms. In this case, the tenant was bound to render fealty, and the lord was entitled to distrain on failure to perform the service. But lands held in frankalmoigne were subject to the *trinoda necessitas*, of repairing highways, building castles, and repelling invasions. Frankalmoigne was a tenure, to be held of the grantor and his heirs; all lands, therefore now held in frankalmoigne, unless created by the crown, must have been granted before the reign of Edward I., for by *Quia emptores*, 18 Edw. I., all grants by subjects to be held of the grantor and his heirs are ineffectual. In Scotland, lands conveyed to the church in *puram elemosynam* were said to be mortified. See *MORTIFICATION*.

FRANKENBERG, a flourishing manufacturing town of the kingdom of Saxony, is situated on an affluent of the Mulde, 32 miles S.W. of Dresden. It has manufactures of cottons, woollens, silk-stuffs; also dye-works and cigar manufactories. In addition to the other elementary and advanced educational establishments, F. possesses a trade school and an agricultural seminary. Pop. (1880) 10,913.

FRANKENHAUSEN, a small town of Germany, in Schwarzbürg-Rudolstadt, stands on the Wipper, 27 miles N.N.W. of Weimar. It has a palace, a higher school, and a seminary for teachers. There are here very productive salt springs, a large sugar-refinery, with manufactories of cigars and articles in mother-of-pearl. In the neighborhood are anthracite mines. Pop. (1880) 4985. F. figures in history as the scene of a battle between the rebellious peasants under Thomas Münzer, 15th May 1525,

and the Saxon, Brunswick, and Hessian troops, in which the former were defeated.

FRANKENSTEIN, a small but active town of Prussia, in the province of Silesia, is situated on a height on the left bank of the Paase, 37 miles south-south-east of Breslau. Six miles south-west of F. is the mountain fortress of Silberberg (still existing, but not maintained as a fortress since 1860), the defences, bastions, and casemates of which are almost entirely hewn out of the solid rock. These works were constructed by Frederick the Great, in order to command the passage from Bohemia. Pop. (1880) 7861, who are engaged in the manufacture of broadcloth, linen, aquafortis, strawplait, saltpetre, &c.

FRANKENTHAL, a prosperous manufacturing town of Germany, in the Bavarian Palatinate, is situated on the Isenach, 16 miles north-north-west of Spire. From the town, a canal between 50 and 60 feet broad extends east to the Rhine, a distance of three miles. It has important cloth manufactures, cotton and linen weaving, and manufactures of gold and silver wire, and of needles, files, and tobacco. Pop. (1880) 9043.

FRANKFURT-ON-THE-MAIN (Ger. *Frankfurt am Main*), a city in the Prussian province of Hessen-Nassau, is situated on the right bank of the Main, in lat. 50° 6' N., and long. 8° 41' E. Till 1866, F. was the foremost, as it was the most ancient, of the four free cities of the German Confederation, and the seat of the Diet. The city lies in a wide and fertile valley at the mouth of the Main, and is encircled by a belt of villas, gardens, vineyards, and orchards. In respect of commerce and wealth, F. is one of the most important cities of Germany; pop. (1875) 103,315, of whom upwards of 7000 are Jews; with suburbs (1880) 137,600. F. is the center from which radiate public roads and railways to every part of Germany; while its site on the banks of the Main, 20 miles from its confluence with the Rhine, by affording it a direct channel of water-communication with the German Ocean, secures to it great advantages as a seat of commerce. Its central position has pointed it out from the earliest ages of the history of Germany as a suitable place for national meetings, and in 794 Charlemagne convoked a council here.

In 843, F. was made the capital of the eastern Frankish empire, and continued so till 889, when Arnulf transferred that honor to Ratisbon; in 1257, F. was raised to the dignity of a free city; and in 1356, Charles IV. confirmed by the famous 'Golden Bull' the right, which it had enjoyed since the days of Frederick Barbarossa, of being the place for the election of the emperors of Germany. The Guildhall, or *Roemer*, contains the *Wahlzimmer*, or Hall of Election, in which the Electors (q. v.) met to deliberate on the nomination of the emperors, and the *Kaisersaal*, or Imperial Hall, in which the newly elected monarch held his public dinner, at which he was waited upon by the counts and high officers of the empire, who held their respective domains and offices in right of their performing various acts of service on that occasion. Round this hall are ranged in niches the portraits of the emperors from Conrad to Leopold II. The Golden Bull is preserved among the archives. The ancient cathedral, St. Bartholomew's, contains the chapel in which the electors accepted the emperor after he had been anointed at the high-altar. F. still contains many old and narrow streets with high-gabled projecting houses, but its ancient walls and ramparts have been converted into pleasure-walks, and there are now broad quays, and wide handsome streets in the more modernized parts of the city. The gates of the famous *Juden-gasse*, which were closed at night to prevent the egress of the Jewish inhabitants, were razed at the time of the French occupation in 1806; and the street is now more than half demolished, almost the whole of the western side having been pulled down. F. is connected with its suburb, Sachsenhausen, which lies on the left bank of the Main, by three bridges (one dating from 1342, another finished in 1878), besides the railway bridge and a wrought-iron suspension bridge for foot passengers. There are fountains in several of the squares, one of which is adorned with a fine statue of Goethe, who was born at F., and another with a group commemorative of the invention of printing. F. possesses several good public libraries, museums, and galleries, and many charitable institutions. It derives great wealth from its banking transactions; the aggregate capital of its bankers, among whom the name of the Rothschilds has long stood foremost, is said to be about 20 millions sterling, and the annual transactions in bills of exchange about 12 millions sterling. Its manufacturing industry has greatly extended since the annexation of Prussia; to the former manufactures of snuff, tobacco, jewelry, printers' black, wax-cloths, and carpets, have been added type-founding, chemical works, and the manufacture of sewing-machines on a large scale. As a free city, F. possessed a small territory of about 39 square miles outside its precincts, and was governed by 2 burgomasters (elected annually), 4 syndics, a civic committee of 21 members, and a legislative chamber of 57 members; the highest court of appeal was the supreme tribunal at Lübeck. The Constituent Assembly elected in 1848 to frame a constitution for Ger-

many, held its sittings at F. At the outbreak of the Austro-Prussian war in 1866, F. chose the side opposed to Prussia. On the 16th July, General von Falckenstein entered the city, a fine of 31 millions of florins being imposed; and on the 18th October F. was formally incorporated with the Prussian state. It was in F. that peace was finally concluded between Germany and France in 1871, the treaty having been signed on the 10th May, in the Swan Hotel here, by Bismarck and Jules Favre.

FRANKFURT-ON-THE-ODER, the capital of an extensive Prussian circle of the same name in the province of Brandenburg, is a place of considerable trade, on the railway line between Berlin and Breslau, and about 50 miles east of the former city. F. lies in lat. 52° 22' N., and long. 14° 33' E. Pop. in 1880, 51,147. It is a handsome, well-built town, and has three suburbs, one of which lies on the right bank of the Oder, and is connected with the remainder of the town by a wooden bridge. Of the six Protestant churches, St. Mary's, founded in the 13th c., is the most worthy of notice, for its large organ, richly gilt wood-carvings, and fine stained windows. The university, founded in 1506, was incorporated in 1811 with that of Breslau, but F. still has its distinct gymnasium, with its branch-schools. Three great fairs are still annually held at F., but although they are still attended, as of old, by many Poles and Silesians, sales are less brisk than in former times. F. has manufactures of ironware, porcelain and pottery, sugar, felt, bone-dust, liquors, chocolate, paper, leather, silk, and wool stuffs. Its situation on a navigable river, connected by canals with the Vistula and the Elbe, affords great commercial and social advantages, which have rendered it a place of importance from a very early period. It was a flourishing member of the Hanseatic League, and during the middle ages it suffered frequently at the hands of marauding enemies. It was besieged in 1430 by the Hussites, in 1450 by the Poles, and in 1477 by the Duke of Sagan. In the Thirty Years' War, it was frequently taken by both parties, and at the beginning of the present century it suffered severely at the hands of the French. F. is the seat of the administrative government, judicial tribunal, council of nobility, and boards of taxation for its circle. The village of Kunersdorf, 4½ miles from F., was the scene of a great battle, fought August 13, 1759, between Frederick the Great and the Russo-Austrian forces, in which the former was compelled to retreat with great loss.

FRANKINCENSE (*thus*), a name employed to designate various fragrant resinous substances which diffuse a strong fragrance in burning, and are on that account used in certain religious services. There is good reason to believe that the frankincense of the Jews, and also of the ancient Greeks and Romans, was chiefly or entirely the substance now known as *Olibanum* (q. v.), the produce of an Indian tree, *Boswellia serrata* or *thurifera*. See BOSWELLIA. It was formerly supposed to have been obtained from the *Juniperus Lycia*, which is now believed not to yield any such product, and is a native of the south of Europe, whilst the prized frankincense of the ancients was brought from the East.—Several trees, however, of different natural orders, yield substances used as frankincense instead of olibanum, in different parts of the world, as several species of *Icica* and of *Croton* in America; and the silver fir (see FIR) in Europe, the resinous product of which is the COMMON FRANKINCENSE of the pharmacopœias, although in the shops, concrete American turpentine is very often sold under this name. It is used in the composition of stimulating plasters, &c. *Burgundy pitch* is made from it. It is a spontaneous exudation from the tree, hardening by exposure to the air, and generally of a whitish or pinkish color, with a rather agreeable odor and a balsamic taste.

FRANKLIN The franklin, or, according to the old spelling, the frankelín, was the English freeholder of former times, who held his lands of the crown, free (frank) from any feudal servitude to a subject-superior. Chaucer's *Franklin's Tale*, and still more his description of the franklin in the prologue to his immortal *Pilgrimage*, have rendered him a classical character. In the whole circle of our literature there is probably no more perfect picture of the person, habits, and surroundings of a jovial old country gentleman. His beard was white as a daisy, his complexion sanguine, he loved a 'sop in wine,' and woe to his cook if his sauce were not poignant and sharp; in a word, 'he was Epicurus' oven son.' But the franklin's luxuries were not intended for his own enjoyment alone, for 'a householder, and that a great, was he.' His table stood 'in his hall alway,' 'ready covered all the longe day;' and

Withouten baked meat never was his house,
Of fish and flesh, and that so plenteous,
It snowed in his house of meat and drink.

Nor was it only in dispensing good cheer that the franklin fulfilled the functions of the country gentleman of his day. At sessions, he was 'lord and sire,' and full often time he had been 'knight of the shire.' He had been sheriff too, and a countour and vavassour; though what these latter offices were, is a subject of contro-

versy amongst the commentators. 'The dress of the franklin, according to the Duke of Sutherland's MS.,' says Mr. Saunders, in his excellent little book called *Cabinet Pictures of English Life* (p. 204), 'was a surcoat of red lined with blue, with bars or stripes of fringe or lace over it. He wore a small blue hat turned up, and black boots.' Chaucer adds to his attire a knife or dagger called an 'anelace,' and a 'gipciere' or silk purse, 'white as morrow [morning] milk,' at his girdle. Mr. Saunders mentions (*at sup.*) that in the *Metrical Chronicle* of Robert de Brune, the franklin of an earlier period (13th c.) is ranked immediately after earls, barons, and lords, and was evidently a person of great consideration. Such, as we have seen, was very much his position in Chaucer's time, but he seems to have fallen in dignity, and we find him in much lower company in Shakspeare's day. In *The Winter's Tale* the clown is made to say (Act v. scene 2):

Not swear it, now I am a gentleman
Let boore and franklin say it, I'll swear it.

From other passages it would seem that his position had come to correspond to that of the well-to-do yeoman. In 1 Henry IV., Act ii. scene 1, we hear of a franklin 'in the wold of Kent hath brought three hundred marks with him in gold;' and *Cymbeline* says (Act iii. scene 2), 'Provide me presently a riding suit, no costlier than is fit a franklin's housewife.' There seems no reason to think, however, that Dr. Johnson's remark that franklin is 'not improperly Englished a gentleman servant,' is warranted by his position at any period, and it certainly is not by the passage which he quotes from the *Fairy Queen*:

A spacious court they see, &c.,
Where them does meet a franklin fair and free.

FRANKLIN, BENJAMIN, a distinguished American statesman and natural philosopher, was born at Boston January 17, 1706. His parents were poor, and had a family of seventeen children, he being the fifteenth. Josiah Franklin, his father, had left England in 1685, and settled in America, where he followed the business of soap-boiler and tallow-chandler. At the age of eight, F. was sent to school, where he displayed great aptitude for learning. At twelve, he was apprenticed to his step-brother James, who had set up a printing-shop in the place, and he soon acquired considerable proficiency at the trade. He was passionately fond of reading, and all the time he could spare, he devoted to the perusal of such books as he could lay his hands on. He early attempted poetry, and when, in 1720, his brother started a newspaper, he contributed a number of anonymous articles to it; but on the fact being discovered, his brother treated him very harshly. After one of the frequent quarrels with his brother he determined to quit him; and accordingly, without the knowledge of his family, he left Boston and proceeded to New York; but not finding employment there, he went next to Philadelphia, where he succeeded in procuring a situation in a printer's shop. Here he attracted the attention of Sir William Keith, the governor of Pennsylvania, who advised him to set up a printing-establishment of his own. Thinking this good advice, he set out for England, with a view to obtain the necessary plant. Finding himself, however, deceived in his expectations of assistance from Keith, and having no resources of his own, he was compelled to take employment in London, where he resided for about a year. On his way back to Philadelphia in 1726, he made the acquaintance of a merchant named Denham, who gave him the situation of book-keeper in his office; but Denham dying soon after, F. went back to his old trade, and, with the assistance of some friends started in business for himself. In 1730, he married a Miss Read, with whom he had become acquainted previous to his visit to England. Matters now prospered with F.; he became the proprietor and editor of a newspaper (*The Gazette*) which attained a high degree of popularity, and projected in 1732 *Poor Richard's Almanac*, in which appeared the well-known maxims afterwards published under the title of *The Way to Wealth*, and translated into various languages. Through the instrumentality of F., a public library was founded in 1732, the first established in Philadelphia. He also founded in 1738, the first association for extinguishing fires, and at a later period the first company for insurance against fire; and in many other ways he contributed to the social and material progress of the city of his adoption. Among the public offices to which he was appointed were those of clerk to the General Assembly of Pennsylvania in 1736; postmaster of Philadelphia in 1737; representative of Philadelphia in the Assembly 1747. In 1753, he was appointed deputy postmaster-general for the British colonies. In 1757, he was sent to England to settle some matters for the Assembly, and so ably did he perform his task, that Massachusetts, Maryland, and Georgia severally appointed him their English agent.

Notwithstanding the multiplicity of his public duties, he found leisure to pursue his scientific investigations with such success as to gain for himself a lasting name in the world of science, as well as to merit the gratitude of the community in general. In 1752, he discovered the identity of electricity with lightning, and turned his discovery to account by publishing a plan for defending

houses from lightning by the use of pointed conductors. He likewise made important discoveries with regard to the laws that regulate the electric fluid, a subject hitherto very imperfectly understood. His renown was spread over the whole civilized world, and honors were heaped upon him by the various learned societies of Europe. The Godfrey Coley gold medal was bestowed upon him by the Royal Society of London, which also nominated him one of its members. The universities of Oxford, St. Andrews, and Edinburgh respectively conferred upon him the degree of D.C.L. He was made an associate of the Academy of Sciences at Paris, as Leibnitz and Newton had been before him.

During his residence in England he became intimate with some of the most distinguished men both of Britain and of the continent; his correspondence with them indicates the combination in a remarkable degree of a cultivated mind with a vivid imagination. In 1762 he returned to America; but new difficulties arising between the mother country and the colonies, which determined the Assembly to demand the establishment of a central government, he was again despatched to England as its agent. He strongly opposed the stamp act, and was examined at the bar of the House of Commons in 1766, when the repeal of that offensive measure was proposed. In consequence of the position he assumed on this occasion, he was deprived of the postmastership, and treated very harshly by the ministry. Despairing of bringing about any reconciliation between the disputants, he returned to Philadelphia in 1775, where the Congress was at that time assembled. He was elected a delegate to it; and from that time he exerted himself to the utmost to obtain a declaration of the independence of the thirteen American states. This declaration was pronounced by Congress on the 4th July 1776, and F. was appointed United States minister at the court of France, where he succeeded in inducing the French government to form an offensive and defensive alliance with the States. On the 20th of January 1782, F. had the supreme satisfaction of signing at Paris, along with the English commissioners, the treaty of peace by which the independence of the American colonies was assured. Returning to America in 1785, he was successively chosen member and president of the supreme executive council for the city of Philadelphia, and in 1787 delegate for Pennsylvania to the convention for the revision and emendation of the Articles of Union. In 1788, he retired from public life, and died April 17, 1790, at the advanced age of 84. The Congress, as a testimony of the gratitude of the thirteen states, and of their sorrow for his loss, appointed a general mourning throughout the States for the period of two months.

F., in all his labors, was ever actuated by an intense desire to promote the well-being and happiness of his fellow-men; and few have been more successful in their aims. From poverty he rose to wealth, and from ignorance and obscurity to extensive erudition and honorable renown; gaining for himself the admiration of Europe and the gratitude of America.

In person, F. was about 5 feet 9 or 10 inches in height, and well and strongly made. He had a fair complexion and gray eyes, while his manners were extremely winning and affable. None of his descendants bears his name; the last who did so being his grandson, William Temple Franklin, who died in 1823. There are many descendants of his daughter, who married a Mr. Bache.

The works of F. appeared in London in 1806. His memoirs, &c., were published in 1817; a complete edition of his works, in 1836-40. In 1874, Bigelow published a new edition of F.'s autobiography (originally published in a French translation), from the original autograph. See Parton's *Life and Times of F.*, 1864.

FRANKLIN, REAR-ADMIRAL SIR JOHN, an English naval officer of distinguished reputation, was born at Spilsby, in Lincolnshire, April 16, 1786. He was descended from a long line of freeholders, and was the youngest son of a respectable yeoman. F. received the rudiments of his education at St. Ives; afterwards he spent two years at the grammar school of Louth. It is stated that he was intended for the church, but as he displayed a decided predilection for the sea, his father wisely abandoned opposition to his choice of a profession, and procured him, in 1800, a midshipman's post on board the *Polyphemus* line-of-battle ship. In the following year, F.'s ship led the van in the desperate battle of Copenhagen. Two months after, he was removed to the *Investigator*, then fitting out under command of Captain Flinders, for discovery and survey of the Australian coast. In this expedition, F. had the companionship of the distinguished botanist Robert Brown, and of his coadjutor Ferdinand Bauer, and from them he learned the great importance of the natural sciences, in the promotion of which he ever afterwards took a deep and intelligent interest. On his return to England, F. was appointed to the *Bellerophon*, in which he acted as signal midshipman in the battle of Trafalgar (1805), and had the good-fortune to escape unhurt. He subsequently served in the *Bedford* on various stations, and took a distinguished part in the attack on New Orleans in

1814. In 1819, F. was despatched by government to Hudson's Bay, with orders to make his way thence to the Arctic Sea, and survey as much of the coast as possible. In the course of this expedition, which lasted about three years and a half, F. traveled 5550 miles under circumstances of the greatest hardship and privation, to which more than half of his companions succumbed. But the gain to science was great, alike from the carefulness and extent of the physical surveys of the mouth of the Coppermine River, and eastward along Coronation Gulf, and from the attention devoted to the natural productions of these inclement shores.

On his return, in 1822, F. was made post-captain, and elected a Fellow of the Royal Society. In 1825, he co-operated (overland) with the sea-expeditions of Captains Parry and Beechey, and surveyed the North American coast from the mouth of the Coppermine westward to about Point Beechey. F.'s discoveries now extended over 44 degrees of longitude, or more than a third of the distance between Baffin's Bay and Behring's Strait. For these valuable explorations, in which he was engaged until 1827, he received the honor of knighthood from his sovereign, and the degree of D.C.L. from the university of Oxford, while the French Geographical Society awarded him their gold medal, and at a subsequent period he was elected corresponding member of the Institute of France. F. next took an active part in the Greek war of liberation. In 1836, he was appointed governor of Van Dieman's Land, where his wise and moderate conduct secured for him the warm approbation both of the government and the colonists. The latter established a college and philosophical society in his honor; and years after, they testified that the memory of his rule was still gratefully cherished, by subscribing £1600 towards an expedition designed for his rescue. In May 1845, F., now bordering on his 60th year, but with physical and mental powers undiminished in vigour, started with the *Erebus* and *Terror* on his last and ill-fated expedition to discover the North-west Passage. The last time that the vessels were seen was in July of the same year. To enter into the history of the efforts undertaken for the relief or discovery of the fate of F. would be out of place here. It is sufficient to say that in the course of eleven years upwards of twenty separate expeditions, at the cost of about a million sterling, were sent out to look for the missing crews; and the discoveries of these expeditions added more to our knowledge of the arctic regions than all previous explorations had done. See NORTH-WEST PASSAGE. It was not until 1859 that the fate of F. was ascertained by the commander of a little vessel fitted out by Lady Franklin, after hope had been declared hopeless by all else. It then appeared that F. had died on the 11th June 1847, fortunately before his sympathetic heart had been lacerated by witnessing the awful sufferings of his men. F. was one of the boldest and most persevering explorers, and from the work ascertained to have been done before the collapse of the expedition, is now fairly regarded as the discoverer of the North-west Passage. Additional light was thrown on the fate of his crews by a memorable sleighing expedition under Lieutenant Schwatka in 1879-80.

FRANKLIN, JANE, LADY, the second wife of Sir John F., to whose unwearied energy, devotion, and hopefulness, when hope had sunk in all other hearts, we are indebted for the knowledge of the fate of her gallant husband, was the daughter of John Griffen, Esq., of Bedford Place, London, and was married to Sir John Franklin in November 1826.

In 1848, when, owing to the long absence of news about the expedition of the *Erebus* and *Terror*, fears began to be entertained about its safety, Lady F. offered large rewards to any persons who should discover and relieve the missing voyagers, or who would make exertions with that end in view. From that time until 1857, when she fitted out the *Fox*, under McClintock, whose discoveries set all doubts about the fate of her husband's expedition at rest, Lady F. never rested in her efforts to incite by voice, pen, and purse, her own countrymen and Americans, to search for the missing ships. Her interest in Arctic exploration never flagged up to her last illness and death in 1875.

FRANKMARRIAGE (*liberum maritagium*) was a species of estate tail existing by the common law of England; for where a man on the marriage of his daughter or cousin, gave lands to be held in frankmarriage, this implied a gift in especial tail, to the donees and heirs of their bodies. This tenure was called *liberum maritagium*, to distinguish it from other species of estates tail (*Co. Litt.* 94 b). Four things were necessary to a gift in frankmarriage: 1. That it must be in consideration of a marriage, but it might be as well after as before a marriage. 2. That the donee with whom it is given be of the blood of the donor. 3. That the donees should hold of the donor. Hence a gift in frankmarriage by a subject became impossible after the statute of *Quia emptores*. 4. That the donees should hold for four generations. Therefore a gift in frankmarriage with a reservation of a remainder to a stranger, or a devise by will, was bad.

FRANK-PLEDGE, a law prevailing in England before the Norman Conquest, whereby the members of every tything were

responsible for the good-conduct of each other. This responsibility, according to Mr. Hallam, consisted in every ten men in a village being answerable each for the others, so that if one committed an offence, the other nine were liable for his appearance to make reparation. Should the offender abscond, the tything, if unable to clear themselves from participation in the crime, were compelled to make good the penalty. This law has been ascribed to Alfred the Great; but it would appear to have been in existence at a much earlier period. Mr. Hallam, *Middle Ages*, ii p. 80 (ed. 1841), observes: 'The peculiar system of frank-pledges seems to have passed through the following very gradual stages. At first, an accused person was bound to find bail for standing his trial. At a subsequent period, his relations were called upon to become securities for payment of the compensation and other fines to which he was liable; they were even subject to be imprisoned until payment was made, and this imprisonment was commutable for a certain sum in money. The next usage was to make people already convicted, or of suspicious repute, give securities for their good-behavior. It is not till the reign of Edgar that we find the first general law, which places every man in the condition of the guilty or suspected, and compels him to find a surety who shall be responsible for his appearance when judicially summoned. This is perpetually repeated and enforced in later statutes during his reign and that of Ethelred. Finally, the laws of Canute declare the necessity of belonging to some hundred and tything, as well as of providing sureties.'

The *Court of Frank-pledge*, or *Court-leet*, is a court of record held once in the year, and not oftener, within a particular hundred, lordship, or manor, before the steward of the leet: being the king's court granted by charter to the lords of those hundreds or manors. All freeholders resident in the jurisdiction are bound to attend this court; but persons under twelve and over sixty years of age are excused, and by the statute of Marlbridge, 52 Hen. III. c. 10, all prelates, peers, and clergymen, and women are discharged from attendance. It was also the custom to summon all the king's subjects to this court, on attaining years of discretion, to take the oath of allegiance. The business of this court was to present by jury all crimes committed within their jurisdiction, and to punish all trivial misdemeanors. This court has practically fallen into desuetude, and the business is discharged by the justices of the peace at general and petty sessions. See Blackstone's *Commentaries*. Originally, the business of the court frank-pledge was confined to the taking securities or free pledges for every person within the jurisdiction; but this practice having fallen into disuse, the court gradually acquired a criminal jurisdiction, concurrent with that of the sheriff's tourn. '*Magna Charta* distinguishes between the tourns or leets of sheriffs and the view of frank-pledge; limiting the former to twice a year, and the latter to once. In the more ordinary sense, frank-pledge and leet are synonymous, as appears from the style of tourns and other leets, which in court-rolls are usually denominated *curia* or *visus franci plegii*. But when free pledge is used, as in *Magna Charta*,' it should be understood in a strict and particular sense.'—*Co. Litt.* by Hargrave, 115 a, note 10.

FRANKS (i. e., freemen) was the name assumed by a confederation of German tribes that appeared on the Lower Rhine in the 3d c., and afterwards overthrew the Roman dominion in Gaul. It was only the name, however, that was new; the individual tribes composing the confederation had been known on the Rhine as early as the time of Augustus. The most important of these were the Sigambri, Chamavi, Amsivarii, Chatti, Chattiarii and Bructeri of the time of the first emperors. In the 3d and 4th centuries, hordes of them began to pour through the Low Countries into Gaul, until at last the country became their prey. After the middle of the 4th c., they appear divided into two groups, the Salians—either from the old Ger. *Sal*, or the river Sala (*Yssel*)—and the Ripuarians (*ripa*, the bank), the first inhabiting Holland and the Low Countries, the last on both sides of the Rhine as far up as the Main. Each group had its own laws, afterwards committed to writing (*Lex Saliica* and *Lex Ripuariorum*). Like the two peoples, these laws differ little even in detail. The F. were a mobile, well-endowed race, forming in language and art the transition from the Low Germans to the High; and they compose to this day the ground of the population of the west of Germany as far as the Neckar, Main, Murg, and Lower Alsace, as well as the chief Germanic element of the population of Northern France. For the later history of the Franks, see articles CLOVIS, CARLOVINGIANS, CHARLEMAGNE, FRANCE, MEROVINGIANS, &c.

FRA'NZENSBRUNN, or FRANZENSBAD, a small village and well-known bathing-place in Austria, on the north-western frontier of Bohemia, three miles north-west of Eger, is situated amid low bare hills, and consists of four rectangular streets lined with trees. It has four cold mineral springs, chiefly of alkaline chalybeate water, deemed highly efficacious in the cure of serofulous complaints and diseases of the skin, and used principally for drinking, but also for bathing purposes, in which case

the water is heated to a temperature of 90° to 98° F. Nearly 200,000 bottles of these waters are exported annually. F. has also mud and gas baths.

FRANZ-JOSEF LAND, an archipelago in the Arctic Ocean, north of Nova Zembla, just beyond the parallel of 80°. Its land-masses are mountainous, at least one peak being 5000 feet high. The archipelago was discovered by the Payer-Weyprecht expedition in 1873, and named after the Austrian emperor. It was visited by the *Willem Barents* in 1879, and the south coasts were explored by Leigh Smith in 1880.

FRASCA'TI, a beautiful town about eight miles east-south-east of Rome, with a population of 7000. It stands on the lower heights of the Alban Hills, not far from the site of ancient Tusculum, which was burned and ruined by the Romans in 1191 A.D. The chief attractions of F. are its lovely villas and salubrious air, which render this resort in the Alban Hills the most fashionable *villeggiatura* in the vicinity of the Eternal City. The most splendid of these summer residences are the villas Aldobrandini, also known as Il Belvedere, from its commanding and noble prospect; those of Mondragon and Taverna of the Borghese family; the villas Pallavicini and Piccolomini.

The cathedral contains a tablet to the Cardinal of York, for many years bishop of this diocese, and another to his brother, Charles Edward, the Young Pretender, who died here in 1788.

FRASER, SIMON. See LOVAT, LORD.

FRASER RIVER, the principal stream of British Columbia, comprises in its basin the far greater part of the colony. The F. R. proper has its origin in the union of two branches, the more important of which receives its waters from a series of lakes that lie in lat. 54°—55° N., long. about 124° 50' W., flows in a general south-east direction for 260 miles, and then unites with the other branch, which has its source near Mount Brown, in the Rocky Mountains, lat. 53° N., long. 118° 40' W., flows north-west, and is 200 miles in length. The point of confluence is near Fort George, in lat. about 53° 25' N., and in long. about 122° 40' W., and hence the F. R. flows in a generally southern direction through nearly the whole length of the colony, and after a total course of 740 miles it falls into the Gulf of Georgia between Vancouver's Island and the mainland, barely to the north of the international boundary of 49° of latitude. Its chief affluents are the Stuart and the Chilcotin on the right, and the Thompson on the left.

Between the Stuart and the Chilcotin, and on the same side, the F. R. is joined by an affluent, which is rather of historical interest than of physical importance—the West Road River, which took its name from its having been ascended by Sir Alexander Mackenzie, on his adventurous journey of 1793 from the Hudson's Bay Territories to the Pacific Ocean. The F. R. is practicable for steamboats as far up as Fort Hope, a distance of about 150 miles from its mouth, while about half the distance, as far as New Westminster, it is navigable for large ships. Above Fort Hope, all intercourse is more safely and conveniently conducted by land; and even the aborigines, as their trails still testify, appear to have yielded to the same necessity.

In 1857, the F. R., in its auriferous diggings and washings, began to stand forth as the rival of California and Australia. Since then, the discoveries, originally confined to the lower basin, have steadily become at once more extensive and more productive. Eastward on the Thompson, and more especially northward among the upper waters of the great artery of the country, the precious deposit has sometimes given almost fabulous returns. The mining operations here are, however, almost wholly in the hands of Chinese and Indians. It was estimated that during the year 1875 they secured gold to the amount of 50,000 dollars (over £10,000). Specimens of silver have also been found on the F. R., so rich as to justify the construction of extensive works. Happily for the country, the days of easy gains and wicked waste have passed away. Since 1862, washings and surface diggings have been succeeded by systematic mining and steady labor. The F. R., its tributaries, and the numerous lakes communicating with them, furnish great facilities for the transport of timber. The lower Fraser country is especially densely wooded. A steamer runs as far up the river as Yale. The salmon of the F. R., of which there are five species, are justly famous.

FRA'SERA, a genus of plants of the natural order *Gentianeæ*, with a 4-partite calyx and corolla, 4 stamens, and a 2-valvular capsule. *F. Walteri*, a native of Carolina, Virginia, and great part of the basins of the Ohio and Mississippi, is often called American Calumba, the root being imported into Europe under that name. It is a pure and valuable bitter, similar in its effects to gentian. The stem is herbaceous, erect, 3—6 feet high; the leaves oval, oblong, opposite and whorled; the flowers greenish yellow. The plant is a biennial. It grows in marshy places.

FRA'SERBURGH, a burgh of barony and regality and seaport on the north coast of Aberdeenshire, 42 miles north of Aberdeen. It stands on the north-west side of a bay two miles in depth im-

mediately south of Kinnaird's Head (supposed to be the *Taiyalorum Promontorium* of the Romans), on which is the Wine Tower, an old castle with a cave below. The town, originally called Faithly, was made a burgh of barony by Queen Mary in 1546. Its name was changed into Fraserburgh (in honor of its proprietor, Sir Alexander Fraser of Philorth) by King James VI. in 1592; and the same king, in 1601, erected it into a free port, free burgh of barony, and free regality.

The streets are wide and clean, with substantial houses. Pop. of parish in 1881, 7552, annually increased to 10,000 during the herring-fishing in July and August. It is possessed of one of the best harbors on the east coast, which has lately been greatly extended, and has a patent slip attached to it. The chief exports are oats, barley, meal, potatoes, cured herrings, and cod. F. is now one of the most successful herring-fishing stations on the east coast of Scotland, the average number of boats being between 700 and 800. Since 1865, it has been connected with Aberdeen by railway. F. has a handsome cross and town-house in the principal square, and a spacious hall belonging to the Harbor Commissioners. Sir Alexander Fraser, in 1592, obtained a charter for the establishment of a college and university here, but the plan was never carried out.

FRASIER, a strawberry flower, is used by Scotch heraldic writers as synonymous with a cinquefoil; as in blazoning the coat of the Frasers, *Azure three frases* (Nisbet, i. p. 388).

FRATE'RCULA. See PUFFIN.

FRATICE'LLIANS, or FRATICELLI ('Little Brethren'), a sect of the middle ages, which may be regarded as an embodiment, outside of the medieval church, of the same spirit to which is due, within the church, the Franciscan order with its many offshoots. The Italian word *Fraticelli* originally was the popular name of the Franciscan monks; but, in the progress of the disputes which arose in the order (see FRANCISCANS), the name was specially attached to the members of the rigorist party, and eventually to those among them who pertinaciously refused to accept the pontifical explanations of the monastic rule, and, in the end, threw off all subjection to the authority of the church. Several of the popes, especially Gregory IX. and Nicholas III., attempted to reconcile the disputants. Pope Celestine V. granted permission to the rigorists to form for themselves a separate organization, in which the rule of St. Francis might be observed in all its primitive and literal rigor. The suppression of this order by Boniface VIII. appears to have furnished the direct occasion for the secession of the extreme party from the church. They openly resisted the authority of the pope, whom they proclaimed an apostate from the faith. The party thus formed was increased by adhesions from other sectarian bodies, as the 'Beghards' and the 'Brethren of the Free Spirit' (see FREE SPIRIT). In vain Clement V., in the council of Vienna (1311—1312), put forward a new declaration regarding the rule of St. Francis. They still held their ground, especially in Sicily, Central and Northern Italy, and Provence. John XXII., against whom they sided actively with Lewis of Bavaria, condemned them by a special bull in 1317, and again in a similar document directed against Henry de Ceva, one of their chief leaders in Sicily.

From these sources we learn that they regarded the existing church as in a state of apostasy, and claimed for their own community the exclusive title of the Church of God. They forbade oaths, and discountenanced marriages. They professed a divine mission for the restoration of the Gospel truth. They held that all spiritual authority was forfeited by sin on the part of the minister. It would even appear that they proceeded so far as to elect for themselves a pope, with a college of cardinals, and a regular hierarchy (Wadding, *Annal. Min. Fratrum ad an. 1374*, n. 20). Their principles, in a word, seem to have partaken largely of the same fanatical and anti-social tendencies which characterized the Brethren of the Free Spirit; and in common with them, the F. were the object of a rigorous persecution about the middle of the 14th century. The principles of this sect formed the subject of a public discussion at Perugia in 1374 between them and a Franciscan monk named Paolucci, which appears to have ended in their discomfiture. They still maintained themselves, nevertheless, in Central Italy, down to the 15th c., when John de Capistran received a commission to labor for their conversion in the March of Ancona; but before the beginning of the following century, they seemed to have disappeared altogether. See Mosheim, *De Beghards et Beguinabus* (Lipsie, 1790); Milman's *Latin Christianity*, vol. v.; Herzog's *Real-Encyclopædie*.

FRATTA-MAGGIO'RE, a town of Italy, six miles north-east of the city of Naples, has extensive rope-works, and furnishes great quantities of strawberries for the market of the capital. Silk-worms are here reared in great quantities. Pop. about 11,000.

FRAUD. By the laws of all civilized nations fraud invalidates obligations. In order to produce this effect, however, it is neces-

sary that the misrepresentations, or other dishonest manoeuvres of the offending party, shall have induced the other to enter into the agreement or contract, and that he would not otherwise have consented. Fraud of this description on the one side produces *error in essentialibus* on the other, and where such error exists there is no consent. But as consent is of the essence of the contract, there is here no contract at all; i. e., the contract, or pretended contract, is, as lawyers say, null *ab initio*. It is not necessary that the fraud which thus gives birth to the contract shall have consisted in positive misrepresentation, or even in studied concealment; and it is well laid down in the case of an English sale, that where the purchaser labored under a deception, in which the seller permitted him to remain, on a point which he knew to be material in enabling him to form his judgment, the contract was void. But there is another kind of fraud which, though it be not actually the cause of, is incident to, the contract, and which though it does not annul the contract, gives rise to an action for damages or restitution by the party deceived. The distinction between these two kinds of fraud was well-known to the civilians, the first species being described by them as that '*quod causam dedit contractui*,' that is to say, which causes the contract; the second as that '*quod tantum in contractum incidit*,' which is incident to, or accompanies the contract, but independently of which the contract would have been entered into (Voet. lib. 4, tit. 3, 3).

There is another very important element to be taken into account in judging of the character, and determining the legal effects of a fraud, viz., whether it proceeded from one whose position was such as to impose upon him the obligation of making the discovery. In illustration of this principle, the following case was put by Lord Thurlow in *Fox v. Mackreth* (2 Bro. Ch. R. 420): 'Suppose that A, knowing there to be a mine on the estate of B, of which he knew B was ignorant, should enter into a contract to purchase the estate of B for the price of the estate, without considering the mine, could the court set it aside? Why not, since B was not apprised of the mine, and A was? Because A, as the buyer, was not obliged, from the nature of the contract, to make the discovery. . . . The court will not correct a contract merely because a man of nice honor would not have entered into it; it must fall within some definition of fraud. The rule must be drawn so as not to affect the general transactions of mankind.' Neither will the commendations usually bestowed on their commodities by tradesmen be regarded as fraudulent statements, so long as they are simply extravagant in degree; but if positively at variance with facts known to them, they will not be permitted to enjoy the protection which custom has extended to ordinary 'puffing.' The same principle will yield the converse result wherever a relation of peculiar confidentiality exists between the contracting parties. Here courts of law require what is called *uberrima fides*, the fullest measure of good faith, to validate the transaction. As an illustration, may be mentioned a case in which the managing partner of a firm purchased the share of his co-partner for a sum which he knew from the accounts, of which he had the entire superintendence, to be inadequate, but the inadequacy of which he concealed. The transaction was reduced, Sir John Leach, V. C., remarking that 'the defendant being the partner whose business it was to keep the accounts of the concern, could not, in fairness, deal with the plaintiff for his share of the profits of the concern without putting him in possession of all the information which he himself had with respect to the state of the accounts between them.'—*Maddeford v. Austwick* 1 Gini. R. 89.

In addition to direct misrepresentation, and concealment in circumstances in which open dealing was a duty, fraud may be perpetrated by taking advantage of the imbecility of the party who has been led into the contract, and still more flagrantly by inducing this imbecility by intoxication or otherwise. See CONCEALMENT, ERROR, MISREPRESENTATION, CONTRACT. In addition to the ordinary English sources of information, we may refer to the extensive and learned *Traité du Dol et de la Fraude*, par J. Bédarride, 3 vols. (Paris, 1852).

FRAUNHOFER, JOSEPH VON, a distinguished practical optician, was born at Straubing, in Bavaria, 6th March 1787. In 1799 he was apprenticed to a glass-cutter in Munich, and in 1806 was received, as a working optician, into the establishment of Reichenbach and Utschneider at Benedictbeurn (afterwards, in 1819, removed to Munich). While there, he acquired considerable wealth through his inventions, and soon afterwards became proprietor of the establishment. He invented a machine for polishing parabolic surfaces, and was the first who succeeded in polishing lenses and mirrors without altering their curvature.

His prisms also were celebrated, being free from the blebs and striæ which are so often seen in those of English manufacture. His inventions are numerous, and include a 'heliumeter,' a 'micrometer,' an 'achromatic microscope,' besides the great parallax telescope at Dorpat. But that which has rendered F.'s name celebrated throughout the scientific world, is his dis-

covery of the lines in the Spectrum. He died at Munich on the 7th of June 1826.

FRAUNHOFER'S LINES. See SPECTRUM.

FRAUSTADT (Polish, Wszowa), a town of Prussia, in the government of Posen, is situated in a sandy plain on the Silesian frontier 55 miles northwest of Breslau. It has important grain markets, and near it are many windmills. Pop. (1880) 6755.

FRAXINELLA. See DITTANY.

FRA'XINUS. See ASH.

FRECKLES. See MACULÆ.

FREDERICIA, a seaport and fortress of Denmark, is situated on the east coast of the province of Jutland, on a projecting tongue of land, at the northern entrance to the Little Belt. It is fortified with nine bastions and three ravelins on the landside, and with two bastions towards the sea. It has several ecclesiastical edifices, a hospital, and a custom-house, at which toll used to be paid by ships passing through the Little Belt. Tobacco is grown and manufactured here. Pop. (1870) 7186.

FREDERICK (Ger. FRIEDRICH) I., OF GERMANY.—Frederick I., Emperor of Germany, surnamed BARBAROSSA (Red-beard), was born in 1121, succeeded his father, Frederick Hohenstaufen, as Duke of Swabia in 1147, and his uncle, Conrad III., as emperor in 1152. He was one of the most enlightened and powerful rulers who ever swayed the imperial sceptre. In his desire to emulate Charlemagne, and to raise the secular power of the empire in opposition to the arrogated supremacy of the papal chair, he was brought into constant collision with his Italian subjects. Six times he was compelled to cross the Alps at the head of great armies, in order to chastise the refractory cities of Lombardy, which were ever ready, on the slightest provocation to throw off their allegiance. In the early periods of his reign, he visited their defection with undue severity; but in his latter days his conduct towards them was characterized by a generous leniency and a politic liberality in advance of his age; and in 1183, he convoked a council at Constance, in which he finally agreed to leave the Lombard cities the right to choose their own municipal rulers, and to conclude treaties and leagues among themselves, although he retained his supremacy over them, together with the power of imposing certain fixed taxes. The difficulty of settling the Italian differences was as usual aggravated in F.'s time by the attitude assumed by the occupants of the papal chair, and one time Italy was distracted by the pretensions of the two rival popes, Alexander III. and Victor IV. who each excommunicated the other, and hurled the anathemas of the church against their several opponents; and it was not till 1176 that F., after his defeat at Legnano, by consenting to acknowledge Urban II., the successor of Alexander III., as the rightful pope, was enabled to turn his attention to Germany. By his energetic measures, he succeeded in thoroughly humbling his troublesome vassal, Henry the Lion, Duke of Brunswick, and thus crushing the Guelphic power in Germany.

F. made Poland tributary to the empire, raised Bohemia to the rank of a kingdom, and the markgraviate of Austria into an independent hereditary duchy. In 1189, F., having settled the affairs of the empire, and proclaimed universal peace in his dominions, resigned the government to his eldest son Henry, and, at the head of 100,000 men, set forth for the Holy Land, accompanied by his second son, Frederick of Swabia, the founder of the order of Teutonic Knights. After gaining two great victories over the Saracens at Philomelum and Iconium, he was drowned (1190) in a river of Syria, while trying to urge his horse across the stream. His remains were rescued by his son, and buried at Tyre. The death of F., which led to the dispersion of the Crusaders before any material advantage had been obtained over the Infidels, excited the deepest grief in Germany, where his memory has always been cherished as that of the best and wisest of his race. F. was a patron of learning, and enacted many admirable laws, some of which are still in force.

FREDERICK II., OF GERMANY, grandson of the former, and son of the Emperor Henry VI., and of Constance, heiress of Sicily, was born in 1194. His mother secured the favor of Pope Innocent III. for her infant son, by conceding many important privileges to the papal chair; and after the civil war which had raged in Germany for eight years between the rival claimants of the throne, Philip of Swabia and Otto IV., was brought to an end by the agency of Innocent, F. succeeded (1212) in obtaining the support of the German electors. On his promising to undertake a crusade, the pope sanctioned his coronation at Aix-la-Chapelle in 1215. Like his grandfather, F. was actuated by an ardent desire for the consolidation of the imperial power in Italy, at the expense of the pontificate, which he wished to reduce to the rank of a mere archiepiscopal dignity. Having secured the nomination of his son Henry to the rank of king of the Romans, and appointed Archbishop Engelbert of Cologne as his vicegerent, he left Germany; and after having been crowned emperor at Rome in 1220, devoted himself to the task of organizing his Italian territories.

He founded the university of Naples, gave encouragement to the medical school of Salerno, invited to his court and patronized men of learning, poets, and artists, and commissioned his chancellor, Petrus de Vineis, to draw up a code of laws, to suit all classes of his German and Italian subjects. F.'s schemes for the union of his vast and widely scattered dominions were, however, frustrated by the refractory conduct of the Lombard cities, and still more by the arrogance of the popes Honorius III. and Gregory IX., who threatened him with excommunication unless he fulfilled his pledge of leading a crusade. Being compelled to depart on this expedition, he made the necessary preparations for its prosecution; but a pestilence having broken out among his troops in the Morea, he returned in haste to Italy, only to be again forced away by papal threats.

This second attempted crusade proved more successful; and in 1228, notwithstanding the machinations of the pope, and the treachery of the Knights Templars, F. extorted a ten years' truce from the Moslem ruler, and forced him to give up Jerusalem and the territory around Joppa and Nazareth. The rest of his life was spent in bringing his rebellious Lombard subjects to subjection, and in counteracting the intrigues of the pope, the rebellion of his eldest son, and the treachery of his friend and minister, the Chancellor Petrus de Vineis, who was suspected of attempting to poison him. F., who died suddenly in 1251, the possessor of seven crowns, was the most accomplished sovereign of the middle ages, for he not only spoke and wrote the six languages common to his subjects, but he was famed for his talents as a minnesinger, and for his skill in all knightly exercises, while he wrote elaborate treatises on natural history and philosophy. His strong sympathies with his Italian mother-land, and his unremitting endeavors to establish a compact and all-supreme empire in Italy, were the causes, not only of his own misfortunes, but of the miseries which he brought upon the German empire, by embroiling him in costly wars abroad, and leading him to neglect the welfare, and sacrifice the interests of his German subjects. See for Frederick I. and Frederick II., Raumer, *Geschichte der Hohenstaufen*; Sismondi, *Italian Republics*, and *Europe in the Middle Ages*; Voigt's *Lombardenbund*; Funk, *Geschichte Kaiser Friedrich II.*

FREDERICK III., OF GERMANY.—Frederick who was F. III. as Emperor of Germany, F. IV. as King of Germany, and F. V. as Duke of Austria, was born in 1415, being the son of Duke Ernst, of the Styrian branch of the house of Hapsburg. At the age of 20, he undertook an expedition to the Holy Land; and on his return, in conjunction with his factious brother, Albert the Prodigious, he assumed the government of his hereditary dominions of the Duchy of Austria, the revenues of which scarcely exceeded 16,000 marks. On the death of the Emperor Albert II., he was unanimously elected as his successor; and two years afterwards, in 1442, he was solemnly crowned at Aix-la-Chapelle; ten years later, he received the imperial crown at the hands of the pope at Rome, and in 1453 secured the archducal title to his family. His reign was a prolonged struggle against domestic intrigues and foreign aggressions. One of his most troublesome opponents was his brother Albert, who refused to give up the provinces which he held until he had received a large sum of money; but notwithstanding these causes of annoyance, and while John Hunyades Corvinus, at the head of a Hungarian army, overran Austria, and laid siege to Vienna, and the usurper Sforza possessed himself of the imperial fief of Milan, on the extinction of the male line of the Visconti, F. remained absorbed in his own private studies, or roused himself only to attempt, by the aid of foreign mercenaries, to recover the crown-lands of which the House of Austria had been deprived.

His pusillanimous subserviency to the papal chair, and his wavering policy, irritated the electors, who at one time cherished the design of deposing him and nominating George Podiebrand, king of Bohemia, to the imperial throne; while it entangled him in quarrels on account of the succession to the Palatinate, and other questions of German policy, and deprived the church in Germany of that independence from the thralldom of the papal chair which it had been the object of the Council of Basel to secure to it. The contempt in which F. was held was made apparent on the death of his ward, Ladislaus, king of Hungary and Bohemia, without children, when, notwithstanding his just pretensions to this inheritance, he was passed over, the people of the former having chosen George Podiebrand as their king, and those of the latter Matthias Corvinus. His brother Albert's death in 1463 seemed him a short reprieve from internal disturbances, and gave him possession of Upper Austria; but he was repeatedly embroiled in quarrels with Podiebrand and Matthias, the latter of whom several times besieged Vienna, and finally dispossessed him of every town of importance in his hereditary domains. In the meanwhile, the Turks were suffered to push their conquests in Europe until they had advanced in 1456 to Hungary, in 1469 to Carniola, and in 1475 to Salzburg, although a vigorous

opposition at the outset would easily have put a definite stop to their encroachments. On the death of Matthias, in 1490, F. recovered Austria, but he was obliged to acknowledge Prince Ladislaus of Bohemia as king of Hungary. This mortification was soon followed by his death, in 1493, after an inglorious reign of 53 years, which did nothing to advance the prosperity or progress of the empire, although the times were propitious to both. But although F. neglected the interests and duties of the imperial crown to indulge in the pursuit of his favorite studies in alchemy, astronomy, and botany, he never lost an opportunity of promoting the aggrandizement of his own family, which he very materially secured by marrying his son and successor, Maximilian, to Mary, the rich heiress of Charles the Bold of Burgundy. F. was temperate, devout, parsimonious, scrupulous about trifles, simple in his habits, pacific in his disposition, and naturally averse to exertion or excitement. From his time, the imperial dignity continued almost hereditary in the House of Austria, which has perpetuated the use of his favorite device, A. E. I. O. U. *Austrie Est Imperare Orbi Universo*. See *Æneas Sylvius, Historia; Coxe, House of Austria*.

FREDERICK V., PRINCE PALATINE.—Frederick V., Electoral Prince Palatine, was born in 1596, succeeded to the Palatinate in 1619, was king of Bohemia from 1619 to 1620, and died in 1632. He married, in 1613, Elizabeth, the daughter of James VI. of Scotland and I. of England, through whose ambitious counsels he was induced to take a prominent part in the proceedings of the union of the Protestant princes of Germany, and finally, although against his own inclinations, to accept the title of king of Bohemia. His complete defeat at the battle of Prague terminated his short-lived enjoyment of the regal crown, of which he retained no other memorial but the mocking title of 'The Winter King.'

Ridicule and contumely followed him wherever he went, and the rest of his life was spent in exile under the ban of the empire, and with no resources beyond those which he could obtain from the generosity of his friends. In 1623, he was declared to have forfeited his electoral title and his dominions in the Palatinate, which were conferred upon his cousin, Maximilian of Bavaria, the head of the Catholic league.

FREDERICK I., OF DENMARK, was born in 1473, and died in 1533. During the disturbed reign of his nephew, Christian II., he behaved with so much circumspection, that the choice of the nation fell upon him when the king was deposed, and he was raised to the throne in 1523. He showed great cruelty to his unfortunate relative, whom he detained in close captivity; but he was a politic ruler. In 1527 he embraced the Lutheran faith, which he established in his dominions by the most arbitrary measures.

FREDERICK III., OF DENMARK, the son of Christian IV., was born in 1609, succeeded to the throne in 1648, and died in 1670. The wars of his father's reign had brought the country to a state of great embarrassment; and notwithstanding all his efforts to maintain peace, F. was continually embroiled in the quarrels of other nations, and during his reign Copenhagen was twice besieged by the Swedes under their warlike king, Charles Gustavus; nor was peace re-established till after the death of Charles. The reign of F. III. was rendered memorable by the change effected in the constitution, which, after having been in some degree elective, was at once changed into a hereditary and absolute monarchy by the voluntary act of the commons and clergy, who, from abhorrence of the nobility, surrendered to the crown the liberties and prerogative which they had hitherto enjoyed, and made the sovereign absolute and irresponsible.

FREDERICK V., OF DENMARK, the son and successor of Christian VI., was born in 1723, ascended the throne in 1746, and died in 1766, leaving the reputation of having been one of the best and wisest monarchs of his time. Denmark owed to him the increase of her national wealth, and the establishment of various branches of commerce and manufacture. F. established a Greenland Company, opened the American colonial trade to all his subjects, founded the military academy of Sorø, in Denmark, and caused schools to be opened at Bergen and Tromsø, in Norway, for the instruction of the Laplanders. He established a academy of painting and sculpture at Copenhagen, and sent a number of learned men—among whom was Niebuhr, the father of the historian—to travel and make explorations in the East.

FREDERICK VI., OF DENMARK, the son of Christian VII. and Caroline Matilda of England, was born 1768, and assumed the regency of the kingdom in 1784, on account of the insanity of his father, on his death, in 1808, he ascended the throne. In this reign, feudal serfdom was abolished, monopolies abrogated, the criminal code amended, and the slave-trade prohibited earlier than in any other country.

In 1800, Denmark joined the maritime confederation formed between Russia, Sweden, and Prussia, which led to retaliation on the part of England, to the seizure by that power of all Danish

vessels in British ports, and to the despatch of a powerful fleet, under Sir Hyde Parker and Nelson, to give efficacy to the peremptory demand that the regent should withdraw from the convention. His refusal to accede to this demand was followed by a fierce naval engagement, in which the Danish fleet was almost wholly destroyed. A peace was concluded on the regent's withdrawal from the confederation; but in consequence of his persisting to maintain an attitude of neutrality, instead of combining with Great Britain against Napoleon, the war was renewed in 1807 by the appearance, before Copenhagen, of a British fleet, bearing envoys, who summoned F. to enter into an alliance with England, and to surrender his fleet and arsenals, and the castle of Cronborg, commanding the sound. On his refusal, Copenhagen was bombarded for three days, the arsenals and docks destroyed, and all the shipping disabled, sunk, or carried to England. This blow paralyzed the national resources, and it required the exercise of much discretion on the part of the government, and great endurance on that of the people, to prevent the irremediable ruin of the country. Smarting under the treatment which he had experienced from the English, the Danish monarch became the ally of Napoleon, and suffered proportionally after the overthrow of his empire. In 1814, Norway was taken by the allies from Denmark, and given to Sweden. The state became bankrupt, and many years passed before order could be restored to the finances. Notwithstanding his autocratic tendencies, F. so far yielded to the movements of the times as to give his subjects, in 1831, a representative council and a liberal constitution. He died December 3, 1839.

FREDERICK VII., OF DENMARK, the late king of Denmark, was born in 1808, and succeeded his father, Christian VIII., in 1848. The principal events of his reign were the wars and diplomatic negotiations arising out of the revolt of the duchies of Holstein and Slesvig (q. v.), and the vexed question of the succession to Denmark Proper and the duchies on the death of the king and of his uncle, the heir-presumptive, both of whom were childless. Notwithstanding the heavy expenses of the war, the material prosperity of the country increased during F.'s reign. He died 15th Nov. 1863.

FREDERICK-CHARLES, a Prussian prince, son of Prince Charles (brother of King William), was born at Berlin, 20th March 1828. In his early youth, he manifested a great liking for warlike occupations; and the first Slesvig-Holstein war (1849) saw him in the field as captain, and not without honor to himself; in the campaign in Baden also he gathered laurels and honorable wounds; and in the second Slesvig-Holstein war his name became famous through the storm of the Düppel entrenchments. But his chief title to fame rests on the part he played in the campaign of 1866 against Austria, where he commanded one of the invading armies, and where his able generalship contributed not a little to the final success of the war.

He has indeed been blamed for excess of caution in advancing through Bohemia to the rendezvous at Gitschin, where his more prompt appearance, it is said, would have saved the Silesian army from the danger of serious disaster which it encountered in passing the defiles; but it may, in fairness, be assumed that the caution was necessary until the contrary is proved. Besides his services in the reorganization of the cavalry, he has written several military works of great merit. He commanded the second German army in the Franco-German war, and the investing forces when Metz capitulated Oct. 27, 1870; and next day was made field-marshal by King William, now Emperor of Germany. He was married to Marie Anna, Princess of Anhalt, in 1854. In March 1879 his third daughter, Louise Margaret, was married to the Duke of Connaught.

FREDERICK-WILLIAM, DUKE OF BRUNSWICK, born in 1771, entered the Prussian service at an early age, and was actively engaged with the army during the war with France in 1792, and again in 1806, and was taken prisoner with Blücher at Leipsic. On the death of his father and eldest brother, he would have succeeded to the dukedom, as his other brothers were incapacitated by disease for reigning, had not Napoleon put a veto on his accession to power. Being resolved to take part in the war against the French, he raised a free corps in Bohemia, and threw himself into Saxony, which he was, however, speedily compelled to evacuate. After the total defeat of the Austrians in 1809, the duke determined to leave Germany; and with his corps of 700 'black hussars,' and 800 infantry, he began his masterly retreat. After various skirmishes, in one of which he defeated the Westphalian commander Wellingerode and a picked detachment of troops, he reached Brunswick, in the neighborhood of which he gained a victory at Oelpe over 4000 Westphalians, commanded by General Renpel. He next crossed the Weser, and having reached Elsteth, and taken possession of a sufficient number of vessels and seamen, he embarked his troops; and finally, after stopping at Heligoland, landed in England with his men in August 1809. He was received with enthusiasm; and having entered the Eng-

fish service with his men, subsequently took part in the Peninsular war, where he served with distinction, receiving from the British government an allowance of £6000 a year, which he retained till his return to his own dominions in 1813. Although no prince could be more earnestly bent on securing the welfare of his subjects, his efforts failed utterly from the untimely and injudicious nature of the reforms he endeavored to effect, while the magnitude of his military establishments, which were quite unsuited to the limited extent of his territories, excited the ill-will of his people. He joined the allied army with his hussars after the return of Napoleon from Elba, and fell gloriously while leading on his men at Quatre Bras, on the 16th of June 1815.

FREDERICK-WILLIAM, ELECTOR OF BRANDENBURG, commonly called 'the Great Elector,' was born in 1620, succeeded to the electorate in 1640, and died in 1688. On his accession, he found an empty exchequer, the towns and cities depopulated, and the whole electorate devastated by the ravages of the Swedish and Imperialist armies during the Thirty Years' War, which was not yet concluded; while a portion of his inheritance had even been confiscated by the Swedes. His first acts were to regulate the finances, and to conclude a treaty of neutrality with Sweden, which left him at leisure to devote himself to the organization of his army, and the re-peopling of the deserted towns and villages by means of immigration. By the treaty of Westphalia, through which he lost several important places, he recovered the eastern portions of Pomerania, Hohenstein, the bishoprics of Halberstadt, Minden, and Kamin, as lay-principalities, and the reversion of the archbishopric of Magdeburg. In the course of ten years he had, by the help of his generals, Defflinger, Schomberg, and Kunenbergh, created an army of 25,000 men, organized on the Swedish model; and having been constrained to enter into an alliance with Charles X., he co-operated with him in the taking of Warsaw, which was effected at the cost of a most sanguinary engagement in 1656. In return for this co-operation, F.-W. secured the emancipation of his Prussian duchy from its former dependence on Poland. The aggressions of Louis XIV. on the Rhenish frontier alarmed the elector, who induced the emperor, the king of Denmark, and the Elector of Hesse-Cassel, to enter into a league against France. The result was unfavorable to the cause of the German princes, and F.-W. was obliged to content himself with making highly disadvantageous terms. The war was soon renewed, and Brandenburg was again a prey to the incursions of the Swedes, who at the instigation of Louis, advanced upon Berlin, laying waste everything on their march. The elector, who had taken up his winter-quarters in Franconia, hurried across the Elbe at the head of his cavalry, and having signally defeated the Swedes, drove them from his dominions. If the emperor had been true to his word, and supported him, F.-W. might have made head against the French; but being forsaken by the other German princes, and his dominions overrun by the troops of Louis, he was obliged to agree to the treaty of St. Germain, by which he restored all his conquests to the Swedes, in return for the withdrawal of the French army, and the payment to him of an indemnity of 300,000 crowns. From this time forth, F.-W. devoted himself to the task of consolidating the prosperity of his dominions. During his reign, he more than tripled the area of his territories, and by his generous reception of 20,000 French Protestants after the revocation of the Edict of Nantes, and the encouragement which he afforded to the immigration of Dutchmen and other foreigners, he augmented the population of his states, and introduced numerous industrial arts among his subjects. He founded the university at Duisburg, and the royal library at Berlin, and reorganized the universities of Frankfurt-on-the-Oder, and Königsberg, opened canals, established a system of posts, and greatly enlarged and beautified Berlin. He left a well-filled exchequer and a highly organized army. See Orlich, *Gesch. des Preuss. Staats im 17. Jahrh.*

FREDERICK III., ELECTOR OF BRANDENBURG, son and successor of the former, and the first king of Prussia, was born in 1657, and succeeded to the electorate of Brandenburg in 1688. He exhibited the same zeal as his father for the aggrandizement and amelioration of his dominions; but he was distinguished from him by his admiration of Louis XIV., whose pomp and luxurious display he imitated at his own court. He supported William of Orange in his attempt on England, and gave him a subsidy of 6000 men, which, under the command of Marshal Schomberg, contributed to gain the victory at the Boyne which decided the fate of James II. F. was always ready to lend troops and money to his allies; he sent 6000 of his best men to aid the Imperialists against the Turks; and although he met with the same ingratitude as his father, he succeeded, by treaties, exchanges, and purchases, in very considerably extending his territories; and after many years' negotiations, he induced the emperor to agree to the 'Crown Treaty,' by which, in return for permission to assume the title of King of Prussia, he bound himself to furnish certain contingents of men and money to the Imperial government. As soon as this treaty had been signed, F. hastened in mid-winter

with all his family and court to Königsberg, where, on the 18th January 1701, he placed the crown on his own head. He died February 25, 1713. F. did much to embellish Berlin, where he founded the Royal Academy of Sciences, and the Academy of Painting and Sculpture, erected several churches, and laid out numerous streets. He established a court of appeal at Berlin, built the palace of Charlottenburg, and founded the university at Halle; but his actions were generally influenced by a love of display; and his vanity, together with his neglect of those who had served him, made him personally unpopular, although his patriotic love of Germany redeemed, in the eyes of his countrymen, many of his bad points.

FREDERICK-WILLIAM I., OF PRUSSIA, born in 1688, was in almost every particular the opposite of his father Frederick I. He was simple, and almost penurious in his habits, attentive to business, passionately fond of military exercises, but averse to mental cultivation, and fond of the society of the low and illiterate, while he carried to the utmost his ideas of arbitrary power and the divine right of kings. The public events of his reign were of little importance, although he was continually implicated in foreign wars, and he supported the cause of Stanislaus of Poland, and assisted Austria in her contests with France. He died in 1740. By his economy and reforms in the finances, he was able to indulge his taste for the organization of military forces, while his childish love of tall soldiers induced him to connive at the most flagrant outrages both at home and abroad for kidnapping tall men and forcing them into his service: the result of this system was, that he left at his death a well-drilled army of 70,000 soldiers, of whom a large proportion were men of gigantic stature. What was of more consequence to his son and successor was, that his exchequer contained 9,000,000 thalers, and that his kingdom had attained an area of more than 45,000 square miles, and a population of upwards of 2,240,000. See Morgenstern, *Ueber Friedrich Wilhelm I.* (Braunsch. 1793); F. Förster, *Gesch. Friedrich-Wilhelm's I.* (Pots. 1835); Carlyle, *Hist. of Frederick II., called Frederick the Great.*

FREDERICK II., OF PRUSSIA, surnamed 'THE GREAT,' was the son of Frederick-William I. and the Princess Sophia-Dorothea, daughter of George I. of Great Britain, and was born in 1712. His early years were spent under the restraints of an irksome military training, and a rigid system of education. His impatience under this discipline, his taste for music and French literature, and his devotion to his mother, gave rise to dissensions between father and son, and resulted in an attempt on the part of F. to escape to the court of his uncle, George II. of England. Being seized in the act, his conduct was visited with still greater severity, and he himself was kept in close confinement, while his friend and confidant, Lieutenant Katt, was executed in his sight, after having been barbarously ill-treated by the king. According to some reports, the prince's life would have been sacrificed to the fury of his father, had not the kings of Sweden and Poland interceded in his favor. Having humbly sued for pardon, he was liberated, and allowed to retire to Rappin, which, with the town of Rheinsberg, was bestowed upon him in 1734. Here he continued to reside till the king's death, surrounded by men of learning, and in correspondence with Voltaire, whom he especially admired, and other philosophers; but on his accession to the throne in 1740, he laid aside these peaceful pursuits, and at once gave evidence of his talents as a legislator, and his determination to take an active share in the political and warlike movements of the age. His first military exploit was to gain a victory at Mollwitz over the Austrians, in 1741, which nearly decided the fate of Silesia, and secured to Prussia the alliance of France and Bohemia. Another victory over the Empress Maria Theresa's troops made him master of Upper and Lower Silesia, and closed the first Silesian war. The second Silesian war, which ended in 1745, from which F. retired with augmented territories and the reputation of being one of the first commanders of the age, was followed by a peace of eleven years, which he devoted to the improvement of the various departments of government, and of the nation generally, to the organization of his army, and the indulgence of his literary tastes. The third Silesian war, or 'The Seven Years' War,' was begun in 1756 by the invasion of Saxony—a step to which F. was driven by the fear that he was to be deprived of Silesia by the allied confederation of France, Austria, Saxony, and Russia. This contest, which was one of the most remarkable of modern times, secured to F. a decided influence in the affairs of Europe generally, as the natural result of the pre-eminent genius which he had shown both under defeat and victory; but although this war crippled the powers of all engaged in it, it left the balance of European politics unchanged. It required all the skill and inventive genius of F. to repair the evils which his country had suffered by the war. In 1772, he shared in the partition of Poland, and obtained as his portion all Polish Prussia and a part of Great Poland; and by the treaty of Teschen, in 1779, Austria was obliged to consent to the union of the Franconian provinces with Prussia, and he was thus

enabled to leave to his nephew and successor a powerful and well-organized kingdom, one-half larger in area than it had been at his own accession, with a full treasury, and an army of 200,000 men.

He died at the château of Sans Souci, August 17, 1786. Frederick the Great is said to have 'inherited all his father's excellences and none of his defects.' His courage, fertility of resource, and indomitable resolution, cannot be too highly praised. Not the least wonderful of his achievements was his contriving to carry on his bloody campaigns without incurring a penny of debt. A true spirit of self-sacrifice—though not, perhaps, for the highest ends—was in him. Never was king more liberal towards his subjects. In Silesia, where war had nearly ruined the inhabitants, he once remitted the taxes for six months, and in Pomerania and New Brandenburg for two years, while his government was carried on with rigid economy, such as Europe had never before witnessed. But not only was his government economical, it was essentially just. Religious persecution was unknown, civil order everywhere prevailed; property was secure, and the press was free. On the other hand, F.'s faults were far from being few. Education had made him French in all his ideas and prejudices; and in those days, to be French was to be sceptical. He was utterly unconscious of the grand intellectual and spiritual life that was about to spring up in Germany, and to make it again the guiding-star of Europe, as it had been in the days of Luther. He was, in fact, almost ignorant of his native language, which, moreover, he despised as semi-barbaric; though before his death Goethe had published his *Götz von Berlichingen*, *Sorrows of Werther*, *Iphigenia in Tauris*, and many of his finest lyrics; while Kant, besides a variety of lesser works, had also given to the world his master-piece, the *Critique of Pure Reason*. The new literature was essentially one of belief and aspiration, and therefore alien to the tendencies of the royal disciple of Voltaire, who had learned from his master to cherish at once contempt and suspicion of his fellow-creatures. This disagreeable feature of his character increased with years. He declared the citizen class to be destitute alike of ability and honor, and relied not on the love of the nation, but on his army and purse. F. was a very voluminous writer. Of his numerous works, all of which are written in French, his *Mémoires pour servir à l'Histoire de Brandebourg*, and *Histoire de la Guerre de Sept Ans*, exhibit perhaps the greatest powers of description, but all evince talent of no common order. The Academy of Berlin, by the direction of Frederick-William IV., brought out a fine edition of his collected works in octavo and quarto, 1846—1851. Frederick left no children, and was succeeded by his nephew, Frederick-William II. See Carlyle, *History of Frederick II.*; Macaulay's *Essay*; and the lives by Dolm, Preuss, Förster, Kugler, Droysen, Klopp, Pelletan (1878).

FREDERICK-WILLIAM II., OF PRUSSIA, was born in 1744, and died in 1797. After a prolonged estrangement between his uncle and himself, he regained the good-will of the king by his valor in the war of the Bavarian succession in 1778; but although he succeeded to a well-consolidated power and an overflowing treasury, he had not the capacity to maintain his favorable position. Futile or hastily undertaken wars wasted his resources; so that at his death, instead of the overplus of 70,000,000 thalers that had been bequeathed to him, the state was hampered with a debt of 22,000,000.

His predilection for unworthy favorites, the establishment of a strict censorship of the press, and the introduction of stringent ecclesiastic enactments, alienated the affections of the people from him, although his natural mildness of disposition had excited the sanguine hopes of the nation on his accession. F.-W. shared in the second partition of Poland in 1793, and thus gained a considerable addition to his kingdom, which, by purchase, inheritance, and other means, was augmented during his reign by the acquisition of more than 46,000 square miles of territory, and 2½ millions of inhabitants. The chief internal improvements in this reign were the introduction of a new code of laws, and a less onerous mode of raising the taxes.

FREDERICK-WILLIAM III., OF PRUSSIA, the son of Frederick-William II., was born in 1770. He early took part in the administration, and, on his accession in 1797, he at once dismissed the unworthy favorites of the preceding reign, and accompanied by his beautiful young queen, Louisa of Mecklenburg-Strelitz, made a tour of inspection through the numerous provinces of his kingdom, with a view of investigating their condition, and contributing to their local and general improvement. But although F.-W. was well intentioned, and in his moral and domestic relations his conduct was exemplary, he lacked the dignity and force of will to cope with the difficulties of his position. By his efforts to maintain an attitude of neutrality in the great European struggle that had been excited by the wars and victories of the French, he awakened the distrust of all the great anti-Gallician powers of Europe, and disappointed the petty German princes, who had looked upon Prussia as their protectress against foreign

encroachments. Napoleon's promises of support and friendly intentions soon changed this neutrality to an alliance with France, and for some time Prussia persevered in her dishonorable and self-seeking policy, which was rewarded by the acquisition of Hildesheim, Paderborn, and Münster, which added nearly 4000 square miles of territory, and half a million of inhabitants to the kingdom; but at length the repeated and systematic insults of Napoleon, who despised F.-W. while he professed to treat him as a friend, roused the spirit of the nation, and the king saw himself obliged, in 1805, to agree to a convention with Russia, the real object of which was to drive Napoleon out of Germany. Again the treachery of Prussia led her to make a new treaty with France, by which she consented to receive the electorate of Hanover, and thus involved herself in a war with England. The insults of Napoleon were redoubled after this fresh proof of F.-W.'s indecision. The Prussian nation, headed by the queen, now called loudly for war, and at the close of 1806, the king yielded to these appeals. Hostilities began without further delay; but the defeat of the Prussians at Jena, Eylau, and Friedland, compelled their unfortunate monarch to sue for peace. The Prussian army was annihilated, and the whole of the kingdom, with the exception of a few fortified places, remained in the power of the French.

By the intervention of the Emperor Alexander of Russia, a peace was concluded, known as the Treaty of Tilsit, by which F.-W. lost the greater part of his realm, and was deprived of all but the semblance of royalty; but although for the next five years he was a mere tool in the hands of Napoleon, who seized every opportunity of humbling and irritating him, his spirit was not subdued, and his unremitting efforts at this period of his life to reorganize his enfeebled government by self-sacrifices of every kind, endeared him greatly to his people. The disastrous termination of Napoleon's Russian campaign was the turning point in the fortunes of Prussia; for although the French emperor was victorious over the Prussians and Russians in the battles of Lützen and Bautzen, which were fought soon after the declaration of war which F.-W. had made against France, to the great joy of his people, in 1813, the allies were soon able to renew hostilities, which were carried on with signal success, until they finally culminated in the great battle of Leipzig, in which the Prussians, under their general, Blücher, earned the greatest share of glory. The Peace of Vienna restored to Prussia almost all her former possessions, while the part taken by the Prussian army under Blücher in gaining the victory of Waterloo, by which Napoleon's power was finally broken, raised the kingdom from its abasement. From that time, F.-W. devoted himself to the improvement of his exhausted states; but although before the French revolution of 1830 Prussia had recovered her old position in regard to material prosperity at home and political consideration abroad, the king adhered too strictly to the old German ideas of absolutism, to grant his people more than the smallest possible amount of political liberty. He had indeed promised to establish a representative constitution for the whole kingdom, but this promise he wholly repudiated when reminded of it, and merely established the *Landstände*, or Provincial Estates, a local institution, devoid of all effective power. His support of the Russian government in its sanguinary methods of crushing revolutionary tendencies in Poland, showed his absolute tendencies, and his dread of liberal principles. F.-W. was more than once embroiled with the pope, on account of his violation of the concordat. He concluded the great German commercial league known as the *Zollverein* (see GERMANY), which organized the German customs and duties in accordance with one uniform system. He died in 1840.

FREDERICK-WILLIAM IV., OF PRUSSIA, son of the foregoing, was born October 15, 1795. He had been carefully educated, was fond of the society of learned men, and was a liberal patron of art and literature. He exhibited much of his father's vacillation and instability of purpose; and although he began his reign (June 7, 1840) by granting minor reforms, and promising radical changes of a liberal character, he always, on one plea or another, evaded the fulfilment of these pledges. He was possessed by high but vague ideas of 'the Christian state,' and showed through life a strong tendency to mystic pietism. The one idea to which he adhered with constancy was that of a union of all Germany into one great body, of which he offered himself to be the guide and head. He encouraged the duchies of Holstein and Slesvig in their insurrectionary movement, and sent troops to assist them against Denmark; but he soon abandoned their cause, and being displeased with the revolutionary character of the Frankfurt Diet, refused to accept the imperial crown which it offered him.

The conspiracies in Prussian Poland were suppressed with much rigor; and the popular movement which followed the French revolution of 1848, was at first met by the king with resolute opposition; but when the people persisted in demanding the removal of the troops from the capital, and enforced their demand by storming the arsenal, and seizing on the palace of the Prince of

Prussia (the present king), who was at the time especially obnoxious to the liberals, he was obliged to comply with their wishes. Constituent assemblies were convoked, only to be dissolved when the king recovered his former security of power, and new constitutions were framed and sworn to, and finally modified or withdrawn. After the complete termination of the revolution in Germany, the revolutionary members of the Assembly of 1848 were prosecuted, and treated with severity, the obnoxious 'pietistic' party and the nobility were reinstated in their former influence at court, and the freedom of the press and of religious and political opinion, was strictly circumscribed. The life of the king was twice attempted; first in 1847 by a dismissed burgo-master, named Tschetch; and secondly, in 1850, by an insane discharged soldier of the name of Sefeloge. In 1857, F.-W. was seized with remittent attacks of insanity; and in 1858 he resigned the management of public affairs to his brother and next heir, who acted as regent of the kingdom till his own accession, in 1860, as William I. F.-W. died in 1861.

FREDERICK CITY, a city of Maryland, U.S., 44 miles north-west of Washington, 65 miles west of Baltimore, on a branch of the Baltimore and Ohio Railroad; a handsome town with manufactures of iron, wool, leather, paper, flour, and tobacco. Frederick College was founded by the state in 1797; here are also a seminary of females, a Jesuit establishment and a nunnery, and a deaf and dumb institute. Pop. (1870) 8526; (1880) 8659.

FREDERICKSBURG, a city of Virginia, U.S., is on the right bank of the river Rappahannock, 110 miles from Chesapeake Bay, 65 miles north of Richmond. Here are the county buildings, several churches and public schools, an orphan asylum, and extensive manufactures of flour and tobacco. Pop. (1880) 5010. On December 13, 1862, it was the scene of a battle between the Federal army, commanded by General Burnside, and the Confederate army under General Lee, in which the former was repulsed, and driven back across the river with a loss of 12,321, while the Confederates, strongly posted on the hills south of the city, suffered but trifling damage; but the city itself was nearly destroyed.

FREDERICK-WILLIAM, Crown-prince of the German Empire and of Prussia, only son of William I. (q. v.), king of Prussia and now German emperor, was born 18th October 1831. His earnest character and eminent talents were early developed under the care of excellent masters, among others of Ernest Curtius (q. v.), who also accompanied him to the university of Bonn, where the prince was matriculated in the law faculty.

After the completion of his education, the prince visited several foreign countries, among others, England, where it seems he became attached to the Princess Royal, eldest daughter of Queen Victoria, and was married to her on the 25th January 1858, with the highest approbation of both nations. Of the issue of this union, there are now living two sons (the eldest Frederick-William, born 27th January 1859), and four daughters. Since his father ascended the throne, the Crown Prince has taken part in the more important affairs of state. He served in the Danish campaign in a subordinate capacity; nevertheless, he gave sufficient proofs of his great ability, to cause the king to intrust to him an important (according to some the most important) task in the war with Austria in 1866, namely, the command of the left Prussian wing operating in and from Silesia. How ably the prince played his part at Königgrätz is well-known. In the Franco-German war, 1870—1871, he acted a very conspicuous part as commander of the troops of Bavaria, Würtemberg, and Baden. He was present at Sedan, August 1870; and was made a field-marshal two months after, by his father. F.-W. is heir-presumptive to the imperial crown of Germany, as well as the throne of Prussia. During the Emperor's illness caused by an assassin's shot in 1878, his public functions were performed by the Crown-Prince.

FREDERICTON, capital of the province of New Brunswick, Canada, stands on the St. John River, 56 m. to the N.W. of the port of St. John. Pop. (1881) 6218. Besides other public buildings, F. contains the university of New Brunswick, which is well endowed, and has a good staff of professors.

FREDERIKSHALD, a fortified seaport of Norway, in the department (amt) of Smalenen, stands on an inlet called Swinesund, near the Swedish border, about 60 miles S.S.E. of Christiania. It is beautifully situated, and is a neat, well-built town, with several handsome edifices. Its harbor is excellent; in it the largest vessels may be safely moored. F. largely exports deals and lobsters. Pop. 9956. To the S.E. of the town stands the fortress of Frederiksteen, on a perpendicular rock 400 feet high. This fortress though often assaulted, has never yet been taken. While laying siege to Frederiksteen, Charles XII. of Sweden was killed, 1718; in commemoration of which event an obelisk was raised, in 1814, upon the spot where he fell.

FREE BENCH (*Francus Bancus*). By custom of certain manors in England, a widow was entitled to dower out of the

lands which were held by her husband in Socage (q. v.). In some places, the widow had the whole, or the half; and the like *dum sola et casta vixerit* (Co. Litt. 110, b.). This right is called *francus bancus*, to distinguish it from other dowers, for that it cometh freely, without any act of the husband's or assignment of the heir (Co. Litt. 94, b.). See **DOWER**. A widow who has forfeited her free bench is, by the custom of some manors, permitted to recover her right. At East and West Enborne, in the county of Berks, and also in the manor of Chadleworth, in the same county and at Torr, in Devon, if the widow commit incontinency, she forfeits her estate; yet if she will come into the court of the manor riding backward on a blackram, with his tail in her hand, and will repeat certain verses (more remarkable for their plainness than their delicacy), the steward is bound by the custom to admit her to her free bench. (Cowel's *Interpreter*, ed. 1727, fol.).

FREE CHURCH OF SCOTLAND, the name assumed by those who at the 'Disruption' of the Established Church of Scotland, in 1843, withdrew from connection with the state, and formed themselves into a distinct religious community, at the same time claiming to represent the historic church of Scotland, as maintaining the principles for which it has contended since the Reformation.

(It is proper to state that, in accordance with a method adopted in other cases also in this work, the present article is written by a member of the church to which it relates, and is an attempt to exhibit the view of its principles and position generally taken by those within its own pale.)

There is no difference between the F. C. of S. and the Established Church in the standards which they receive; and all the laws of the church existing and in force prior to the Disruption, are acknowledged as still binding in the one as much as in the other, except in so far as they may since have been repealed. The same Presbyterian constitution subsists in both churches, with the same classes of office-bearers and gradations of church-courts. The F. C. indeed, professes to maintain this constitution and church-government in a perfection impossible in the present circumstances of the Established Church, because of acts of parliament by which the Established Church is trammelled, and interventions of civil authority to which it is liable. And the whole difference between the F. C. and the Established Church relates to the consent and submission of the Established Church to this control of the civil power in things which the F. C. regards as belonging not to the province of civil government, but to the church of Christ and to its office-bearers and courts, as deriving authority from Him; so that the controversy is often described as respecting the *Headship of Christ* or the *Kingdom of Christ*. It is to be borne in mind, however, that the doctrine of the headship of Christ over his church, as set forth in the Westminster standards, is fully professed both by the Established Church and by the F. C. of Scotland; the only question between them is, whether or not the existing relations of the Established Church of Scotland to the state are consistent with the due maintenance and practical exhibition of this doctrine. And the question does not directly relate to *Voluntaryism* (q. v.). Those who constituted the F. C. of S. in 1843, firmly believed that the church might be connected with the state, and receive countenance and support from it, to the advantage of both; whilst they maintained that there must not, for the sake of any apparent benefits flowing from such connection, be any sacrifice of the independence or self-government of the church, as the kingdom of Christ, deriving its existence, organization, and laws from Him. Nor has any change of opinion on this subject been manifested.

The Westminster Confession of Faith asserts 'that there is no other head of the church but the Lord Jesus Christ; and that 'the Lord Jesus, as the King and Head of his church, hath therein appointed a government in the hand of church-officers, distinct from the civil magistrate;' it ascribes to these church officers the right of meeting in 'synods or councils,' which it affirms to be 'an ordinance of God;' and represents the exercise of church discipline as intrusted to them as well as the ministry of the word and sacraments. It ascribes to the civil magistrate much power and many duties concerning things spiritual, but no power in or over these things themselves. And all this was equally the doctrine of the Church of Scotland before the Westminster Confession was compiled. The support which, in many parts of Europe, princes gave to the cause of the Reformation, and the circumstance that states as well as churches were shaking off the fetters of Rome, led in many cases to a confounding of the civil and the spiritual. The Church of Scotland accomplished its emancipation from Rome not with the co-operation of the civil power, but in spite of its resistance; and after the Reformation, the Scottish Reformers and their successors were compelled to a closer study of their principles, by the continued attempts of the civil rulers to assume authority over all the internal affairs of the church. But amidst their struggles, the Presbyterians of Scotland so far prevailed as to obtain at different times important acts of parliament in recognition of their principles, and 'ratification of the liberty of the true kirk;'

and finally, after the Revolution of 1688, an act ratifying the Westminster Confession of Faith itself, and incorporating with the statute law of the realm all its statements concerning the province of church-judicatories and that of the civil magistrate, and the bounds of their respective powers.

The rights and privileges of the Presbyterian Church of Scotland guaranteed by the Revolution settlement, were expressly secured by the Treaty of Union, and jealously reserved from the power of the British parliament; yet within five years afterwards, when Jacobite councils prevailed in the court of Queen Anne, an act was passed for the restoration of patronage in Scotland, with the design of advancing the Jacobite interest by rendering ministers more dependent on the aristocracy, and less strenuous advocates of the most liberal principles then known. This soon became the cause of strife within the Church of Scotland, and of separation from it; effects which have continually increased to the present day. How the church at first earnestly protested against this act; how this protest gradually became formal, and was at last relinquished; how the church-courts themselves became most active in carrying out the settlement of presentees, notwithstanding all opposition of congregations, are points to which it is enough here to allude.

It is important, however, to observe that in all the enforcement of the rights given to patrons by the act of 1712, during the 18th c., and considerable part of the 19th, no direct invasion of the ecclesiastical province took place on the part of civil courts or of the civil power; the presentation by the patron was regarded as conveying a civil right at most to the benefice or emoluments only, whilst the church-courts proceeded without restraint in the induction of ministers; and in a few instances it happened that the benefice and the pastoral office were disconnected by the opposite decisions of the civil and ecclesiastical courts. And even the 'forced settlements,' in which the fullest effect was given by the church-courts to the will of patrons, were accomplished according to the ancient form, upon the *call* of the parishioners, inviting the presentee to be their minister, although the *call* was a mere form—in the words of Dr. Chalmers, 'the expressed consent of a few, and these often the mere dribble of a parish.'

When the 'Moderate' party, long dominant in the General Assembly of the Church of Scotland, became again the minority in 1834, the accession of the 'Evangelical' party to power was at once signalized by an attempt to restore the *call* to efficacy. This was done by the famous *Veto Law*, by which it was declared 'that it is a fundamental law of this church that no pastor shall be intruded on any congregation contrary to the will of the people,' and enacted, in order to give effect to this principle, that a solemn dissent of a majority of male heads of families, members of the vacant congregation, and in full communion with the church, shall be deemed sufficient ground for the rejection of the presentee. The Veto Law thus determined rather how strong an expression of dissent by the parishioners should be requisite to invalidate a call, than how strong an expression of assent should be requisite to give it validity; a circumstance which was afterwards much turned to account in controversy; as if the *veto* were a new and unconstitutional principle introduced; although it was certainly adopted as the least extreme mode of giving effect to the old principle which the law declared.

The same General Assembly by which the Veto Act was passed, is memorable for the assertion of the constitutional principles and inherent powers of the church in another important particular, the admission of the ministers of 'chapels of ease' to the same ecclesiastical status with the ministers of endowed parishes, in consequence of which they became members of church-courts, and had districts assigned to them *quoad sacra*, with the full parochial organization.

The Veto Act was soon the subject of litigation in the Court of Session. A conflict arose which in various forms agitated the whole of Scotland, and which, ere long, related as much to the status of chapel ministers as to the rights of presentees to parishes; and indeed involved the whole question of the relations of civil and ecclesiastical powers, at least as far as the Established Church was concerned. The first case carried into the civil court was that of a presentation to Auchterarder, in which the call to the presentee was signed by only two parishioners, whilst almost all who were entitled to do so according to the Veto Act, came forward to declare their dissent. The decision of the Court of Session, which, upon an appeal, was affirmed by the House of Lords, was to the effect, that the rejection of the presentee on the ground of this dissent was illegal; the opinions of the judges in the Scottish court were indeed divided; but those in accordance with which the judgment was pronounced, asserted the right of the civil courts to review and control all proceedings of church-courts, a power which it was speedily attempted to put forth in other cases, to the extent of requiring presbyteries to proceed to the settlement of qualified presentees without respect to the opposition of congregations; interdicting the admission of ministers to pastoral charges even when no question of emoluments was involved; interdicting the *quoad*

sacra division of parishes or any innovation on the existing state of a parish as to pastoral superintendence and the jurisdiction and discipline of the kirk-session; interdicting church-courts from pronouncing ecclesiastical censures, and suspending or revoking them when pronounced; interdicting ministers from preaching the gospel and from administering the sacraments within certain parishes; determining who should and who should not be deemed entitled to sit and vote in General Assemblies and other courts of the church; and other such things, wholly subversive of the independence of the church, and reducing it, if acquiesced in, to the condition of 'a creature of the state.' They were not, however, acquiesced in; and although in one instance, ministers were brought to the bar of the Court of Session, and reproved for disregarding its authority, their protest against its claim to authority was maintained even there; and in the far greater number of instances, its interdicts were broken without any attempt being made to call those who did so to account. It is impossible here to enter into the details of this struggle, which was brought to a final issue by the judgment of the House of Lords in August 1842, affirming a decree of the Court of Session, which required the presbytery of Auchterarder to take the ordinary steps towards the settlement of the presentee to Auchterarder, without regard to the dissent of the parishioners. The law of the land being thus decided by the supreme court to be such as they could not with good conscience comply with, and parliament having rejected an application, in the form of a 'Claim of Right,' for an act such as would have reconciled the duties of their position according to the law of the land, in the church by law established, with what they believed to be their duty towards Christ and according to his law; it now seemed to the greater number of the ministers and elders holding the principle of the independence of the church, that the only course open to them was to retire from their position by the sacrifice of the emoluments and benefits of an establishment. And this they did at the meeting of the General Assembly on 18th May 1843.

Headed by Dr. Chalmers, Dr. Welsh, and others of the most eminent in the church, they left the appointed place of meeting of the General Assembly, St. Andrew's Church, Edinburgh, and proceeded to another place, previously prepared, Tanfield Hall, Canonmills, where, in the midst of a great concourse of people, the first General Assembly of the F. C. of S. was immediately constituted, and Dr. Chalmers was unanimously called to the chair as its moderator. Four hundred and seventy-four ministers renounced their connection with the Establishment, and along with them a great body of its elders and members.

Immediate steps were taken for completing the organization of the F. C., and extending it as much as possible into every district of Scotland. The forethought of Dr. Chalmers had already devised the SUSTENTATION FUND (q. v.). The F. C. undertook from the first the continued support of all the missions previously carried on by the Church of Scotland; and all the missionaries hastened to declare their adherence to the Free Church. An 'education scheme' was soon afterwards undertaken; and colleges for the training of ministers were founded in Edinburgh, Glasgow, and Aberdeen. Considerable opposition was at first experienced on the part of landowners, who refused to grant sites for churches and other buildings; but this gradually gave way. The bitterness of feeling which at first existed between the Established Church of Scotland and the F. C. has long since very much passed away.

The number of ministerial charges in the F. C. of S. is slightly above 1000. There are also numerous 'preaching stations,' in which preaching is regularly maintained, and other ordinances are administered under the care of presbyteries. Some of these are continually being added to the list of ministerial charges. The whole sum raised for religious and educational purposes by the F. C. of S. up to March 1873, or in about thirty years, was about £10,299,306, or rather more than £343,310 a year. In this are included the sums devoted to the erection of churches, mansees, school-buildings, colleges, &c. The Sustentation Fund now allows an 'equal dividend' of £160 to the ministers, with an addition of £30 or £15 in certain cases. The total sum raised in 1880-81 was £590,333.

Since 1843, the history of the F. C. has been generally that of peaceful progress. It has been agitated by questions respecting the administration of the Sustentation Fund, colleges, &c., which are of little interest to those beyond its own pale. It was brought into a litigation in the Court of Session, seeming to affect its fundamental principles. The minister of the F. C. at Cardross, in Dumbartonshire, having been suspended by the General Assembly of 1858, had recourse to the Court of Session, on the alleged ground of irregularity in the proceedings of the ecclesiastical judicatories, demanding the suspension of the sentence; and being on this account summarily deposed by the General Assembly, he raised an action in the Court of Session, not only claiming damages, but to have the sentence rescinded and found null and void. The case terminated in a recognition of the independence of the church in things purely spiritual, and a full admission

of its subjection to the civil courts in all things temporal, including the right of these courts to demand full information as to all ecclesiastical proceedings, and production of minutes and other documents, when they should see cause.

Negotiations towards union with the United Presbyterian Church gave rise to great dissension in the F. C. itself, from the unwillingness of many of its members to modify their profession of the doctrine of the lawfulness of the establishment of the church by the state; and it seemed as if a disruption of the F. C. was impending; but in 1873 the proposal of immediate union was laid aside, and peace in the F. C. restored. A similar proposal with regard to the Reformed Presbyterian Church was more successful, and the union was consummated in 1876.

FREE CITIES, the name given to those German towns, Hamburg, Bremen, Lübeck, and Frankfurt-on-the-Main, which were of themselves sovereign states and members of the German confederation. They are remnants of the once numerous 'Imperial' cities, or cities not subject to any superior lord, but immediately under the empire. Of the four F. C., Hamburg, Lübeck, and Bremen still retain their privileges under the re-constituted German empire; but Frankfurt (q. v.) was annexed to Prussia in 1866.

FREEDOM OF THE PRESS. See **PRESS**.

FREEHOLD, ESTATE OF (*liberum tenementum*, frank tenement). Real estates in England in the present day are divided into freehold and copyhold. By freehold property is meant all estates which owe no duty or service to any lord but the king. What are now known as estates of freehold were, under the feudal system, denominated frank tenements. They were held by the honorable tenure of Knight's Service (q. v.) and Free Socage (q. v.), and might have been held either of the crown or of a subject. But the statute of *Quia emptores* having abolished subinfeudation, all freehold estates, except those which have been held of subjects since the time of Edward I., are now held of the crown. A freehold estate must be an estate in fee, in tail, or for life; all other estates in land, as estates for years, are called chattel interests. An estate of freehold could in general be created only by livery of seisin of Feoffment (q. v.). By the doctrine of the feudal law, no person who had an estate of less duration than for his own life or for the life of another man, was considered to be a freeholder; and none but a freeholder was considered to have possession of the land. A tenant for years, &c., was regarded as holding possession for the freeholder. The possession of the freeholder might, however, be defeated by the wrongful act of the tenant; for a transfer of possession or livery of seisin by the tenant would divest the freeholder, and leave him to his Right of Entry (q. v.). This effect of a feoffment by wrong was abolished by 8 and 9 Vict. c. 106, s. 4. Before the time of Henry VI., all freeholders were entitled to vote on the election of a knight of the shire, as they still may for the appointment of coroner. But by 8 Hen. VI. c. 7, the famous statute was passed which still in great measure regulates the county elections, and enacts that no freeholder shall vote whose freehold is not of the value of at least 40s. a year. By 2 Will. IV. c. 45, s. 18, this qualification is continued as to all freeholds of inheritance, and to freeholders for life in actual occupation, or who have acquired their lands by marriage, marriage settlement, devise, or promotion to any benefice or office.

FREEHOLD LAND SCHEME had for its object to enable mechanics artisans, and other persons belonging to the lower classes, to purchase a piece of freehold land, of such yearly value as to entitle the owner to the elective franchise. Irrespective of any political object, benefit building societies now exist in most of the greater towns of this country, and are believed to be of great service to the laboring-man. See **BENEFIT SOCIETIES**.

FREE-LANCES were roving companies of knights and men-at-arms, who, after the Crusades had ceased to give them employment, wandered from state to state, selling their services to any lord who was willing to purchase their aid in the perpetual feuds of the middle ages. They played their most prominent part in Italy, where they were known as *Condottieri* (q. v.).

FREEMAN AND FREEDMAN. In the most general acceptance of these terms, the first implies one who has inherited the full privileges and immunities of citizenship; the second, one who has been delivered from the restraints of bondage, but who, usually, is not placed in a position of full social or even political equality with him who was born free. Though the words are Teutonic (being composed *frei*, free; and *mann*, a man or human being), the distinction between them depends on the constitution of Roman society. The equivalent for freeman (*liber homo*), indeed, comprehended all classes of those who were not slaves; but the distinction here pointed out was preserved by the application of the term *ingenuus* to him who was born free (Gaius, i. 11), and of *libertinus* to him who, being born in servitude, was emancipated. For the further development of this subject, as regards

the classical nations of antiquity, see **SLAVERY, CITIZEN**. As the organization of Roman society survived the convulsions of the middle ages to a far greater extent in the towns (see **MUNICIPALITY, MUNICIPAL CORPORATION**) than in the landward districts, where the institutions of feudality almost entirely superseded it, it is in the borough and other municipal corporations of this country, and of continental Europe, that we still find *freemen*, or persons inherited or acquiring by adoption, purchase, or apprenticeship, the rights of citizenship. See **FREEMAN'S ROLL**. But the idea of a freeman was by no means peculiar to the Roman or Romanized population of Europe; on the contrary, it belonged to the constitution of society in all the Indo-Germanic nations. Amongst those branches of them commonly known as Teutonic, it was generally based on the possession of some portion of the soil. In Anglo-Saxon England, the freemen were divided into *Ceorls* (q. v.) and *Eorls* (q. v.), or *Thanes* (q. v.). See **CITIZEN**.

FREEMAN'S ROLL. By 5 and 6 Will. IV. c. 76, commonly called the Municipal Corporations' Act, which placed the corporate towns, or, as they are denominated, the boroughs enumerated in the schedules A and B—i. e., nearly all the boroughs in England and Wales except London—under one uniform constitution, a distinction is made (s. 2) between the Freeman's Roll and the Burgess Roll.

Every person who, if the act had not passed, would, as a burgess or freeman, have enjoyed, or might have acquired, the right of voting in the election of members of parliament, is to be entitled to enjoy or acquire such right as heretofore. And it is further enacted (s. 5), that the town-clerk of each borough shall make out a list, to be called the *Freeman's Roll*, of all persons admitted burgesses or freemen, for the purpose of such reserved rights as aforesaid, as distinguished from the burgesses newly created by the act, and entitled to the rights which it newly confers; these last are to be entered on another roll, to be called the *Burgess Roll*. See **BURGESS**.

FREEMASON, FREEMASONRY. See **MASONS, FREE**.

FREE PORT (Ital. *porto franco*), is a harbor where the ships of all nations may enter on paying a moderate toll, and load and unload. Free ports form *dépôts* where goods are stored at first without paying duty; these goods may then be either re-shipped for export on paying a mere transit-duty, or they may pay the usual full customs of the country, and be admitted for home consumption. Free ports thus facilitate transit trade, and form, as it were, a foreign district within a state. See **WAREHOUSING SYSTEM**.

FREE-SPIRIT, BRETHERN OF THE, a fanatical sect of the middle ages, which was very generally (though sometimes secretly) diffused over Italy, France, and Germany, between the 13th and 15th centuries. They took their name from the 'freedom of spirit' which they claimed, in virtue of the words of St. Paul (Romans, viii. 2, 14), maintaining that the true sons of God are exempt from subjection to the law. They appeared first in Alsace, in the early part of the 13th c., and attracted notice by their singular attire and their fanatical proceedings, traversing the country in troops, accompanied by women, with whom, under the name of sisters, they lived in the greatest familiarity. Their doctrine was a species of pantheistic mysticism, which they applied with fearless consistency to all the details of the moral obligations. They held, according to Mosheim, who has collected the original authorities, 'that all things emanate from God, and will revert back into Him; that rational souls are part of the Divine Being; that the whole universe is God; that a man, by turning his thoughts inward, is united inexplicably with the First Cause, and becomes one with Him; and that those who are so immersed in the vortex of the Deity attain to perfect freedom, and are divested not only of the lusts, but even of the instincts, of nature.' From these principles, they inferred that the free man, thus absorbed in God, is himself God, and a son of God, in the same sense in which Christ is called the Son of God; and that, as such, he is raised above all laws, human and divine; to such a degree that, according to some of them, 'the godlike man cannot sin, do what he may; either because the soul, being elevated and blended with the divine nature, is no longer affected by the actions of the body, or because the emotions of the soul, after such union, become in reality the acts and operations of God himself, and therefore, though apparently criminal, and contrary to the law, are really good and holy, because God is above all law.'

These blasphemous and immoral principles, incredible as they may appear, are extracted by Mosheim, partly from the books of the sect, partly from the decrees of Henry, Archbishop of Cologne, by whom they were condemned. Principles such as these drew down upon the sect the arm of the state, as well as the censures of the church. No sect of the time suffered so much from the inquisition in the 14th century. They were regarded as offenders of public order and morality, as well as against the faith of the church. See **INQUISITION**. After the first appearance of the

sect in Alsace (1212), where its leader was a certain fanatic called Ortlieb (after whom the members are sometimes called Ortliebians), it spread into Thurgau and the Upper and Lower Rhine. During the latter part of that century, one of the leaders, named 'Meister Eckart,' had so large a following at Cologne, that the archbishop made his teachings the subject of a lengthened edict. The sect spread also into Swabia, where its members were confounded with the Beghards. In France, they were popularly known by the name 'Turlupins,' a word of uncertain etymology. We meet them in Bohemia in the beginning of the 15th c., and there is considerable similarity between their principles and those of the Adamites, who figure in Hussite history. From this date they are heard of no more.—See Mosheim, Soames's ed. ii. 582; also Gieseler's *Church History*, iii. 467, iv. 226.

FREE STATE, ORANGE. See **ORANGE RIVER FREE STATE.**

FREE-STONE, any rock which admits of being *freely* cut and dressed by the builder. In Scotland, it is synonymous with sandstone. It has also been defined as any rock which works equally freely in every direction, having no tendency to split in one direction more than another. In this sense, limestone and even granite have been called freestones.

FREE-TOWN—a name of the same significance as the *Liberia* of American origin to the south of it—the capital of Sierra Leone, a British settlement on the west coast of Africa. It is situated on the left bank of the Sierra Leone river, about five miles from the sea, in lat. 8° 29' N., and long. 13° 9' W. Pop. about 16,000. The town is pleasantly situated, and its wide streets are prettily ornamented with rows of orange, lime, banana, or cocoa-nut trees. The temperature, as one may expect from the locality, is tolerably uniform, varying in opposite seasons between the averages of 77°-6 F. and 80°-9. Towards the interior, F. is enclosed by the mountain-chain from which the colony is designated, a position to which the proverbial insalubrity of the climate is partly owing. The population, exclusive of the authorities and the garrison, consists almost exclusively of liberated negroes.

FREE TRADE. This term, when used so late as thirty years ago, expressed a disputed proposition, and was the badge of a political party; it now expresses the most important and fundamental truth in political economy. From its simplicity, it affords, to those who expect to make political economy an exact science, the hope that they have obtained at least one axiom. But it has in reality been established as the result of a double experience—the one being the failure of all deviations from it, the other the practical success of the principle during the short period in which it has been permitted to regulate the commerce of this country.

Trade consists in buying and selling. There is free trade when there is no interference with the natural course of buying and selling, if such interference be intended to improve or otherwise to influence trade. It is necessary to keep this distinction in view, because there are many laws not contrary to the spirit of free trade which interfere with buying and selling; for instance, in this country, it is unlawful to deal in slaves, because we do not acknowledge the right of one human being to be the owner of another; it is unlawful to sell intoxicating spirits without having obtained a license, because the tax for the license brings revenue to the Exchequer, and intoxicating liquors are a commodity which it is advisable to tax, in preference to the common necessities of life, or even harmless luxuries. There are many of these last which cannot be sold into this country without paying customs duty, but this is for the purpose of revenue merely, not as a restraint on trade.

The many attempts made by government to regulate trade for the purpose of benefiting the communities over which they ruled, may be divided into two great classes: the one prohibited the exportation of commodities, the other encouraged exportation, and prohibited or discouraged importation. The former was the old rule in this and in other countries. It was supposed that the wealth of the country depended on its retaining within itself certain productions of native growth or industry, and their removal out of the country was prohibited or restrained. Until a late period, the exportation of machinery was prohibited; but this was an exceptional remnant of the old principle, which had yielded to its converse, in which it was maintained that exportation is the source of wealth, and importation is a wasting of a nation's substance. On this theory the great body of British commercial and financial legislation, which received its death-blow in 1846, was founded. By it, a commercial community was then likened to an isolated human being possessed of a certain fund which he must of course spend, so as to become so much the poorer, if he buys commodities, which to him is equivalent to a nation's importing them. The notion was founded on the analogy of the miser, who will, of course, increase his store by restricting his purchases. Communities, however, are not in the position of the miser, possessing separate capital, which he can protect and increase; they rather resemble the merchant who buys and sells, making a profit

on what passes through his hands. Whatever communities import, they pay for by exports. This can be shown by analysis in any class of national transactions. If we pay for the goods we import by bills of exchange, these bills represent goods exported, otherwise they would not be paid. See **EXCHANGE**. If we pay for goods in bullion, it is the same thing; gold does not grow in this country, and every sovereign we send abroad to pay for goods has been got as the price of goods exported, unless it have been brought by any of our own people from the gold districts, and then it is virtually a produce of British industry. It is, in fact, a sort of dynamic law that importation causes exportation, just as a vacuum in physics is filled up by air, or the other nearest fluid.

As applied to the individual inhabitants, and not to the nation, free trade is the right of every man to do as he pleases with his capital and abilities; and as the general desire of mankind is to improve their condition, and, in fact, the greater portion of them are thoroughly devoted to this pursuit, the interests of the nation at large cannot be in better hands than in those of men who, by increasing their own wealth, are increasing the wealth of the public. The progress made by this country since 1846 has afforded a wonderful experimental illustration of this truth, since the exports have been tripled. They were, in round numbers, 40, and are now 250 millions. For more particular facts and circumstances connected with the establishment of free trade, see **ANTI-CORN LAW LEAGUE**, **CORN LAWS**, **CUSTOMS**.

FREE-WILL. The freedom or liberty of the will is the designation of a doctrine maintained in opposition to another doctrine, expressed by the term 'necessity.' The contest between these two views has been maintained in the fields both of theology and metaphysics. The idea of a man being 'free' in his actions appears first in the writings of the ancient Stoics. Afterwards in Philo Judæus, an Alexandrian Platonist, who flourished at the commencement of the Christian era, there occurs an inquiry propounded, 'whether it be not the case that the upright man is free, and the vicious man a slave.' This language was evidently meant to pay a compliment to virtue, and to affix a degrading stigma on vice, and ought not to have been too literally interpreted; for in strictness it might have been maintained with even greater plausibility, that the vicious man, who defies all restraints of society, has the greater liberty of the two. The doctrine of freedom, as applied to the human will, was first contended for by Pelagius against Augustine's doctrines regarding the operation of grace; and in a later age was the subject of controversy between Arminians and Calvinists, the Calvinists (such as Jonathan Edwards) having usually been Necessitarians.

Although in this dispute there are certain points of real difference of opinion between the opposing parties, yet the problem has been unnecessarily encumbered with the unsuitable phraseology that has accidentally invested it. The notion of 'freedom' is intelligible when we speak of a free man as opposed to a Russian serf, or of a free press as opposed to censorship; but with reference to human actions generally, it has no particular relevancy. When a man, urged by hunger, eats the food that is before him, we recognize two separate facts, the one leading to the other: the first is a painful feeling or sensation, the other a series of movements by which food is conveyed to the system; the one fact we call the motive, the other the action, of the will following on the motive; but there is no propriety in describing this sequence as either free or not free.

We may inquire into the greater or less certainty of the sequence—namely, whether a hungry man does always, as a matter of course, avail himself of the food presented to him, or whether one may be very hungry with the option of eating, and with no other motive operating to deter from the act, and yet not eat, thus showing an absence of uniform connection between pain and the movements for alleviating it; this would be a *real* question, and would throw light on the actual constitution of the human will; the question of liberty and necessity does not present us so much with an intelligible question as with an artificial difficulty made by inapplicable phraseology. It would have been much the same to have disputed whether or not the will is rich, or noble, or royal, merely because the virtuous and right-minded man has sometimes been commended by those epithets being applied to him. The word 'necessity,' also, is ill chosen, in consequence of its great ambiguity; being applied sometimes to logical and mathematical implication, as when we say the whole is greater than its part; sometimes to the rigorous uniformity of physical laws, such as gravitation; and at other times to what is merely a high probability, as when we expect that a man of honorable and upright character will speak the truth on some given occasion. See **NECESSITY**.

If we cast aside these confusing phrases, and inquire what is the real matter of dispute, we shall find that there are intelligible differences of opinion in reference to the sequence of human volition. It may be maintained that our actions have the same uniformity as the successions of the physical world; and this view

would be supported by a very wide induction of experience. It will be found that the whole of the complicated operations of society depend upon the certainty that men, in the same circumstances and under the same motives, will act in the same way. We allow for differences of individual character; but when once we have seen what any man is disposed to do in one instance, we take for granted that he will be similarly actuated when the identical circumstances are repeated. The whole of our trading operations are founded on the maxim that human beings prefer a greater to a smaller gain; and it has never been found that any portion of our race has taken a wayward fit, and contradicted itself on this point. We are prepared for exceptions to the rule, when other strong motives are present, but these are merely the intervention of a new force, not the suspension of the law that connects the other motive with its usual consequent. Nor is there anything degrading to human nature in this uniformity; while the opposite state of things would undermine all the securities of human life, and land us in a moral chaos. If human beings, who habitually dread pains and penalties, were suddenly, for no ulterior reason, to court hunger and cold, imprisonment and disgrace, it is obvious that there would be a speedy termination of man's career on the globe.

Still, the position thus contended for may be, and has been, called in question; or, at least certain exceptions to its universality may be put forward. We are able to comprehend the meaning of this counter-doctrine, even although we may find a difficulty in acceding to it. For example, Socrates drew a distinction between *human* and *divine* knowledge, intending by the one the departments of nature where strict law prevailed, and where by assiduous observation men might attain to certainty; such was the knowledge of the operative respecting his special craft, in which it was absurd to seek for any other source of insight than his own and other men's experience. But this did not include all knowledge. There was a department, the divine, reserved by the gods for their own special administration, and where they did not bind themselves to observe uniformity of dealing. This region included, according to Socrates, such great operations of the physical world as the motions of the heavenly bodies, the phenomena of weather and season. To be enlightened on these, it was necessary to consult the gods by oracle and sacrifice. Now, applying this view to the case of the human will, it might be maintained that, in the greater number of instances, and in all matters of primary importance, such as self-preservation, the uniformity of human actions must be admitted; but still there may be some deep, subtle, and refined operations, where the same motives sometimes lead one way, sometimes another, the whole situation being in every other respect identical. But it lies with the supporters of this view to substantiate their exceptional cases in the midst of so much evident uniformity. As yet, nothing of the kind has ever been proved, and our only safe ground, philosophically, is what is our safe ground practically—namely, to abide by the doctrine of law in *all* human actions, on which we have not the smallest scruple as respects the preponderating mass of them.

The partisans of liberty, who take up the ground of opposition to uniform law as now expounded, not infrequently express themselves to the following effect. Granting that the emotions of the mind have a uniform efficacy as motives, and that he that has a musical taste will be found on all occasions acting in conformity with it, still the emotions are not the whole of the mind. We have, in our mental composition, Feelings, and Intelligence, and Activity; but these do not make up our entire being. There is a something that all these inhere in, a substratum or support, which we call our 'self,' the 'ego,' or 'I,' and this abstract self is exempt from the conditions that attach to these attributes of self. This ultimate personality of every human being is free and independent, being exempt from the laws whereby our several feelings operate as motives to our ordinary actions. A self-determining power is supposed to reside here, even if excluded from the other mental adjuncts. It is considered unphilosophical and incorrect to resolve the whole of mind into feelings, actions and intellect; these are mere attributes of an inexplicable something which each one is conscious of, and recognizes as the essence or center of the mental being, while they are merely properties or attributes. Granting the existence of this inner self, there is said to be sufficient scope for a properly free agency, without going the length of supposing that men are to contradict themselves in the everyday conduct of life.

Such a mode of stating the doctrine of liberty, however, is liable to the charge of logical confusion, not to speak of the difficulty of establishing the existence of the entity in question. If we were to inquire into what constitutes the *essence* of mind, the thing which being present constitutes mind, and whose absence is the negation of mind, we might perhaps not be able to come to a conclusion that all philosophers would acquiesce in. It is always reckoned a very abstract and metaphysical discussion to settle the essence of things; even as regards *matter*, this is not an easy question. But if 'essence' is to mean something, and not

absolutely nothing, it must point to some power, property, or quality, capable of being named and signalized. Thus, we might say the essence of material bodies is the quality variously named, as resistance, momentum, inertia; all which imply that one body is at once an obstruction to other moving bodies, and a moving power when once in motion; but if any one insists that this is but one of the attributes of matter, in common with weight, extension, color, &c., and that there must be something still deeper, in which all the various qualities inhere, we can only answer that we know of no such essence or substratum, and are incapable of conceiving any such. We may fix upon the most fundamental, the most universal, and ineradicable quality of a thing, such as this property of resistance as regards material bodies, and term that the essence; while any other attempt at discovering an essence would only end in setting up fictions. So in the case of mind. If we are called on to specify any one aspect of our mental constitution more universal and fundamental than the rest, with a view to setting forth the essence of mind, we should be obliged to select *volition*, or action governed by feeling, as the main or central fact. Wherever we can prove the existence of feeling, and of an activity controlled by that—as when an animal uses its organs to preserve its own life, to cater for pleasures, and ward off pains—we should have to admit the reality of mind, although, perhaps, the intelligence were of the lowest kind. Any being not possessing both sensibility and the power of acting in accordance with it, could not be said to possess a true mental nature. We should not trouble ourselves with considering the possible existence of a mystical 'ego,' but should at once declare that such a being did not come up to the standard or definition of mind. Will, or volition, as thus explained—namely, the direction of the active organs of a living creature to chime in with its various feelings—is itself the essence or substratum of mind, as resistance is the essence of matter. Wherefore, to speak of feelings and actions as something apart from 'ego,' but inhering in it, is merely to count the same fact twice over, or to call a thing the attribute of itself. Volition *is* mind, and not an attribute of mind; and when we have specified the power of voluntary, or feeling-guided action, and a certain amount of intelligence, varying greatly in individuals, we have specified everything that can belong to any individual man or animal; an 'ego' beyond this is something inexplicable and fictitious. It cannot, therefore, be admitted that any foundation is given to a supposed 'free agency,' by referring to this occult and imaginary essence, any more than it would be competent to claim exceptions to the great physical laws that govern material bodies, by assuming an occult essence of matter with powers and properties at variance with its inertia, weight, extension, and other known qualities.

In one respect, the mind is differently situated from the material world in all that regards the power of tracing strict uniformity, and predicting the future from the past. Each one of us has direct access to our own feelings, but only an indirect and imperfect access to the feelings of another person. Excepting self, we can never know the whole of what any one feels; our best observations and reasonings are but approximations to the truth, and predictions founded on them are liable to be falsified through unseen forces in the arcanæ of another man's individuality. Admitting the uniformity of sequence of motive and act, we are never able to exhaust the motives of any single mind, beyond our own; and thus each one may be said to move in a certain inner circle of the impenetrable and unpredictable, while the large mass of the everyday actions of all human beings follows an almost undeviating regularity. This is a very important distinction between mind and matter, although not invalidating the great general fact of uniform law, as attaching to the one no less than to the other. For a sketch of the history of this great controversy, see Dugald Stewart's *Active Powers*.

FREEZING AND FUSING POINTS. See FUSING POINTS.

FREEZING MIXTURES, AND OTHER MEANS OF COOLING.

When matter passes from the solid into the liquid state, heat in large quantity disappears, and ceases to affect the thermometer. See *HEAT*. The chemist avails himself of the fact that heat disappears during liquefaction, for the purpose of procuring artificial cold. When a piece of ice having a temperature of 32° F. is placed in its own weight of water at 174°, we find, on testing the water with the thermometer after the ice has melted, that its temperature is 32°; the heat which the water contained having disappeared during the melting of the ice. As water in passing from the solid to the fluid state possesses the property of rendering latent a greater amount of heat than any other substance, it is, when in a solid form, as ice or snow, or when combined with salts, as water of crystallization, a powerful agent in producing artificial cold.

The substance employed in freezing mixtures should be finely powdered, rapidly mixed, and placed in vessels with little conducting power. The following are a few of the important formulæ for these mixtures: 1. A mixture of two parts of

pounded ice or of fresh snow and 1 part of common salt, causes the thermometer to fall to -4° . 2. A mixture of 5 parts of commercial hydrochloric acid and 8 parts of powdered crystallized sulphate of soda, causes a reduction of temperature from 50° to 0° . 3. Equal parts of water, of powdered crystallized nitrate of ammonia, and of powdered crystallized carbonate of soda, produce a cold of -7° . 4. A mixture of 3 parts of crystallized chloride of calcium, previously cooled to 32° , and 2 parts of snow, produces a cold of -50° , which is sufficient to freeze mercury. 5. By dissolving solid carbonic acid, or solid nitrous oxide gas, in sulphuric ether, temperatures of from -120° to -146° may be obtained, at which alcohol passes to the consistency of oil, and finally to that of melted wax. This is the most powerful freezing mixture that is known.

The freezing mixtures used by confectioners and those that are most convenient for ordinary experimental purposes, are the first and second of the above list.

When matter passes from the liquid to the æiform state, heat also disappears, and the knowledge of this fact has been applied to the cooling of liquids, and to the actual production of ice. If a glass bottle containing water be covered with a cloth, which is kept constantly wet by the application of water, the evaporation from the wet cloth will soon diminish the temperature of the contents of the bottle, and if the cloth were moistened with alcohol or with ether, the cold would be proportionally greater, the degree of cold varying with the rapidity and extent of the evaporation. Wine-coolers, or water-coolers, made of porous earthenware, act in the same manner as the cloth. They are soaked in, and saturated by water, which by its evaporation occasions cold. Coolers of this kind are common in most hot countries. On the ancient monuments of Egypt, a man is sometimes represented as fanning these vessels with a palm-leaf, to promote evaporation, and the Arabs in that country still practice this custom. See REFRIGERATING-MACHINES.

In some parts of India, where the dryness of the air allows a considerable evaporation to take place, ice is obtained in the following manner: 'Flat, shallow excavations, from one to two feet deep, are loosely lined with rice-straw, or some similar bad conductor of heat, and upon the surface of this layer are placed shallow pans of porous earthenware, filled with water to the depth of one or two inches. Radiation (see HEAT) rapidly reduces the temperature below the freezing-point, and ice is formed in thin crusts, which are removed as fast as they are produced, and stowed away in suitable ice-houses.'—Miller's *Elements of Chemistry*, 2d ed., vol. i. p. 220.

FREEZING-POINT. See THERMOMETER.

FREGENAL DE LA SIERRA, a town of Spain, in the province of Badajoz, and 300 miles south-east from Badajoz. It stands in a valley among mountains on the right bank of the Martiga. The streets are wide and well paved, and the houses in general well built. There is an ancient castle, erected by the Templars, within which is the bull-ring, capable of containing 4000 people. Leather and linen fabrics are extensively manufactured. Pop. (1877) 7707.

FREIBERG, an ancient city of Germany, the center of administration for the Saxon mines, is situated on the northern slope of the Erzgebirge mountains on the left bank of the Münsbach, not far from its confluence with the Mulde, 20 miles south-west of Dresden. It owes its origin to its silver-mines, discovered about the year 1190. It is still surrounded by old walls and towers, and contains many interesting buildings and institutions, of which the principal are the town-house, dating from 1410, and the cathedral (1484—1512), two stately Gothic edifices, and the Berg-Academie, or School of Mines, founded in 1765, the most famous institution of the kind in Europe. At the Berg-Academie, instruction is given by professors in surveying, mining, the preparation of ores, geology, mineralogy, &c. It possesses lecture-rooms, a library, and mineralogical and geological collections; and has attached to it three separate laboratories, and an office for the sale of minerals. Humboldt, Werner, Jameson of Edinburgh, and many other eminent geologists and mineralogists, studied at this institution. There are, it is said about 150 mines of silver, copper, lead, and cobalt around Freiberg. The manufactures consist principally of articles in imitation of gold and silver ware, of white-lead, gunpowder, iron and copper wares, &c. In the 17th c., it was a place of great wealth, and had a pop. of 40,000. The mines, however, have of late greatly fallen off, owing either to the richest veins being exhausted, or to the shafts being driven so deep that the water cannot be drained off from them. Pop. (1880) 25,445.

FREIBURG, or **FRIBOURG**, a canton of Switzerland, bounded on the N. and E. by Bern, and on the S. and W. by Vaud and the Lake of Neuchâtel. It has a superficies of 642 square miles, and according to the census of 1880, a population amounting to 115,400, of whom near 100,000 were Catholics. More than two-thirds of the inhabitants are French; the remainder are Germans. The official language is French, but all the laws and decrees

binding on the whole canton are published both in French and German. The surface of the country is hilly, the mountains in the south of the canton forming a continuation of the Bernese Alps, and rising in the highest points upwards of 7000 feet high. The principal rivers are the Saane or Sarine—which traverses almost the whole extent of the canton from its southern to its northern extremity—and the Broye. The country abounds in excellent meadows and rich pastures, upon which are reared the strongest horses and the best breed of cattle in the whole of Switzerland; indeed, the great part of the wealth of the canton consists in cows, sheep, goats, and horses, of which in proportion to its area there are great numbers. Dairy husbandry, and especially cheese-making, is pursued with great success; 40,000 cwt. of cheese are said to be made yearly. There are considerable manufactures of straw-plat, leather, cherry brandy, and tobacco. F. was received as a member of the Swiss confederation in 1481, and in 1848 a liberal constitution was established. It sends six members to the national council.

FREIBURG, or **FRIBOURG**, a town of Switzerland, capital of the canton of the same name, is situated on both banks of the Sarine, but chiefly on a hilly promontory formed by one of its windings, about 18 miles south-west of Bern. Seen from some distance, the town has a highly imposing and picturesque appearance. Houses climb to the top, and extend to the very edge of the precipice that overhangs the river, and in another portion of the town they form terraces, the roofs of one tier being on a level with the pavement of another; while the whole is surrounded by a long rising and falling line of embattled walls, with watch-towers and gateways of ancient fortifications which still exist in a perfect state. The banks of the Sarine are united by four bridges, one of them a suspension-bridge, 906 feet long, 23 feet wide, and 175 feet above the stream, the longest bridge of a single span in the world—about 300 feet longer than the Menai Bridge. Another suspension-bridge spans the gorge of Gotteron, and is about 700 feet long, and 317 feet above the valley beneath. The church of St. Nicholas, a fine Gothic structure, has an organ built by a native of F., which has 7800 pipes, one of them 32 feet long, and is considered the finest toned instrument in Europe. This church has also the highest spire and finest set of bells in Switzerland. The other principal buildings are the Cantonal School (previous to 1848 the Jesuits' College), the most conspicuous building of the town; and the Lyceum. The inhabitants of the upper portion of the town speak French; in the lower portion, German is spoken. F. has few manufactures; the chief are woollens, hardware, leather, pottery, and tobacco. Pop. (1880) 11,546, of which only 500 are Protestants.

FREIBURG, a town of Germany, in the grand duchy of Baden, capital of the circle of the Upper Rhine, is the seat of an archbishop, and is situated on the Dreisam, on the western border of the Black Forest, 42 miles south-south-east from Strasburg. It is an open, well-built town; the walls and ditches with which it was formerly surrounded, have been converted into promenades and vineyards. The Minster or Cathedral of F. is one of the most beautiful and perfect specimens of Gothic architecture in Germany. It is cruciform, and built of red sandstone, was begun in 1122, and not thoroughly completed till 1513. It has a tower 367 feet high, remarkable for its elegance and lightness. In one of its chapels, the University Chapel, there are, among other pictures, a Nativity and an Adoration by Holbein, the latter considered one of his most successful pictures. The university of F. was founded in 1456; in 1875 it had 48 professors and teachers, and 318 students. The Exchange (*Kaufhaus*) is a quaint Gothic structure of the 16th century. The chief manufactures are chicory, tobacco, paper, potash, &c. Pop. (1880) 36,382, of whom about 2500 are Protestants.

FREIGHT (a word having the same origin as 'fare'), the hire of a ship, or part of a ship, for the transport of merchandise; also the merchandise so transported. The agreement for the service is termed a Charter-party (q. v.).

If a merchant freight a whole ship, but neglect to fill it, the captain is not at liberty to complete the cargo from other sources, without accounting to the merchant for any moneys received for such additional load. On the other hand, if the merchant covenant to freight a certain portion of a ship, he is bound to pay the sum agreed on for that portion, notwithstanding that his goods may fail to occupy as much space. If, in the charter-party, a day be appointed for sailing, and either the merchant fail to have his goods ready for embarkation by the time fixed, or the vessel be unprepared to start—wind and weather permitting—the agreement may be declared void by the aggrieved party, who can also recover at law for any detriment caused to his property in consequence of the delay. The use of charter-parties has been traced back as far as the reign of Henry III.

This contract, which in England, and generally in the commercial language of this country, is called freight, is more commonly spoken of by the legal writers of Scotland as Affright-

ment, from the French *affrètement* (Bell's *Com.* i. p. 414), but there is no essential difference in the laws of the two countries with regard to it. Throughout the whole commercial world, indeed, in so far as its provisions are not made the subjects of positive stipulation either by Charter-party or Bill of Lading (q. v.), they will be held to be in accordance with the usage of trade, and of that particular branch of trade to which the hiring has reference.

It was formerly held that the payment of the wages of the crew was contingent on the earning of freight by the ship, in accordance with the maxim of Lord Stowell, that 'freight is the mother of wages.' But this rule, which was already subject to many exceptions, has been abrogated by the Merchant Shipping Act (17 and 18 Vict. c. 104), and wages may now be recovered either by seamen or apprentices, even though no freight has been earned by the vessel. The seaman has a right to cling to the last plank in satisfaction of his wages; but in cases of shipwreck, his claim for wages will be barred if it be proved that he did not exert himself to the utmost to save the ship, cargo, and stores. This provision was first introduced by 7 and 8 Vict. c. 112, s. 17, which enacted that, in order to enable him to recover his wages, the seaman should be bound to produce a certificate from the master, or chief surviving officer of the ship, to the effect that he had so exerted himself. By s. 183 of 17 and 18 Vict. c. 104, the onus of proof is very properly laid on those who impugn the conduct of the seaman. The old rule is still adhered to in America, but it is not applied to the master, and it does not hold with reference to seamen, if the freight has been lost by the fault either of the master or owner; e. g., if the ship has been seized for debt, or for having contraband goods on board. See Kent's *Com.* iii. pp. 266, 267.

FREILIGRATH, FERDINAND, a brilliant lyric poet of Germany, was born at Detmold, in the principality of Lippe, 17th June 1810. He attended the high school in his native town till the year 1825, when he entered a merchant's office, first at Soest, and afterwards at Amsterdam. Encouraged by the favorable reception of his poems, he abandoned mercantile pursuits, married, and removed to Darmstadt.

In 1842, a pension was bestowed upon him by the king of Prussia, whereupon he removed to St. Goar, on the Rhine. This circumstance, and his poem *Aus Spanien*, deprived him of the sympathy of the liberal party, which, however, was restored to him twofold when, in 1844, he gave up his pension, and in his political poem attached himself to the democratic party. The publication of his *Glaubensbekenntnisse* (Confession of Faith), in the same year, compelled him to take refuge abroad. He went to Belgium, Switzerland, and in 1845, to London, where he resumed his mercantile pursuits, and became correspondent for the banking-house of Huth & Co. He was about to accept an invitation to America, sent him by Longfellow, when the events of 1848 recalled him to his native country. F. settled in Düsseldorf, where he became the most important member of the democratic party, and sang the praises of democratic socialism. He was impeached on account of his poem *Die Todten an die Lebenden* (The Dead to the Living). The interest felt in this trial was extraordinary. F. was defended by celebrated advocates, who did not fail to ridicule the folly shown in prosecuting a man for writing poetry. The doctrine that the poet is a 'chartered libertine' in the expression of his sentiments, carried the day, and F. was acquitted, 3d October 1848. The consequence was inevitable. His poem immediately became the rage; the first edition was sold off in Düsseldorf within a few hours. A second prosecution induced F. again to withdraw from his native country, and from 1849 to 1868 he resided in London. In the latter year, he returned to Germany, and made Stuttgart his home. Several songs, written by him there at the beginning of the Franco-German war, have attained great popularity. F.'s principal productions are his *Gedichte* (1838; 27th edit. 1871); *Ca Ira!* (1846); *Die Revolution* (1848); and *Neuere politische und sociale Gedichte* (1849). Complete editions of his works appeared at New York (6 vols. 1858—1859), and at Stuttgart (6 vols. 1870; 2d ed. 1871). F.'s poems display lively imagination, fire and melody of rhythm, a richness of execution, and a picturesque originality of style which not seldom, however, passes into eccentricity and merely 'spasmodic' force of expression. His translations from English poets are admirable. F. died at Cannstadt, near Stuttgart, on March 18, 1876.

FREIRIRA, a seaport of Chili, in the province of Atacama, at the mouth of the Guasco. It is a place of some trade. Pop. 10,000.

FREISCHÜTZ, the freeshooter, is the name given in the legend to a hunter or marksman who, by entering into a compact with the devil, procures balls, six of which infallibly hit, however great the distance, while the seventh, or, according to some versions, one of the seven, belongs to the devil, who directs it at his pleasure. Legends of this nature were rife among the troopers of Germany of the 14th and 15th centuries, and during the Thirty

Years' War. The story first appeared in a poetic form in 1810 in Apel's *Gespenssterbuch* (Ghost-book, 1810—1815), and F. Kind adapted the story (1843) to the opera composed by Weber in 1821, which has made it known in all civilized countries.

FREISING, a town of Bavaria, is situated in a fruitful, agreeable district on the left bank of the Isar, 20 miles north-east of Munich. The town was the seat of an episcopal prince till 1802, when the see was secularized. The bishopric of F. dated as far back as 724 A.D., but its bishops were first made princes by the Emperor Ferdinand (1619—1637). The chief buildings are the palace formerly of the bishop, and a beautiful cathedral, dating from the 12th c., having three naves, two towers, and a singular crypt, the pillars of which have monsters crawling up their shafts. Pop. (1880) 8850, who carry on brewing and distilling, and manufacture vinegar, tobacco, saltpetre, &c.

FRÉJUS (anc. *Forum Julii*), a small town of France, in the department of Var, is situated a mile inland from the embouchure of the Argens (anc. *Argentæus*) into the Mediterranean Sea, and 15 miles south-east of Draguignan. It was originally a colony from Marseille, and was afterwards colonized anew by Julius Cæsar, and called Forum Julii. It has remains of ancient Roman walls, and of a Roman circus and viaduct. The ancient harbor, at one time the most important Gallic port, and in which Augustus posted the fleet of 300 galleys which had been captured from Antony at Actium, has become silted up. Here, or rather at the new harbor of St. Raphael, 1½ miles off, Napoleon landed on his return from Egypt in 1799, and embarked for Elba in 1814. Pop. (1876) 2791.

FREMONT, JOHN CHARLES, an eminent American traveler and explorer, son of a French emigrant gentleman and a Virginian lady, was born at Savannah, Georgia, January 21, 1813. He lost his father at the age of four years, and removed to Charleston with his mother, where, at the age of 15, he entered Charleston College. For two years he taught mathematics on board the sloop-of-war *Natchez*, received his degree in 1835, and soon after passed a rigorous examination for the post of professor of mathematics in the navy, and was appointed to the frigate *Independence*; but resolving to quit the sea, he turned his attention to civil-engineering, and was employed in the Mississippi survey, and similar undertakings. In 1840, he received from President Van Buren a commission as second-lieutenant in the corps of Topographical Engineers, and was ordered to make an examination of the river Des Moines, upon the western frontier. In 1841, he married the daughter of Colonel Benton. He now proposed to penetrate the Rocky Mountains, and, his plans being approved of, he reached and explored the South Pass in 1842, with only a handful of men. He thus demonstrated the feasibility of an overland communication between the two sides of the continent, and discovered the route to California, since followed by thousands. During the whole of his journey, he made careful barometrical and astronomical observations, and noted attentively the geography, botany, and geology of the district. A lofty peak which he ascended, 13,750 feet above the sea, is now called Fremont's Peak. His report of the expedition was laid before Congress in the winter of 1842—1843, and attracted great attention both at home and abroad.

He immediately planned a second expedition more extensive than the first, and determined to survey the then unknown regions lying between the Rocky Mountains and the Pacific Ocean. He commenced his journey in May 1843, explored the Kansas River, crossed the South Pass, and, after 1700 miles of traveling, came, on September 6, in sight of the Great Salt Lake, of which very vague and erroneous notions were entertained. He advanced as far as Fort Vancouver, 90 miles from the mouth of the Columbia River, and then commenced his return. He selected a route leading to the Upper Colorado, through an almost unknown region, crossed by rugged mountain-ridges. He soon encountered deep snows, and found himself in a bare and desolate country, with the prospect before him of death from cold and hunger to his whole party. After suffering the greatest hardships, he determined to make for San Francisco instead of the United States, and when he could get no Indian to guide him across the snow-covered mountains which lay between him and the valleys of California, he boldly undertook the passage without a guide. He accomplished it in 40 days, reaching Sutter's Fort on the Sacramento, early in March, with his men almost reduced to skeletons, and only 35 out of 67 horses and mules remaining, and those so weak and thin that they could barely walk. He proceeded southward, along the Western range of the Sierra Nevada, crossed that range through a gap, entered the Great Basin, and reached Washington in August 1844. The remainder of the year was taken up in preparing his report. In consideration of his valuable services, F. was brevetted captain in January 1845, and in the spring of the same year set out on a third expedition to explore the Great Basin and the maritime region of California. He took part in the war with Mexico, and cleared the northern part of California from Mexican troops. He then became involved in a

dispute between two of his superior officers in regard to the right of command in California, which led to his trial by court-martial, and the unjust deprivation of his commission. The president offered to reinstate him, but as it was justice and not favor that he demanded, he resigned his position in the army.

In 1848, he started upon a fourth expedition, at his own expense, trying to find a practicable passage to California along the upper waters of Rio Grande. In attempting to cross the great Sierra covered with snow, his guide lost his way, and P.'s party encountered horrible suffering, being even driven to cannibalism to support life, and losing one-third of their numbers. In 1849 he settled in California, and in the same year was elected senator for that state. In 1850, Baron Humboldt, on behalf of the king of Prussia, sent him 'the great golden medal for progress in the sciences,' while at the same time the Geographical Society of Berlin made him an honorary member. The Royal Geographical Society of London also awarded him the 'founder's medal for pre-eminent services in promoting the cause of geographical science.' In 1853 he conducted a fifth expedition along the route of the fourth. In 1856 he stood for the presidency. In 1861 he was made a major-general, but gave up his command in 1862. In 1864 he was again nominated for the presidency, but withdrew. In 1873 he was found guilty at Paris of fraud in connection with his scheme for a southern railway to the Pacific.

FRENCH BEANS. See KIDNEY BEANS.

FRENCH BERRIES, Avignon Berries, Persian Berries, or Yellow Berries (Fr. *Graines d'Avignon*), small berries, the fruit of certain species of Buckthorn (q. v.), but principally of the Yellow-berried Buckthorn (*Rhamnus infectiorius*) used by dyers in dyeing yellow. For this purpose, they are gathered unripe, and dried; they yield a rich yellow color, but it is fugitive, and on this account the use of this dye-stuff has very much given place to that of mineral dyes. It is, however, still imported into Britain from the Levant and from the south of France. That from the Levant is the best. The yellow-berried buckthorn is a very spreading procumbent shrub, with ovato-lanceolate smooth leaves, growing naturally in rough rocky places in the countries near the Mediterranean. It is cultivated to some extent in the south of France.

FRENCH HONEYSUCKLE (*Hedysarum coronarium*) a beautiful biennial plant of the natural order Leguminosæ, sub-order Papilionaceæ with branching and spreading stems, pinnate leaves, scarlet or sometimes white flowers, and jointed pods, which have one seed in each articulation. It has fine foliage, and a very elegant appearance, and is often to be seen in flower gardens. It is a native of the south of Europe, and is there pretty extensively cultivated as food for cattle. It grows to a height of four or five feet, yields a large crop and is very nutritious. It is used either in a green state, or dried as hay. It requires a rather warmer climate than that of England for its profitable cultivation. The genus *Hedysarum* contains many species, extensively diffused over the warmer parts of the world. A few are found in cold regions as *H. fruticosum* in Siberia, growing in sandy soils, very useful in fixing them by its roots, and valuable as affording food for horses.

FRENCH LANGUAGE AND LITERATURE. The *French language* has been developed under the combined influence of numerous forms of speech, among which Latin, as in every other tongue of Western Europe, takes a principal part. It would appear that in the 4th and 5th centuries of our era, the whole of Gallia, from the Rhine to the Pyrenees, had adopted the language of the Roman conquerors, not the polished speech of the classic writers—the *sermo urbanus*—but the form of Latin that had become common to all the subjugated provinces of Central Europe—*lingua Romana rustica*. Suetonius, Pliny, Juvenal, and Martial make frequent reference to the Latin in use in Southern Gaul and Spain; and in the 4th c. we find that, under the Emperor Theodosius, the Roman Senate was addressed by an orator of Gaul in rude and uncultured transalpine Latin. At this period, and much later, Latin was employed in the provincial assemblies of Gaul; but in the 7th c., two other forms of speech had come into general use—a provincial dialect of the *lingua Romana*, and a form of German known as the *lingua Theotisca*. The latter which was probably a mingled jargon, used in common by the Frankish and Teutonic tribes, and consequently in vogue in the north and east, received a more definite development under Charlemagne, who caused a grammar of it to be prepared for the use of the schools which he had established, and in which it was taught conjointly with Latin.

The council of Tours (813) recommended the use both of the rustic Latin and the Teutonic dialect; and in 842, in the compact made between the two brothers, Charles the Bald and Louis the German, the former swore in the *Romana rustica*, and the latter in the *Teutsche* language, which, although it had been generally spoken at the court of Charlemagne, had already given place in France to the Frankish form of Latin. This Gallo-Romanic idiom

early branched off into the two characteristically different forms of the *Provençal* or *Langue d'oc* of the south, and the *Roman Wallon*, or *Langue d'oïl* of the north. The comparative prosperity which the south of France enjoyed, first under the kings of Arles, and subsequently under the counts of Provence, its freedom from foreign aggression for several centuries, the beauty of the climate, and the more thoroughly Romanized character of the people, led to the early development of the Provençal, and, by the lips of the troubadours, breathed forth a rich melody of song, which, after a time, was re-echoed in less harmonious tones by the *trouvères* of the north in their ruder tongue. The earlier productions of these two schools exhibit striking differences in diction, inflection, and construction; and while the troubadour sang of love, and dwelt on the beauties which a southern climate and a fruitful soil scattered broadcast over the face of nature around him, the northern *trouvère* invented a chivalrous mythology of his own, and ascribed to the heroes of Greece and Rome, and the brethren in arms of King Arthur and Charlemagne, the sentiments of his own times. The use of the northern or Walloon French was very considerably extended through its adoption by the Normans, who in time carried it under William the Conqueror to England, and, under the northern leaders of the Crusades, to the south and east. In the south, on the contrary, the cruel persecutions of the Albigenses, against which the troubadours inveighed aloud, checked the development of the Provençal language; for the songs of the troubadours were proscribed, and thus the use of the *langue d'oïl* soon extended with the spread of northern power into the provinces of Provence and Languedoc. One of the earliest monuments of the French-Walloon, in the form in which it shows evidence of its gradual development in modern French, is the *Roman de Rou*, a versified chronicle of the exploits of Rollo and his successors, composed by Robert Wace. In this composition, the language is no longer the sonorous, many-vowelled Provençal, or the mongrel Latin of the *lingua rustica*, but a distinct form of speech. The language thus formed by the ingrafting of Norman, Frankish, and Teutonic idioms on the degenerated Latin of the Gallic provinces, was rapidly developed under the fostering influence of the university of Paris and the Sorbonne, which already, in the 13th c., attracted the learned men of all nations to their schools. The *Roman de la Rose*, begun in the 13th c. by Jean de Meung, and completed in the 14th c. by G. de Lorris, and *Guyot's Bible*, belonging to the same period, are typical of the literature of France in the middle ages, which consisted chiefly of tales of chivalry, and coarse sallies against the clergy.

Fróissart's chronicles of the 14th c., which afford a vivid picture of the wars of the English and French, in which he himself took an active share, are written in a dialect that is quite comprehensible to the modern student. Comines, who wrote in the 15th c., is a less picturesque narrator; but he may be classed among the earliest true historians of his country, for he was one of the first who observed public events with judgment, and recorded what he had seen in a straightforward, truthful manner. Francis I., by his love of music, song, and dramatic representations, gave indirect encouragement to literature; while the French language acquired force and terseness through the writings of Rabelais, Ronsard, Amyot, and Montaigne; and although, under the regencies of Catharine and Marie de' Medici, Italian writers were more patronized at court than native authors, the language and the literary talent of the nation were undergoing a process of gradual development, which was completed by the establishment, under the auspices of Richelieu, of the *Académie Française* in 1634. At this period, Corneille brought French tragedy to its highest point of grandeur in the classic style of the drama, which he had adopted. His best pieces are *Le Cid*, *Les Horaces*, *Cinna*, &c. Pascal, in his *Lettres Provinciales*, established a standard of French prose; while Descartes, in his *Discours sur la Méthode*, showed the adaptability of the language to subjects requiring conciseness and precision. A long galaxy of great names gave splendor to the reign of Louis XIV. in every branch of literature. Notwithstanding the frivolity of the habits of the higher classes in France during this period, no age produced more vigorous writers or original thinkers. Bossuet and Flechier won respect by their noble funeral orations; Bourdaloue and Massillon, by their eloquent preaching; Fénelon, by his learning and earnest exhortations; and Pascal, by his Christian view of the great questions of human experiences. In dramatic literature, Racine and Molière stand forth conspicuous among a host of lesser writers, the former pre-eminent in tragedy, as his *Andromaque*, *Iphigénie*, *Phèdre*, testify; the latter inimitable in comedy, and exhibiting wonderful powers of delineating human character from a humorous point of view, that have never been surpassed. Among his best pieces we may instance *Tartuffe*, *Le Misanthrope*, and *Les Femmes Savantes*. La Fontaine is alike well-known among his countrymen for his moral Fables and his licentious Tales. La Rochefoucauld and La Bruyère, in their *Sentences* and *Caractères*, depicted human character, with its peculiarities, inclinations, and foibles in strong, humorous, and vivid touches. This was the age of Memoirs and

Letters: in the former branch of contemporary history, Cardinal Retz was perhaps the most successful of the host of writers who gained a reputation in this special department of literature; while Madame de Sévigné's letters are models of easy epistolary style, and afford a lively picture of the times. This age, in which, at anyrate, the *semblance* of religion had been respected, was followed by one of scepticism, infidelity, and philosophical speculations of the wildest kind. Four men of genius, Montesquieu, Voltaire, Rousseau, and Buffon, contributed, to a very great extent, by their writings, and the influence which they exerted on the minds of their contemporaries, in bringing about the Revolution.

Montesquieu, by his philosophical dissertations on the laws and government of his country, taught the French to take more enlightened views of the rights and duties of different classes of society, and thus naturally roused the angry passions of the oppressed lower orders; while the passionate eloquence of Rousseau won a hearing for doctrines which were entirely subversive of moral obligations, and recognized no higher standard than human inclinations. Voltaire's versatility of powers, which were exercised with equal ease, and nearly equal success, on tragedy, satire, romance, poetry, history, and philosophy, enabled him, to the end of his long life, to maintain the supremacy over public opinion, which he had won in his youth. Buffon devoted himself to the study and description of nature, and his *Histoire Naturelle*, which inaugurated a new era in the literature of natural history, is a remarkable monument of the science and learning of that period. Diderot, and D'Alembert the geometer, founded the *Encyclopédie*, which, while it gave a lucid summary of numerous branches of human knowledge, was always hostile to religion. The Revolution, which had been materially accelerated, if not produced, by the inspirations of men of consummate intellect, was not favorable to literature. A period of almost complete intellectual torpor succeeded the active mental development that had characterized the preceding classic and philosophic periods. The Empire was scarcely more propitious to learning; but with the *Corinne* and *L'Allemagne* of Madame de Staël, and *Les Martyrs* of Chateaubriand, a reaction took place; and these productions of the new romantic school were soon followed by numerous others, either belonging to the same, or to the rival classical school. Among the host of young and original writers who now acquired reputation, we may instance, in poetry, dramatic art, and fiction, Victor Hugo, the greatest of living French poets, Alfred de Vigny, Frédéric Soulié, and A. Dumas the elder, one of the most prolific of novel-writers, among whose most popular works are—*Les Trois Mousquetaires*, *Le Comte de Monte Christo*, *Le Collier de la Reine*, &c. He published ample reminiscences of his various travels and personal adventures in *Le Caucase*, *Voyage*, *Les Mémoires d'Horace*, *Mémoires de Garibaldi*, the successive volumes of his own *Mémoires*, &c. The catalogue of his writings is scarcely conceivable for its extent, numbering, it is said, above 1200 volumes. Casimir Delavigne has attempted to combine the romantic and classical schools in his *Louis XI.* *Les Enfants d'Edouard*, &c. George Sand (Madame Dudevant) is one of the most elegant writers of her country, and her works are models of style. Her *Indiana*, which appeared in 1832, inaugurated a new era of emotional novel-writing, and has had numerous imitators. Among her numerous works, the most popular are *Lélia*, *Mauprat*, *Andr*, *Consuelo*, and the numerous pieces which she subsequently wrote for the stage, such as *François le Champi*, *Marquis de Villemer*, &c. *Les Mystères de Paris*, and *Le Juif Errant*, which depict the concealed miseries and depravities of social life, quickly brought their author, Eugène Sue, into notice.

The tendency to materialism and sensualism, which characterizes the works of the two last-named writers, is more or less perceptible in all belonging to their age in France. The few artistic and good historical novels that have appeared have not met with the success they deserved. Among other recent writers of fiction, we may especially instance Balzac; A. de Masset, with his unrivalled richness of fancy, and melody of speech; Jules Sandeau, with whom Madame Dudevant wrote in conjunction; the historian Merimée; Théophile Gautier; Paul de Kock; the literary partners, Erckmann-Chatrian; Edmond About; and Dumas the younger, who has latterly devoted himself mainly to writing for the theater, which still absorbs much of the talent of France (as in Sardou's case). Till recently, few names in the domain of poetry, beyond those of Béranger, Lamartine, Victor Hugo, De Vigny, Sainte Beuve, and De Musset, were much known out of France: Gautier and De Banville, lyrists of the romantic school, have of late obtained a favorable hearing in many lands; and De Lisle is recognized as the head of a small but popular modern school. History is undoubtedly the most successful branch of modern French literature. Among those who have gained for themselves a world-wide reputation in this department of research, we would instance Barante, whose early work, *L'Histoire des Ducs de Bourgogne*, has been followed by his able histories of the *Convention* and *Directory*. Guizot has shown inde-

fatigable powers of research and a philosophic power of generalization in a great number of works, among which the first rank may be awarded to his *Essais sur l'Histoire de France*, and *L'Histoire de la Civilisation en Europe*. Thierry, in his *Lettres sur l'Histoire de France*, and *L'Histoire de la Conquête de l'Angleterre par les Normans*, displays great powers of narration and aptitude for theoretic criticism, perhaps more imaginative than sagacious. Sismondi has shown great research and profound knowledge in his somewhat diffuse History. The late President A. Thiers has devoted his learning, industry, and powers of delineation to the exposition of the revolutionary and imperial phases of French government. Louis Blanc, in his *Histoire de Dix Ans*, gives one of the most vivid pictures of contemporary history that we possess. Lamartine, who carries his poetic inspirations and enthusiastic temperament with him into his historical researches, presents magnificent but not perfectly trustworthy pictures of history in his *Histoire des Girondins*, *Histoire des Constituents*, and *Histoire de la Restauration*. Vilemain, although better known for his history of literature, is yet to be classed among historians. Michelet is known as the brilliant author of the *Histoire de France*, Martin and Taine, both recently admitted members of the Académie, may close the list.

There is no department of the moral and physical sciences that has not been enriched and elucidated by the labors of French savans. Among the great scientific writers of modern France, we may instance in metaphysics and political economy, Victor Cousin, Jouffroy, Simon, and Lamennais, whose eloquent defence of spiritualistic and religious principles reacted strongly against the materialism to which French philosophy had long been addicted; while socialism has found powerful advocates in Comte, St. Simon, Fourier, and Leroux. Chevalier, De Tocqueville, Bonald, and Laferrière, are known for their able and philosophic exposition of the jurisprudence of nations, and the social and political condition of democracy in the new and old world.

In philology and ancient history, Champollion, Sylvestre de Sacy, Renan, Renusat, and Stanislas Julien, by their profound researches into Egyptian hieroglyphics and Semitic literature, have thrown new light on the origin of races and languages. In mathematics D'Alembert, Laplace, Lagrange, Biot, Ampère, and Arago stand unrivalled. In natural history, and its kindred sciences, among a host of great French discoverers, we can only instance a few of the more distinguished, as Cuvier, Geoffroy and Isidore St. Hilaire, Blainville, Jussieu, D'Orbigny, Haüy, Gay-Lussac, Elie de Beaumont, Milne-Edwards, and Brongniart, whose painstaking and important services in the cause of science have identified their names with the triumphs of physical research.

No country has ever produced a greater number of elegant essayists and literary critics than France, and no language seems to lend itself more readily than French to a concise and graceful, yet forcible style of epigrammatic writing, and few admit of more idiomatic terseness, or greater polish. See Saintsbury's *Short History of French Literature* (1882); the *Histoire de la Litt. Française*, by Nisard (1846), and that by Gêruzeux (1852); Vilemain, *Tableau de la Littér. au Moyen Âge* (1857); Demogeot, *Hist. de la Littér. Franç.* (1857); Littré's *Histoire de la Langue Française* (1867); Gidel's *Histoire de la Littérature Française* (1875); *La Littérature Française*, Staaff (1869—1873); *History of French Literature*, by H. Van Laun, (1877—1879).

FRENCH POLISHING, the name given to the now common method of coating wood with a fine smooth surface or varnish of gum-lac. Gum-lac is easily soluble in spirits of wine, methylated spirits, or wood-naphtha, and a varnish is thus produced; but if it be applied simply with a brush, as copal, mastic, and most other varnishes are applied, the result is a very rough and broken surface, instead of a smooth continuous polish. To obtain (this with a lac-varnish on wood, it is necessary to apply a very small quantity at once, and to rub it continuously until it dries. If a dry rubber be used, the lac sticks to it, and it is dragged from the wood. An oiled rubber is therefore used, and the oil should be a drying oil, such as linseed. Various kinds of rubbers are used; such as a ball of wood covered with rag, a small roll of cloth with the edges downwards, and likewise covered with rag. The varnish and oil may be mixed together in a bottle, shaken up when used, and a little poured upon the rubber; or a simple solution of shell-lac may be used, and some of this laid upon an oiled rubber. Several successive coats and rubbings are required, and some skill is necessary, in order to produce a good surface.

The following are some receipts for French polish for mahogany; they might be multiplied to a great extent, for they should be modified according to the kind of wood to which they are applied, and the mode of applying them: 1. 5 oz. of pale shell-lac, dissolved in 1 pint of wood-naphtha, or methylated spirit, or spirits of wine. 2. 5 oz. of pale shell-lac, 1 oz. gum sandarac, 1 pint spirit. 3. 1½ lb. pale shell-lac, ¼ lb. mastic, 2 quarts spirit. 4. Shell-lac, 6 oz.; spirit or naphtha, 1 pint; linseed oil, ½ pint. The last is the most easy to apply; it requires no oil on the rubber,

and is a very good domestic polish for restoring furniture, if properly applied by careful and continuous rubbing.

FRENCH PROTESTANT CHURCH. See **HUGUENOTS.**

FRENCH RIVER, a stream of Upper Canada, empties Lake Nipissing into Lake Huron, entering Georgian Bay in lat. 45° 53' N., and long. 81° 5' W. It has a rapid course of about sixty miles; and, towards its mouth, is so uniform in breadth and depth, as to resemble an artificial cut through bare rock. It forms part of the route by which canoes, preferring the Ottawa to the St. Lawrence, pass from Montreal to the Red River of the north.

FRENCH SETTLEMENTS. See **PONDICHERRY.**

FRÉRON, ÉLIE CATHERINE, a French writer, was born at Quimper in 1719, educated under the Jesuits at the college of Louis le Grand, and first acquired a reputation by his publication of a critical journal in 1746. This journal appeared under the curious title, *Lettres de Madame la Comtesse de ****. It was suppressed in 1749, but virtually re-appeared as *Lettres sur quelques Ecrits de ce Temps* (13 vols., 1749—1754), and was again continued under the title of *Année Littéraire* (1754—1776). F. exhibited the most intense bitterness against his leading contemporaries. A worshiper of the age of Louis XIV., he hated and satirized the levelling philosophy of his times. Voltaire was the special object of his aversion, and that sensitive scoffer was deeply galled by the weekly diatribes of his antagonist. The names of Voltaire and F. are inseparably, though not amicably, conjoined in the history of literature. F. was often right in his criticisms and in the accusations which he brought against his adversaries, but opinion in France in the 18th c. was swayed by epigrams, and F. fell a victim to the animosity of the wits. He died of grief, March 10, 1776.—**LOUIS STANISLAS FRÉRON**, a son of the former, was born in Paris in 1765, played a somewhat prominent part in the melodrama of the French Revolution, and in 1802 was sent as sub-prefect to the island of St. Domingo, by the First Consul, but died two months after his arrival.

FRESCO, FRESCO-PAINTING, or PAINTING IN FRESCO, the term applied to paintings executed upon plaster while it is still wet or fresh (Ital., *fresco*). Many celebrated artists and well-known writers have maintained that fresco is the only way in which the highest efforts in art should be embodied. A very large proportion of the best works of the Italian schools, particularly those of Rome and Florence, are done in this manner; and during the present century it has been revived, and many of the chief paintings of the modern German school are executed in fresco. The practice has to some extent been introduced into Britain, and certain works of that kind have been executed in the new Houses of Parliament. Munich has been the chief home of this revived art.

Before noticing more particularly the various properties claimed for fresco-painting, it is proper first to describe the process. A cartoon or drawing on paper is first made of the subject. This must be executed with a correct outline, and the shading and effect fully made out. The finished cartoon may either be of the same size as the intended fresco, or it may be done on a smaller scale; but, at all events, an outline of the same size as the fresco-painting is necessary. When the finished cartoon is made the same size as the fresco, it is generally executed in black and white, with chalk or charcoal, but it is essential to have also a careful study of the subject in colors, and this is in most cases done on a small scale. The colors used are mostly earths or minerals, as few others will stand the action of lime: these are ground and applied with pure water. The ground to be painted on is the last or smooth coating of plaster that is laid over the rough plaster-work with which walls are prepared. This last coating, or ground, or rather as much of it as the artist calculates on being able to cover in one day, is laid on immediately before he commences work. The surface is wet, but firm and smooth; the tracing is laid over the portion prepared, and the artist, with a point of hard wood or bone, goes over the lines of the tracing, and slightly indents them on the plaster. He then proceeds with his work, the finished cartoon and colored sketch being hung or placed near him for his guidance. After his day's work is over, any portion of the plaster that has not been painted on, or that may remain beyond or at the edge of his work, is cut away; and next day, when the painter is ready to commence work, the plasterer is at hand, and joins closely another portion of plaster to the edge of the portion painted on the previous day, which, when cut, had been slightly sloped. The lime, in drying, throws out a kind of crystal surface, which protects the color, and imparts a degree of clearness much superior to, and easily distinguishable from, that of a work in tempera or size paint. This process, although apparently simple, nevertheless requires great dexterity and certainty of hand; for the surface of the plaster is delicate, and must not be overworked, besides, the lime only imbibes a certain quantity of additional moisture in the form of liquid colors, after which it loses its crystallizing quality, and the surface,

or a portion of it, becomes what painters call rotten. Many frescoes are defective in this way. It is only after the lime has dried that such flaws are discovered; the proper plan, in such a case, is to cut away the defective portion, have fresh plaster laid on, and do the work over again. But the flaws are too often retouched with tempera or size colors; and though they may escape notice for a time, the parts touched will change or come off in the course of a few years. Another difficulty in fresco is, that the colors become much lighter after the plaster dries, and for this allowance must be made. However, by practice, the painter may soon get over this difficulty; and he can test the difference between the color as wet and as dry, by putting a touch on a piece of tumber he has generally at hand, which instantly dries the color, and shows as it will be when the lime has dried.

The pre-eminence claimed for fresco-painting is founded on—1. The quality it possesses of clearness and exhibiting colors in a pure and bright state. The surface not being dry and dull, as tempera or size color, nor glossy like oil-paintings, is capable of being favorably viewed from any point. 2. Its durability—many frescoes being painted on arcades or the cloisters of churches open on one side, some on the fronts of houses entirely exposed in the open air. 3. The skill and dexterity required in execution—retouching not being admissible, nor those various appliances of glazing over painting, &c., available in working with oil-colors; all which circumstances compel the fresco-painter to confine his energy more to the subject and design, than to the mechanical qualities so much sought after by painters in oil. The frescoes of M. Angelo in the Sistine Chapel, by Raphael in the stanze of the Vatican, and those in the cupola of the cathedral of Parma by Correggio, are pointed to by the advocates of this mode of art as settling the question.

But, on the other side, it may be said—1. Though a certain degree of clearness and purity of color results from fresco, it is deficient in depth and richness. The absence of glossiness is no doubt an advantage in the case of mural-painting with reference to architectural decoration; but to a considerable extent this difficulty can be obviated in the case of painting in oil; and Delaroche's great picture of the Hemicycle in the Beaux Arts in Paris, which is in oil, is not objectionable on that ground—indeed, many mistake it for fresco. 2. No doubt, in fresco, the colors are not liable to change much, if the work be executed in pure fresco, and not retouched; but, generally speaking, the surface is fragile, and easily broken or scratched, and there is no way of mending it but by retouching with tempera colors; and if that be extensively done, its nature is altered, and it becomes a picture in size and colors. The 'Madonna de Foligno,' 'Madonna di San Sisto,' 'Spasalizia,' and other celebrated easel-pictures by Raphael, are in much better preservation than his frescoes in the stanze of the Vatican. 3. The properties of difficulty in execution and limited range of coloring, and of technical appliances, are of a negative kind. No doubt, some painters have maintained that good coloring is incompatible with grand compositions; but, on the other hand, Titian's 'Entombment' in the Louvre, and Peter Martyr in Venice, among others, are referred to as rebutting such an assertion.

Mural-painting is of great antiquity: in Egypt, in the Etruscan tombs, on the walls of houses in Pompeii, and in the catacombs, there are various remains of paintings which are generally considered to be frescoes; those in Pompeii, in particular, are remarkable for grandeur and purity of style in design and drawing; but they are executed in a slight and free manner, and on this account, and from the same or nearly similar subjects being often found repeated, are supposed to be copies by house-decorators of celebrated paintings that were preserved in temples or palaces at Rome. Whether these were frescoes painted on the walls or movable pictures, is matter of dispute. 'The Greeks preferred movable pictures, which could be taken away in case of fire, or sold if necessary.'—Wilkinson on *Egyptian and Greek Paintings*. Pliny says Apelles never painted on walls; and various pictures of immense value are stated to have been taken from Greece to Rome.

On the whole, it may be assumed as an opinion that has long been generally adopted, that where painting is to be combined with architecture, fresco is the style that assimilates most with it. On the other hand, the fact of Delaroche having so successfully executed in the Beaux Arts a work in oil, which by size and subject was so well adapted for fresco, and the circumstance of the adoption lately in Germany, and by the artists in our Houses of Parliament, of stereochromic painting (see below) in place of fresco—a method by which certain defects in the process of fresco-painting are said to be obviated—mitigate against the soundness of some of the opinions hitherto adopted as to the advantages ascribed to fresco-painting.

Fresco Secco is a spurious kind of fresco, much used in Italy in ordinary house-decoration. The colors, mixed in water, are laid on the wall after the plaster is dry, and adhere in a certain degree by absorption, the hard or glassy surface which forms on plaster

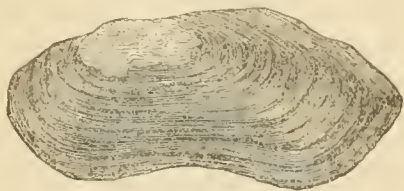
after it dries being first removed by pumice or otherwise. Pictures executed in this manner look coarse and dry, or rotten, and are in every way inferior to pure fresco.

Stereochromic Painting (Gr. *stereos*, firm, and *chroma*, color).—The ordinary process of fresco secco, however, has lately assumed very great importance from a discovery by the late Dr. J. R. von Fuchs of what is called water-glass (see FUCHS'S SOLUBLE GLASS), which, being passed over the surface of a work executed in fresco secco, imparts much brilliancy, and fixes and gives great durability to the colors; this method is styled stereochromic painting, and has been extensively practised in Berlin by Kaulbach and other eminent German artists. The late Prince Albert was so much impressed by the bearing which this discovery would have on the art of mural-painting, that he translated from the German a pamphlet describing the 'manufacture, properties, and application of water-glass (soluble alkaline silicate), including a process of stereochromic painting,' and printed it for private circulation. Mr. MacIse, R.A., made use of this new style of art in executing his great picture in the palace of Westminster of the 'Meeting of Wellington and Blücher at Waterloo.'

FRESHWATER HERRING. See COREGONUS.

FRESHWATER MUSCLE, a popular name common to a whole family of lamellibranchiate molluscs, *Unionidæ* (sometimes called *Naiadæ*), allied to muscles (*Mytilidæ*), but having a much larger foot, which does not generally produce a Byssus (q. v.), except in a very young state of the animal. All the known molluscs of this family are inhabitants of fresh water, some of them being found in still, and some in running waters. A few species are European; but it is in North America that they chiefly abound, its lakes and rivers producing many species. They crawl about by means of the foot; many of them generally live immersed in mud. They are supposed to feed on animalcules, and on decomposed animal and vegetable matter. The epidermis of many is brilliantly colored, and the inside of the shell is lined with a brilliantly and variously colored nacre, so abundant as to be sometimes used for mother-of-pearl. Pearls are sometimes produced. There are four British species, of which one, *Anodon cygneus*, attaining a size of 2½ inches long by 6 broad, is common in lakes, ponds, and muddy rivers. It is very variable in the thickness of the shell and in other particulars. The hinge is toothless.

Two species are confined chiefly to the south and east of England; the fourth (*Unio* or *Alasmodon margaritifera*, *Mya margaritifera* of Linnæus) inhabits the rivers of mountainous and hilly districts with a rocky bed, and has long been celebrated for the pearls which it produces. It is about 2½ inches long by 5 broad, and has a thick blackish-brown shell, with a toothed hinge. It is the most northern European species, and is found in the rivers of Norway and Sweden. The pearls of the British rivers were famous among the ancient Romans; and Suetonius represents them as having formed an inducement for Caesar's expedition. Some of the rivers of Wales, the north-west of England and Scotland,



Freshwater Muscle (*Alasmodon margaritifera*);

have at various times produced beautiful and valuable pearls. In several of the rivers and lochs in Perthshire, muscle-gathering is quite a trade, and the pearls found form the means of subsistence to many families. A pearl from the Conway, presented by Sir Richard Wynn to the queen of Charles II., is among the ornaments of the British crown. Large and fine pearls have also been procured from rivers of Tyrone and Donegal.

FRESHWATER STRATA are so named from their supposed origin. This can be easily determined from an examination of the contained fossils. Though the great proportion of aqueous rocks are of marine origin, yet freshwater strata are occasionally met with. The yellow sandstones of the Old Red or Lower Carboniferous period are freshwater beds, as are also the Burdie House limestone in the Edinburgh coal-field, the Pubeck beds in the Oolite, the Wealden beds in the Chalk, and the Hempstead and other beds in the Eocene period.

FRESNEL, AUGUSTIN JEAN, a French physicist, was born at Broglie, in the department of Eure, 10th May 1788, educated at Caen at the Ecole Polytechnique, and finally at the Ecole des Ponts et Chaussées. On the completion of his studies, he was sent as government engineer to La Vendée, and afterwards to the department of Drôme, where he remained till March 1815. On the return of Napoleon from Elba, F. offered his services to the Bourbons, but ill health prevented him from actively engaging in

military life. At the Restoration, he resumed his duties as government engineer; but in the interval he had been devoting his enforced leisure to physico-mathematical researches, particularly the polarization of light, with so much success, that although in a letter, dated 28th December 1814, we find him writing to a friend to get him some books on the subject, as he did not know what the phrase 'polarization of light meant' ('Je ne sais ce qu'on entend par la polarisation de la lumière'), yet before the completion of the following year, he ranked among the first authorities on the question. In ignorance, it is said of the labors of Young, F. demonstrated to his countrymen the error of the Newtonian theory of the propagation of light by the emission of material particles, and ably advocated the undulatory hypothesis. The result of his researches was exhibited in a memoir, crowned by the French Académie des Sciences in 1819.

Along with Arago, he investigated the action exercised by polarized rays of light on each other, and their discoveries, published in a joint memoir, confirmed his previous theory on the mode of the propagation of light. His practical application of the new theory to the improvement of the light-house system, was of incalculable value, and has quite abolished the old method of illuminating light-houses. See LIGHT-HOUSES. In 1823, F. was elected a member of the Académie des Sciences; in 1825, a member of the Royal Society of London; and in 1827, received from the same Society the Rumford medal for his discoveries concerning light and heat. He died July 14, 1827.

FRESNILLO, a mining town of Mexico, in the state of Zacatecas, 30 miles north-west from Zacatecas, on a feeder of the Santiago or Tololatlán. It has a spacious square, in the center of which is a splendid fountain. In the neighborhood are silver and copper mines, which are among the most productive in Mexico. Pop. 12,000.

FRET, a figure, in Heraldry, resembling two sticks laid saltier-wise, and interlaced with a muscle.



Fret.



Fretty.

FRETTY. When six, eight, or more pieces are represented crossing and interlacing like lattice-work, the shield is said to be fretty.

FREUDENSTADT, a town in Württemberg, and capital of a bailiwick of the same name, in the circle of the Black Forest, 40 miles south-west of Stuttgart, is situated on a rock which is washed by the Murg. It was founded in 1599 by Duke Frederic I., and peopled by Protestant refugees from Austria. It has a considerable trade in wood, cattle, and fruit. Cotton-spinning, weaving, bleaching, smith-work, especially making nails, &c., are the principal industries. The town is regularly built. It has a good market-place with arcades, and a grammar-school. The environs are beautiful, and present many interesting prospects. Pop. (1880) 6026, nearly all Protestants.

FREYJA AND FRIGGA, though spoken of in northern mythology as distinct, are originally one, and intimately associated with Freyr. Frigga, in the genealogy of the Ases (q. v.), is the supreme goddess, wife of Odin, and one of the daughters of the giant Fiögwyn, and presides over marriages. Freyja is the daughter of Niord, sister of Freyr, and goddess of love. She is drawn on a car yoked with cats; to her, deceased women go, and also the half of those that fall in battle, whence she is called Val-Freyja. In this last respect, she must be considered as signifying the Earth; but the earth is also represented by Frigga, the wife of Odin, and when Freyja seeks Odin, as Isis seeks her Osiris, this is Odin conceived as the Sun. The names also, Frigga and Freyja, are in signification almost alike, and the two are often confounded in mythology. The Anglo-Saxons and Lombards worshiped the wife of Odin as Frea. The name yet survives in Friday.

FREYR, the son of Niord, of the dynasty of the Vanagods, was adopted with his father among the Ases, who, when he got his first tooth, bestowed upon him the celestial castle Alfheim. He is the god of peace and fertility; dispenses rain and fertility; and to him prayers for a good harvest are addressed. His wife is Gerda, daughter of the giant Gymer. F. had seen her as he once ascended the lofty seat of Odin, Hlidskialf, from which everything on earth is seen. Gerda was so beautiful, that the brightness of her naked arms illuminated air and sea. Seized with violent love, F. sent Skirnir as spokesman, and for his services had to give him his good sword, which he will miss in the great final contest or eclipse of the gods. Like Freyja, he was the

patron of marriage, and probably the two were at one time conceived as united, hermaphrodite-wise. F. was held in great veneration, especially in Sweden, of which he was patron-god, and also in Iceland. His chief temple was at Upsala, where a bloody offering was yearly made to him of men and animals. His festival was at the winter solstice, the turn of the year—Yule-tide. While the god was borne round the land, all strife was laid aside. (Does the procession of the boar's-head, at Christmas-time, commemorate F., who rode on the boar, Gullinbursti, and whose symbol was the boar's-head?) The circumstance that the Saxon form of F.'s name, Fro, has been preserved in the German name of a Christian festival Fronleichnam (Corpus Christi, the Lord's body), seems to show that it had become among these peoples the abstract term for a god.

FREY'STÄDTEL, FREYSTADT, or (Hung.) **GALGOCZ**, a town of Hungary, in the circle of Neutra, 84 miles north-west from Pesth, on a height above the left bank of the Waag, opposite to Leopoldstadt. The Waag is here crossed by a long bridge. F. contains a fine castle belonging to Count Erlody, situated on a steep limestone cliff, with fine gardens. There is also a curious round tower, supposed to have been a Turkish minaret. Various articles of wood are extensively manufactured. There are important cattle-markets. Pop. (1880) 6410.

FREYTAG, GUSTAV, a dramatic poet and novelist of Germany, was born 13th July 1816, at Krenzburg, in Silesia, studied at the universities of Breslau and Berlin, and took his degree in philosophy in 1838. His first important work was a comedy, entitled *Die Brautfahrt, oder Kunz von Rosen* (Breslau, 1844). Among his other productions may be mentioned *In Breslau* (Berlin, 1845), which is a collection of small poems written in a popular style; the dramas *Die Valentine* (Leip. 1847) and *Graf Waldemar* (Leip. 1848); and the comedy entitled *Die Journalisten* (1854). An edition of his dramatic works was published at Leipzig, in 3 vols., 1848—1850. But his greatest achievement in literature is undoubtedly *Soll und Haben* (Leip. 1855), a novel of German citizen-life. It has been translated into English by Mrs. Malcolm under the title of *Debit and Credit* (1858). In 1859, F. published a new classical drama, *Die Fabier*. A series of prose pictures from German History, entitled *Neuere Bilder aus dem Leben des Deutschen Volkes* (Leip. 1862; Eng. trans. *Pictures of German Life*), followed the series, *Bilder aus der Deutschen Vergangenheit*. *Die Verlorene Handschrift* (*The Lost Manuscript*), appeared in 1864. The series of tales called *Die Ahnen* includes *Ingo und Ingerman*, *Das Nest der Zaunkönige*, *Die Brüder vom Deutschen Hause*, and *Markus König* (1876). F. has also written on the rules of the drama. In 1870, he retired from the editorship of the *Grenzboten*, which he had conducted for twenty-three years, and became the editor of a weekly magazine published at Leipzig.

FRIAR, a name common to the members of certain religious orders in the Roman Catholic Church, and generally employed in contradistinction to the name Monk and Regular Clerk (see these articles). The name friar, although from its etymology (*frère*, brother) it belongs to the members of all religious brotherhoods, yet has come to be reserved almost exclusively for the brethren of the Mendicant orders. It is applied chiefly to the four great orders, Dominicans, Franciscans, Augustinians, Carmelites, and later, to the Trinitarians, and to the various branches of these orders. The Franciscans were properly denominated 'Friars Minor' (*Fratres Minores*). The Dominicans received, in contrast, the title 'Friars Major,' which, however, was perhaps rather a sobriquet than a serious name. These several bodies of friars, too, were popularly called, from the color or other peculiarity of their habit, Grey Friars (Franciscans), Black Friars (Dominicans), White Friars (Carmelites), Crutched [or Crouched (*Cruciati*, 'crossed')] Friars (Trinitarians), so called from the cross, which was embroidered upon their habit. This is the origin of the names of the several localities in London, and other towns thus designated, to the present day. In the orders to which we refer, the friars who are in priest's orders are styled 'father.' The other members are called simply 'brother.' The vow taken by friars at profession is of the class called in the Catholic Church 'solemn,' and is held to render null and void any contract of marriage entered into by the party subsequently to his religious profession.

FRIARS' BALSAM. See **BENZON**.

FRICTION. When one body rubs against another as it moves, a certain force is felt to resist the motion. This resistance is called *friction*. As a considerable proportion of the motive-power in all operations is spent in overcoming the friction of the parts of the machine upon one another, and is thus lost for the useful work, it is of great importance to understand the nature of this obstructive force, with a view to reduce it to the least possible amount. Accordingly, a great many careful experiments have been made on this subject, and the result is a number of precise and valuable facts or laws regarding friction, which are

now considered certain and reliable. The more important may be thus stated and illustrated.

When a block of oak—say a cubic foot, which weighs about 60 lbs.—is placed on a horizontal table of cast iron, the two surfaces being flat and smooth, it requires a force of nearly $\frac{1}{2}$ the weight of the block, or 24 lbs., pulling horizontally, to make it slide along the table. This measures the friction between the two surfaces. Another block of the same size and shape laid on the same table, would require the same force to draw it; and if the two were laid side by side, and fastened together so as to become one block, it would evidently require double the force or 48 lbs., to draw the double block; the amount of the friction being thus still $\frac{1}{2}$ of the weight, or of the pressure between the two surfaces. But suppose that, instead of being laid side by side, the second block were laid on the top of the first, what is to be expected? Here the weight is double as before, but the extent of rubbing surface remains unaltered; it would be natural, therefore, to expect that this would make a difference, and that, though the friction would, of course, be increased, the increase would be less than in the former case.

Experiment, however, shows that there is no difference, and that the friction is just double in both cases. In short, the unexpected and important fact is established, that, *within certain limits, the friction of any two surfaces increases in proportion to the force with which they are pressed together, and is wholly independent of the extent of the surfaces in contact.*

The amount of friction between two bodies is thus a constant fraction or proportion of the force with which they are pressed against each other. This fraction differs for the different kinds of surfaces. Thus, between oak and cast iron, it is, as already stated, about $\frac{1}{2}$, or more exactly, .38; for wrought iron on wrought iron (we speak at present of dry surfaces, without grease or nunguent of any kind), it is .44; for brass upon cast iron, .22. This constant fraction (expressing the proportion between the pressure of two surfaces and their friction) is called the *coefficient of friction* for these two surfaces.

Another way of illustrating this law of friction is the following, which has an important bearing on the erection of structures, and on mechanics in general. Suppose a slab AB, in contact with another slab CD, of the same or of different material; and that a force PQ presses on AB obliquely. Let QR be the perpendicular to the two surfaces, and draw PR, PS parallel to AB and QR, thus resolving the force PQ into two forces, one, PS, pressing AB against CD, the other, PR or SQ, tending to make AB slide towards C. It will clearly depend upon the strength of friction between AB and CD, how far the force PQ may be made to decline from the perpendicular without actually causing the one body to slide on the other. Suppose that when the pushing force is brought into the position P'Q, AB is just ready to slip on CD, and that it is a case of oak upon iron; then, since P'S' or R'Q is the force pressing the surfaces together, and P'R' or S'Q the force tending to produce motion, PR' will be $\frac{1}{2}$ of P'Q. The angle PQR is called the *limiting angle of resistance* of the two surfaces AB, CD; for so long as the direction of the pressure PQ is within that angle, the friction of the surfaces will sustain it, but if the obliquity is greater, the surfaces will slip. This is true, independently of the extent of the surfaces in contact; and also of the amount of the pressure; for the stability depends upon the proportion of PR to PQ, and that is the same, whatever is the length of PQ, so long as its inclination is the same.

If the slab CD were tilted up, so as to form an inclined plane, until AB were on the point of sliding, the angle of inclination would be found to be equal to the limiting angle of resistance RQP'.

Knowing the coefficient of friction of any two substances, their limiting angle of resistance is easily found. *Example*.—The coefficient of brick upon hard limestone is .60; required the limiting angle. Take a line QR' of any convenient length, raise a perpendicular R'P' equal to $\frac{60}{100}$ of QR', and join QP'; RQP' is the angle required: if measured, it would be found to be about 31°. In any structure, then, the obliquity of the thrust between two surfaces of these materials must always be considerably within this limit in order to be safe.

The *friction of quiescence*, that is, the resistance to the commencement of motion, is greater than the resistance to its continuance; and the more so if the surfaces have been a considerable time in contact. But the slightest shock or jar is sufficient to destroy this cohesion, or whatever it is that constitutes the peculiar initial resistance; so that it is only the constant and regular friction of motion that is of much consequence in practice.

Friction is very much diminished by the use of grease or unguents. The coefficient of wrought iron upon oak, which, in the

dry state, is .49, is reduced by the application of water to .26, and by dry soap to .21. The result of experiments on this subject is stated to be, 'that with the unguents, hog's-lard and olive-oil, interposed in a continuance stratum between them, surfaces of wood on metal, wood on wood, metal on wood, and metal on metal (when in motion), have all of them very nearly the same coefficient of friction, the value of that coefficient being in all cases included between .07 and .08.' Tallow gives the same coefficient as the other unguents, except in the case of metals upon metals, in which the coefficient rises to .10. In the case of wood on wood, black-lead is frequently employed for the same purpose. The most important fact, perhaps, and one that could hardly have been anticipated before experiment, is, *that the friction of motion is wholly independent of the velocity of the motion.*

The resistance to the motion of a wheeled carriage proceeds from two sources; the friction of the axle, and the inequalities of the road. The resistance of friction to the turning of a shaft in its bearings, or of an axle in its box, has evidently the greater leverage, the thicker the journal or the axle is; the axle of wheels are accordingly made as small as is consistent with the required strength. The resistance that occurs between the circumference of the wheel and the road, constitutes what is called *rolling friction*. There are on all roads, to a greater or less extent, visible rigid prominences, such as small stones, in passing over which the wheel and the load resting on it have to be lifted up against gravity. But even were these wanting, the hardest road yields, and allows the wheel to sink to a certain depth below its surface; so that in front of the wheel there is always an eminence or obstacle, which it is at every instant surmounting and crushing down. This is the case even on iron rails, though of course to a much less extent than on any other road. Now for overcoming this resistance, it can be shown, on the principle of the lever, that a large wheel has the advantage over a small one; and by numerous experiments, the fact has been fully established that, on horizontal roads of uniform quality and material, *the traction varies directly as the load, and inversely as the radius of the wheel.*

The best direction of traction in a two-wheeled carriage is not parallel to the road, but at a slight inclination upward, in proportion to the depth to which the wheel sinks in the road.

On a perfectly good and level macadamized road, the traction of a cart is found to be $\frac{1}{30}$ of the load; that is, to draw a ton, the horse requires to pull with a force equal to 75 lbs. On a railway, the traction is reduced to $\frac{1}{325}$ of the load, or to 8 lbs. per ton.

While friction thus acts as an obstruction to motion, and wastes a portion of the motive-power, it has also important uses. It is, in fact, an indispensable condition, no less than gravity, in the stability of every structure, and in every mechanical motion on the earth's surface. How essential it is to our own movements, we experience when we try to walk on ice. Even on ice there is still considerable friction, so that one foot can be slightly advanced before the other; were it altogether annihilated, we could not stir a fraction of an inch, even supposing we could stand upright. Without friction, a ladder could not be planted against a wall, unless there were a hole in the ground to retain the foot. In short, no oblique pressure of any kind could be sustained. The advantage of railways consists chiefly in the diminution of friction; but were this diminution carried much further, there could be no motion whatever, at least by means of locomotives. Without considerable friction, the driving-wheels of the locomotive would slide round on the rails without advancing; and this sometimes happens, when particular states of the weather render the rails as if they were greased.

The force of friction is often directly employed in mechanics. It is used, for instance, to communicate motion by means of belts, chains, &c. It is the force that holds a knot. It is specially useful when a machine, with great momentum, has to be checked or arrested in its motion. The best example of this is the *break* used on railways. By means of a system of levers, blocks of wood are made to press against the circumference of a number of the carriage-wheels; and thus the momentum of a train weighing hundreds of tons, and moving with a velocity of perhaps 50 miles an hour, is gradually destroyed in a wonderfully short space of time.

Friction-wheels are employed to diminish the friction of axles on their supports. Two wheels, of large circumference in proportion to their weight, are placed close together, parallel to each other, and so that the one seems to overlap the half of the other; in the notch thus formed by the upper circumferences of the wheels one end of the axle rests; a similar arrangement being made for the other end. The friction, which formerly acted directly on the axle, is by this arrangement referred to the axles of the friction-wheels, and is, by the laws of mechanics, reduced in the ratio of the circumference of the friction-wheel to the circumference of its axle. In order to render the friction of the friction-wheels themselves the least possible, they are made as light and as large as is practicable.

FRIEDEBERG, a walled town of Prussia, in the province of Brandenburg, 56 miles north-east from Frankfurt, on the Peza. Around it are several lakes. It has woole manufactures and tanneries, and some trade in cattle. Pop. (1880) 6381.

FRIEDLAND, a small town of East Prussia, in the circle of Königsberg, situated on the left bank of the Alle, 26 miles south-east of Königsberg, in lat. 54° 26' N, and long 21° E. Pop. (1880) 3366, who are employed in linen-weaving. F. has been rendered famous by the victory obtained there by Napoleon, 14th June 1807, over the Russian forces under Bennigsen. The Russian general found himself unable to cope successfully with an army of 80,000 men, as his own force consisted of less than 50,000 horse and foot; and he was forced to retire after a disastrous battle. He fell back upon the town of Tilsit, on the Niemen, where the treaty between the French and Russian emperors and the king of Prussia, known as the treaty of Tilsit, was drawn up.—**FRIEDLAND** is also the name of a town in Bohemia, situated on the Wittig, near the Prussian border. It is the capital of a district or duchy of the same name, from which the famous Wallenstein (q. v.) took his title of Duke of Friedland. Pop. of the town (1869) 4482.

FRIEDLAND, VALENTINE, generally called, from his birth-place, *Trotzendorf*, and indisputably the greatest educationist of his age, was a native of Upper Lusatia, and was born 14th February 1490. After the death of his father, in 1513, he went to Leipsic, where he studied under the celebrated Peter Mosellanus and Richard Crocus, acquiring among other things a knowledge of Greek. On the dawn of the Reformation, he proceeded to Wittenberg, where he formed a close intimacy with Luther and Melancthon, and learned Hebrew from a converted Jew. In 1523, he proceeded to Goldberg, in Silesia, as rector of the gymnasium there; left after four years, but returned in 1531, and exhibited the greatest energy in improving the organization of the school. Success crowned his efforts. The gymnasium of Goldberg acquired a rare celebrity. Not only from Silesia, but also from Poland, Lithuania, Austria, Bohemia, Hungary, and Transylvania, pupils sought it in great numbers. Often more than 1000 attended at a time, who all dwelt together in buildings set apart for the purpose, and were admirably superintended and drilled. F. had a most wonderful belief in the efficacy of knowledge, and, in particular, placed so high a value on clearness of thought and expression, that he was wont to affirm that only rogues were unintelligible. He died 26th April 1556. See the biographies by Pinzger (1825) and Löschke (1856).

FRIENDLY ISLANDS, as distinguished from the Fiji Islands (q. v.), generally reckoned a part of them, are otherwise styled the **TONGA GROUP**. They lie to the south-east of Fiji, and consist of three sub-groups, of which some 30 islands are inhabited, Tongatabu being the largest. The great majority are of coral formation; but some are volcanic, and there are several active volcanoes. The people are the most intelligent and skilful of the fair Polynesians, but are decreasing in numbers: once reckoned at 40,000, they do not now exceed 10,000. A treaty with Germany in 1876 granted a coaling-station; and a treaty with Great Britain was concluded in 1879. The F. I. were discovered by Tasman in 1643, but received their collective name from Cook. Both these navigators found the soil closely and highly cultivated, and the people apparently unprovided with arms. The climate is salubrious, but humid; earthquakes and hurricanes are frequent, but the former are not destructive. Among the products of the islands are yams, sweet-potatoes, bananas, cocoa-nuts, bread-fruit, sugar-cane, the *titi*, hog-plum, &c.; some corn also is grown. The Flora resembles that of the Fiji group; but the native animals are very few.

The F. I. were first visited by missionaries in 1797. In 1827 the work of evangelization fell into the hands of the Wesleyan Methodists, and after a lengthened and perilous struggle with the savage paganism of the inhabitants, it was crowned with success. Almost all the islanders are now Christians; great numbers can speak English, and, in addition, have learned writing, arithmetic, and geography; while the females have been taught to sew. The various islands used to be governed by independent chiefs, but nearly the whole of them are now under the rule of one chief, called King George, who is not only a Christian, but a zealous preacher of the gospel.

FRIENDLY SOCIETIES. The uncertainties of human life and health, and the effects of these on the well-being of those who are dependent for their subsistence on human labor, are too manifest not to have arrested the attention of men in all ages, and to have taxed their ingenuity to guard against them. It is probable, therefore, that traces of some sort of institution, corresponding more or less closely to the friendly societies of modern Europe, might be found wherever mankind have not depended for their means of living on the spontaneous products of the soil. At all events, they had their prototypes in the cases, boxes, and chests, or kists—as they were called in Scotland and Germany—of the guilds and corporations of medieval Europe; which were funds not only for maintaining the dignity and ministering to the conviviality

of the members, but for providing for the aged and the sick. Mr. Turner finds them in Anglo-Saxon England, and, like the other institutions connected with municipal life, they probably formed part of the legacy of the Romans to the Teutonic conquerors of Europe. Friendly societies are a form of mutual insurance, and, like all insurances, they depend on the principle of substituting the certainty which attends the fortunes of large numbers of men for the uncertainty which belongs to the fortune of each. Their main objects are the securing, in virtue of a small periodical payment during health and vigor, of a weekly sum during sickness, a sum to cover funeral expenses at death, and sometimes of a pension after a certain age.

In some respects, therefore, joining a friendly society is better than becoming a depositor in a savings-bank. Sickness may come before the savings are considerable; or, if considerable, they may be melted away by a long-continued sickness; but after the first weekly payment is made to a friendly society, the member is secure of succor, at least for a time, and he has, perhaps, other advantages. It is possible, on the other hand, that a difficulty may be experienced, in certain circumstances, in keeping up the weekly or other periodical payments required, and in this case, in most societies, he altogether forfeits the expected benefits.

It is to be regretted that, of this excellent class of institutions, many are founded upon erroneous principles, or rather upon no principles at all; and it often happens, therefore, that those who trust to them are disappointed, the funds falling short before all claims are satisfied. This was at one time not to be wondered at, as no proper calculations for friendly societies existed; but such is no longer the case, sound calculations being now attainable. The most important observations on the average amount of sickness incident to human life are those made by the Highland Society, Mr. Charles Ansell, Mr. Finlaison on behalf of the government, Mr. F. G. P. Neison, and the Manchester Unity of Odd-fellows. The first two were formed on data too limited to be of much value; those of the government were rendered practically worthless by an arbitrary definition of sickness, which made them uncertain for youth and maturity, and deprived them of all authority in reference to old age. The calculations of Mr. Neison and the Odd-fellows are based on by far the greatest number of cases, and though investigated by the former in relation to the five years ending 1840, and by the latter in relation to a period precisely twenty years later, they corroborate each other almost completely. We give the estimate arrived at by Mr. Neison of 'sickness experienced in *weeks* in passing through different periods of life: 20 to 30, 8·7; 30 to 40, 9·9; 40 to 50, 14·8; 50 to 60, 27·1; 60 to 65, 26·6; 65 to 70, 50·7; 70 to 75, 84·9; 75 to 80, 120·5.

One great mistake in the formation of friendly societies is to assume that each member should pay an equal sum, whatever his age may be. This is unjust to the younger members, who are less likely to become burdensome to the funds than the middle-aged; and, indeed, there is a rising scale of probability of sickness throughout all the years of a man's life. It is, however, well to remember that as sickness varies more considerably than mortality with the salubrity of the localities inhabited and the occupations of the members, no absolute reliance can be placed on published averages. All of them, however, agree in this, that *increase of years is attended by increased liability to sickness*. Now, a rightly constituted friendly society is bound to take this circumstance into account. To admit all ages at an equal payment, is clearly making the younger members pay for the elder.

Another great error in the constitution of benefit societies is in making them for a year only. These *yearly societies* are to be found in almost every colliery in the north of England, and are popular among the less intelligent of the people. The objects are generally a fund for sickness and funeral expenses, a deposit fund, and sometimes a loan bank.

Towards the first, there is perhaps a weekly payment of two-pence or threepence, together with the interest arising from the loan of money to the members. Towards the deposit fund there is a payment ranging generally from sixpence to two shillings, the accumulations being received back when the society closes. The money deposited is employed in making loans to such of the members as desire such accommodation, within the amount of their several entire deposits for the year, one penny per pound per month being charged by way of interest. The surplus, if any, of the twopences and interest, after sick and funeral money, books, and other necessities are paid, is divided amongst those members who may be clear of the books at the close of the society. In some instances, only three-fourths of the funds are divided, and the members commence another year with the balance, but this only happens when they are all in good health. Nothing of the kind would occur if one or more of the number were likely to suffer more than the ordinary rate of sickness. Then the healthy members join other societies, and leave the sick to take care of themselves. In any case they are so left at the end of the year, as no society will receive them. Yearly societies are, indeed, in every point of view a most objectionable class of institutions,

to which working-people would never resort except through ignorance.

A well-constituted friendly society involves, in the first place, the principle of payments appropriate to particular ages, as no other plan can be considered equitable. It stands forth before the working-classes as a permanent institution, like the life-insurance societies of the middle and upper classes, and necessarily requires its members to consider the connection they form with it as an enduring one, because its grand aim is expressly to make provision, at one period of life, for contingencies which may arise at another—for youth, in short, to endow old age. By a yearly society, a man is left at last no better than he was at first, as far as that society is concerned; but the proper friendly society contemplates his enjoying a comfortable and independent old age, from the results of his own well-bestowed earnings.

It is essential to the character of a proper benefit society that individuals be not admitted indiscriminately. To take a person in bad health, or of broken constitution, is unjust to those members who are healthy, because he is obviously more likely to be a speedy burden upon the funds. Here, as in life-insurance societies, it is necessary to admit members only upon their showing that they are of sound constitution and in good health. And it may be well to grant no benefits until after the member has been a year in the society. By these means, men are induced to enter when they are hale and well, instead of postponing the step until they have a pressing need for assistance, when their endeavor to get into a benefit society becomes little else than a fraud.

Under the sanction of government, tables have been formed by Mr. John Tidd Pratt, late registrar of friendly societies in England, and by Dr. Farr, the actuary of the English registrar-general. The former, together with useful instructions in the book-keeping of friendly societies, are embodied in the reports by Mr. Pratt, printed by order of the House of Commons for the years 1856—1857; and the latter, together with a masterly essay on the mathematical treatment of the subject, are contained in the twelfth report of the registrar-general.

On the imperative necessity of acting on correct tables for such a purpose, it would be superfluous to dwell; and the necessity of identifying the rates of any society with such responsible authority is the more apparent, as we are told by Mr. Pratt that 'although the registrar certifies to the *legality* of the rules of a friendly society, it does not follow as a necessary consequence that the constitution of the society is based on good principles, or that the rates of payment are sufficient in amount to guarantee the promised benefits and allowances.' In fact, there are large numbers of insolvent societies whose rules have been certified in the most regular manner. It cannot be too much insisted upon that the registrar's certificate is absolutely worthless as a guarantee of safety.

We have an idea of a benefit society in its simplest form, if we suppose a hundred men, of 35 years of age, to associate, and make such a payment at first as may be sure to afford each man that shall fall sick during the ensuing year one shilling a day during the term of his sickness. Taking, for the sake of illustration, Mr. Neison's Tables, we find that, amongst such a body of men, there will be nearly 100 weeks of illness in the course of the year. This, multiplied by 7, gives the whole sum required, £35 or even seven shillings each, which, less by a small sum for interest, will accordingly be the entry-money of each man. A society of individuals of different ages, each paying the sum which would in like manner be found proper to his age, would be quite as sound in principle as on the above simple scheme. It is only a step further to equalize each man's annual payments over the whole period during which he undertakes to be a paying member.

A point for consideration, however, is the rate at which the funds of the societies may be improved. In many cases, it is best to rest content with depositing the money in the funds or the savings-banks, in which case they are sure to obtain for it interest at a rate of not less than £3, 0s. 10d, per cent. per annum, or twopence per cent. per day. Some of these societies have sums invested with the Commissioners for the Reduction of the National Debt, at threepence and twopence-half-penny per cent. per day. Many of them invest with local building societies, some in corporation debentures, and in many other ways which afford a better rate of interest with safety; and the tendency to abandon the old routine of merely savings-bank deposit seems rapidly and generally growing.

By the act 27 and 28 Vict. c. 43, government gave to the working-classes an opportunity of effecting small life-insurances, or of purchasing immediate or deferred monthly allowances or annuities, in a manner absolutely free from risk, as the credit of the nation itself is pledged to meet the obligation purchased by the subscriptions or payments of the contributor. A great number of people have availed themselves of the new facilities, but it is probable that very many more would have done so had the scale begun at a lower and been continued to a higher point. At present, no life can be insured for less than £20, or more than £100.

Now, many people are willing enough to insure for as much as will cover their funeral expenses, say for £10, who would not be disposed to make further provision for their families. This class, and it is not a small one, is practically excluded from the benefit of the government system, and it would be well, in future legislation, to reduce the minimum to at least half its present amount. At the same time, the maximum might be safely increased to £200 without interfering with the legitimate business of life-assurance companies.

These government insurances are effected through the agency of the Post-office. A list of offices authorized to act may be obtained at any post-office, and at the places so authorized all necessary information and forms of proposal may be had. There also, when filled up, the forms of proposal may be delivered. The premiums charged vary with the age, but not with the sex, of the person to be insured, and the mode in which they are to be paid. For example, the life of a man or woman in his or her 30th year may be insured for £100 :

By a single payment of	£43	3	7
By an annual payment throughout life of	2	6	7
By a quarterly payment throughout life of	0	13	0
By a monthly payment throughout life of	0	4	4
By a fortnightly payment throughout life of	0	2	2
By an annual payment until the age of 60 of	2	13	10
By a quarterly payment until the age of 60 of	0	15	0
By a monthly payment until the age of 60 of	0	5	0
By a fortnightly payment of	0	2	6

Smaller sums may be insured by proportionate payments, but no one payment must be less than two shillings.

If after five years' payments the insurer desires, or is compelled by circumstances, to discontinue his insurance, a portion of the premiums, not being less than one-third, will be returned to him.

The sums charged for the purchase of *immediate* annuities vary with the *age and sex* of the person on whose life the annuity is to depend. Thus a man aged 65 can purchase an *immediate* annuity of £10, payable half-yearly, for £88, 18s. 4d.; a woman of the same age can purchase a like annuity for £103, 16s. 8d. A man aged 70 can purchase an *immediate* annuity of £10, payable half-yearly, for £73, 3s. 4d.; a woman of the same age can purchase a like annuity for £84, 19s. 2d.

The sums charged for the purchase of *deferred* annuities, or *deferred* monthly allowances, also vary with the *age and sex* of the annuitant, with the number of years which are to pass before the commencement of the annuity, and with the conditions of the contract as to the mode of purchase, mode of payment, and return or non-return of purchase-money.

When no part of the purchase-money is to be returned, a man aged 30 may purchase a deferred annuity of £10, to commence on his reaching the age of 60, and to be payable half-yearly, either by an immediate payment of £24, 3s. 4d., or by an annual payment, until he reaches the age of 60, of £1, 8s. 4d. A woman of like age may purchase a like annuity by an immediate payment of £32, 8s. 4d., or an annual payment up to 60 of £1 17s. 6d.; and a man aged 30 may purchase a deferred allowance, of £2, 7s. 8d. per month, to commence when he reaches the age of 60, by a payment until he reaches that age of 8s. per month; and a woman aged 30 may, by a like payment, purchase a deferred allowance of £1, 16s. 7d., also to commence at 60.

Purchasers of annuities are permitted to elect whether the purchase-money shall be returned to their representatives in case of death before reaching the stipulated age, or to themselves in case of desiring for any reason to withdraw from the arrangement; but for this privilege, they must pay a higher price. Thus, instead of the £24, 3s. 4d. referred to above, the purchaser at 30 of a £10 annuity, to commence at 60, would have to pay £40, 9s. 2d., and so in proportion. No annuity can exceed £50 per annum, or £4, 3s. 4d. per month, except in the case of husband and wife, who may each be insured or purchase an annuity to the full amount allowed by the act.

After many fruitless attempts at legislation, an act (38 and 39 Vict. c. 60) was passed in 1875 to consolidate and amend the law relating to friendly societies. It deals with (1) all societies which provide for the relief of members or their relatives during sickness, infirmity, old age, or widowhood, or for orphans during minority; for small insurances on occasions of birth or death; for maintenance of members in distress, or when on travel in search of employment; for endowment of members or their nominees; and for insurance of tools or other working implements up to fifteen pounds value. It is, however, provided that no society assuring annuities exceeding £50 per annum, or gross sums exceeding £200, shall be registered under the act, and that no sum exceeding £6 altogether shall be insured or paid on the death of a child under five years of age, and no sum exceeding £10 on the death of a child under ten years. It also deals with (2) cattle insurance societies, to whatever amount the insurances extend; (3) benevolent societies; (4) working-men's clubs; and (5), with certain limi-

tations, specially authorized societies, for any purpose to which, in the judgment of the Treasury, the act ought to extend. The act establishes a central office, with chief registrar and assistants, whose functions are to examine and certify rules, to prepare and circulate model forms of accounts, balance sheets and valuations; to collect and publish statistics of life and sickness, and other matters applicable to the business of friendly societies; and to construct and publish tables for the payment of sums of money at death, in sickness, old age, or other calculable contingencies. These tables, though intended for the guidance of societies, are not to be compulsory, but no society granting annuities can be registered under the act unless its tables are certified by an actuary approved by the Treasury. All societies are to have registered offices, must appoint trustees, provide for efficient audit, and furnish classified returns of receipt and expenditure annually to the registrar. Friendly societies must also, once in every five years, make a return of the sickness and mortality of their members, and prepare a valuation, either by their own valuer or the registrar, of their assets and liabilities. The nominee of a member may be paid a sum not exceeding £50 on the death of the nominator, and societies are empowered to pay a like amount to the representatives of a deceased member, without letters of administration. Minors may be members, but they are not permitted to hold office.

Societies may invest moneys in the post-office or other savings-banks, in the public funds, with the Commissioners for the Reduction of the National Debt, in the purchase of lands or the erection of buildings for their own use, and in other securities directed by their rules. Under certain circumstances, and with special guarantees, loans may be made to members on personal security. Officers are to provide sureties and render accounts, and provision is made for arbitration or summary legal jurisdiction in cases of dispute, as also for amalgamation or dissolution. The act bears abundant evidence of the care bestowed upon it in its elaborate arrangements for registration, and other precautions for the safety and success of the societies to which it relates.

FRIENDS, SOCIETY OF, the proper designation of a sect of Christians, better known as Quakers. Their founder was George Fox (q. v. for the origin of the name Quakers), born at Drayton, in Leicestershire, in 1624, who at first followed the occupation of a shoemaker, but afterwards devoted himself to the propagation of what he regarded as a more spiritual form of Christianity than prevailed in his day. In spite of severe and cruel persecutions, the Society of F. succeeded in establishing themselves both in England and America. They have, indeed, never been numerically powerful (having at no time exceeded 200,000 members); but the purity of life which from the beginning has so honorably distinguished them as a class, has unquestionably exercised a salutary influence on the public at large; while in respect to certain great questions affecting the interests of mankind such as *war and slavery*, they have beyond all doubt originated opinions and tendencies which, whether sound or erroneous, are no longer confined to themselves, but have widely leavened the mind of Christendom. For an account of the more eminent representatives of the Friends, see the biographies of BARCLAY, FOX, PENN, &c. We confine ourselves here to a brief notice of their doctrine, practice, and discipline, as it is laid down in their own publications.

Doctrine.—It is perhaps more in the *spirit* than in the *letter* of their faith that the Society of F. differ from other orthodox Christians. They themselves assert their belief in the great fundamental facts of Christianity, and even in the substantial identity of most of the doctrinal opinions which they hold with those of other evangelical denominations. The Epistle addressed by George Fox and other Friends to the governor of Barbadoes, in 1673, contains a confession of faith not differing materially from the so-called Apostles' Creed, except that it is more copiously worded, and dwells with great diffuseness on the internal work of Christ. The Declaration of Christian Doctrine given forth on behalf of the Society in 1693, expresses a belief in what is usually termed the Trinity, in the atonement made by Christ for sin, in the resurrection from the dead, and in the doctrine of a final and eternal judgment; and the Declaratory Minute of the early meeting in 1829 asserts the inspiration and divine authority of the Old and New Testament, the depravity of human nature consequent on the fall of Adam, and other characteristic doctrines of Christian orthodoxy, adding: 'Our religious Society, from its earliest establishment to the present day, has received these most important doctrines of Holy Scripture in their plain and obvious acceptation.'

It is nevertheless certain that uniformity of theological opinion cannot be predicated of the Friends, any more than of other bodies of Christians. As early as 1668, William Penn and George Whitehead held a public discussion with a clergyman of the English Church, named Vincent, in which they maintained that the

doctrine of a tri-personal God, as held by that church, was not found in the Scriptures, though in what form they accepted the doctrine themselves does not appear; and some time later, Penn published a work himself, entitled the *Sandy Foundation Shaken*, in which, among other things, he endeavored to show that the doctrines of vicarious atonement and of imputed righteousness did not rest on any scriptural foundation. But in general, the Society of F., in the expression of their belief, have avoided the technical phraseology of other Christian churches, restricting themselves with commendable modesty to the words of Scripture itself, as far as that is possible and avoiding, in particular, the knotty points of Calvinistic divinity (see Barclay's *Catechism and Confession of Faith*, published in 1673, where the answers to the questions—to avoid theological dogmatism—are taken from the Bible itself).

This habit of allowing to each individual the full freedom of the Scriptures, has, of course, rendered it all the more difficult to ascertain to what extent individual minds, among the Society, may have differed in their mode of apprehending and dogmatically explaining the facts of Christianity. Their principal distinguishing doctrine is that of the 'Light of Christ in man,' on which many of their outward peculiarities, as a religious body are grounded. The doctrine of the internal light is founded on the view of Christ given by St. John, who, in the first chapter of his gospel, describes Christ—the Eternal Logos—as the 'life' and 'light of men,' 'the true light,' 'the light that lighteth every man that cometh into the world, &c.' Barclay taught that even the heathen were illumined by this light, though they might not know—as, indeed, those who lived before Christ *could* not know—the historical Jesus in whom Christians believe. In their case, Christ was the light shining in darkness, though the darkness comprehended it not. The existence of 'natural virtue' (as orthodox theologians term it) among the heathen was denied by Barclay, who regarded all such virtue as Christian in its essence, and as proceeding from the light of Christ shining through the darkness of pagan superstition. These opinions would seem to be somewhat freer than those expressed in the General Epistle of the Society published in 1836, wherein they refuse to acknowledge 'any principle of spiritual light, life, or holiness inherent by nature in the mind of man,' and again assert, that they 'believe in no principle whatsoever of spiritual light, life, or holiness, except the influence of the Holy Spirit of God bestowed on mankind in various measures and degrees through Jesus Christ our Lord;' but, on the other hand, in a little treatise published by the Society in 1861, it is affirmed that 'the Holy Spirit has always been afforded in various measures to mankind; while stress is also laid on the statement of St. Paul, that 'the grace of God (understood by Friends to signify the 'operation of the Divine Spirit') that bringeth salvation, *hath appeared to all men;*' while another exponent of their views, Mr. T. Evans of Philadelphia (see *Cyclopædia of Religious Denominations*, Lond., Griffin & Co., 1853), states that 'God hath granted to all men, of whatsoever nation or country, a day or time of visitation, during which it is possible for them to partake of the benefits of Christ's death and be saved.'

For this end, he hath communicated to every man a measure of the light of his own Son, a measure of grace or the Holy Spirit, by which he invites, calls, exhorts, and strives with every man, in order to save him; which light or grace, as it is received, and not resisted, works the salvation of all, even of those who are ignorant of Adam's fall, and of the death and sufferings of Christ; both by bringing them to a sense of their own misery, and to be sharers in the sufferings of Christ inwardly; and by making them partakers of his resurrection, in becoming holy, pure and righteous, and recovered out of their sins.' Hence it may be safely asserted that they hold a broader (or, as others would say, a more latitudinarian) view of the Spirit's working than any other Christian church or society. In America, about the year 1827, Elias Hicks, a Friend of very remarkable powers, created a schism in the Society, by the promulgation of opinions denying the miraculous conception, divinity, and atonement of Christ, and also the authenticity and divine authority of the Holy Scriptures. About one-half the society in America adopted the views of Hicks, and are known as Hicksite Friends; their opinions, of course, are repudiated by the rest of the Society, who may be described as Orthodox Friends. The Hicksite schism thoroughly alarmed the latter, both in England and America, and a movement was begun in favor of education, of a doctrinal belief more nearly allied to that of the so-called 'Evangelical' party, and of a relaxation in the formality and discipline of the Society. The leader of this movement was Joseph John Gurney, of Norwich. This new tendency, however, excited considerable opposition among some of the Friends in America; and the consequence was a division among the Orthodox Friends themselves, and the formation of a new sect, called 'Wilburites,' after the name of their founder, John Wilbur, who are noted for their strictness with which they maintain the traditions and peculiarities of the Society. (See *Friendly Sketches in America*, by William Tallack. Lond.,

Bennett, 1862.) Some slight indications of theological differences have manifested themselves in England also.

2. *Practice*.—It is in the application of their leading doctrine of the 'internal light' that the peculiarities of the Friends are most apparent. Believing that it is the Holy Spirit, or the indwelling Christ, that alone maketh wise unto salvation, illumining the mind with true and spiritual knowledge of the deep things of God, they do not consider 'human learning' essential to a minister of the gospel, and look with distrust on the method adopted by other churches for obtaining such—viz., by formally training after a human fashion a body of youths chosen on no principle of inward fitness. They believe that the call to this work now, as of old, is 'not of men, neither by man, but by Jesus Christ, and God the Father;' and that it is bestowed irrespectively of rank, talent, learning, or sex. Consequently, they have no theological halls, professors of divinity, or classes for 'students.'

Further, as fitness for the ministry is held to be a free gift of God through the Holy Spirit, so, they argue, it ought to be freely bestowed, in support of which they adduce the precept of the Saviour—'Freely ye have received, freely give;' hence those who minister among them are not paid for their labor of love, but, on the other hand, whenever such are engaged from home in the work of the gospel, they are, in the spirit of Christian love, freely entertained, and have all their wants supplied: in short, the Friends maintain the absolutely voluntary character of religious obligations, and that Christians should do all for love, and nothing for money. It also follows from their view of a call to the work of the ministry, that women may exhort as well as men, for the 'spirit of Christ' may move them as powerfully as the other sex. The prophecy of Joel as applied by Peter is cited as authority for the preaching of women: 'On my servants and on my handmaidens I will pour out in those days of my spirit, and they shall prophesy.' They also adduce the New Testament examples of Tryphæna, Tryphosa, the beloved Persis, and other women who appear to have labored in the Gospel. Their mode of conducting public worship likewise illustrates the entireness of their dependence on the 'internal light.' In other religious bodies, the minister has a set form of worship, through which he must go, whether he feels devoutly disposed or not. This seems objectionable to the Friends, who meet and remain in silence until they believe themselves moved to speak by the Holy Ghost. Their prayers and praises are, for the most part, silent and inward. They prefer to make melody in their hearts unto God, considering such to be more spiritual than the outward service of the voice.

The doctrine of the 'internal light' has also led the Friends to reject the ordinances of Baptism and the Lord's Supper as these are observed by other Christians. They believe the Christian baptism to be a spiritual one, and not, like the Jewish and heathen baptisms, one with water; in support of which they quote, among other passages, the words of John the Baptist himself: 'I baptize you with water, but there cometh one after me who shall baptize you with the Holy Ghost and with fire.' Similarly do they regard the rite of the Eucharist: it is, say they, inward and spiritual, and consists not in any symbolic breaking of bread and drinking of wine, but in that daily communion with Christ through the Holy Spirit, and through the obedience of faith, by which the believer is nourished and strengthened. They believe that the last words of the dying Redeemer on the cross, 'It is finished,' announced the entire abolition of symbolic rites; that under the new spiritual dispensation then introduced, the necessity for such, as a means of arriving at truth, ceased, and that their place has been abundantly supplied by the Comforter, the Holy Ghost, whose office it now is to lead and guide men into all truth. The true Christian supper, according to them, is set forth in the Revelations—'Behold I stand at the door and knock: if any man hear my voice and open the door, I will come unto him, and will sup with him and he with me.' For the same reason—viz., that the teaching of the Spirit is inward and spiritual—the Friends ignore the religious observance of days and times, with the exception of the Sabbath, which some at least among them regard as of perpetual obligation.

The taking or administering of oaths is regarded by Friends as inconsistent with the command of Christ, 'swear not at all,' and with the exhortation of the apostle James—'Above all things, my brethren, swear not, neither by heaven, neither by the earth, neither by any other oath: but let your yea be yea; and your nay, nay; lest ye fall into condemnation.' They have also refused to pay tithes for the maintenance of what they hold to be a hireling ministry, believing that Christ put an end to the priesthood and ceremonial usages instituted under the Mosaic dispensation, and that he substituted none in their place. In consequence, all consistent Friends have been regularly mulcted of plate, furniture, or other goods, to the value of the amount due. The recent conversion of tithes into *rent-charge*, however, has, in the opinion of many Friends, largely removed objections to the payment to this ecclesiastical demand. In regard to the civil magistracy, while they respect and honor it, as ordained of God, they are careful to warn the members of their Society against thoughtlessly incurring its

responsibilities, involving as it does the administration of oaths, the issuing of orders and warrants in reference to ecclesiastical demands, the calling out of an armed force in cases of civil commotion, and other duties inconsistent with the peaceful principles of the Society. The Friends have likewise consistently protested against war in all its forms; and the Society has repeatedly advised members against aiding and assisting in the conveyance of soldiers, their baggage, arms, ammunition, or military stores. They regard the profession of arms and fighting, not only as diametrically opposed to the general spirit of Christ, whose advent was sung by angels in these words: 'Glory to God in the highest, and on earth, peace, good-will towards men;' but as positively forbidden by such precepts as—'Love your enemies, bless them that curse you, do good to them that hate you, and pray for them which despitefully use you and persecute you;' also, 'Resist not evil: but whosoever shall smite thee on the right cheek, turn to him the other also;' and while they acknowledge that temporary calamities may result from the adopting the principle of non-resistance, they have so strong a faith in its being essentially the dictate of divine love to the Christian heart, that they believe God, by his wise and omnipotent providence, could, and will yet make it 'mighty to the pulling down of the strongholds of iniquity.' The world, they believe, will by and by confess that the peace-makers are most truly the children of God. The efforts of the Society for the emancipation of the slaves are a part of modern British history. They may most certainly lay claim to having cultivated the moral sense of their fellow-countrymen in regard to this important question. As early as 1727, they commenced to 'censure' the traffic in slaves, as a practice 'neither commendable nor allowed,' and gradually warmed in their opposition, until the whole nation felt the glow, and entered with enthusiasm on the work of abolition. In respect to what may be called minor points, the Friends are also very scrupulous; they object to 'balls, gaming-places, horse-races, and playhouses, those nurseries of debauchery and wickedness, the burden and grief of the sober part of other societies as well as of our own.'

The Printed Epistle of the yearly meeting of 1854 contains a warning against indulging in music, especially what goes by the name of 'sacred music,' and denounces musical exhibitions, such as oratorios, as essentially a 'profanation'—the tendency of these things being, it is alleged, 'to withdraw the soul from that quiet, humble, and retired frame in which prayer and praise may be truly offered with the spirit and with the understanding also.' They object, besides, to 'the hurtful tendency of reading plays, romances, novels, and other pernicious books;' and the yearly meeting of 1764 'recommends to every member of our Society to discourage and suppress the same.' A similar recommendation was issued by the Society in 1851 for the benefit of 'younger Friends' in particular, who would appear to have been eating the forbidden fruit. The Printed Epistle of the yearly meeting of 1724 likewise 'advises against imitating the vain custom of wearing or giving mourning, and all extravagant expenses about the interment of the dead,' and this advice has been repeatedly renewed. A multitude of other minute peculiarities, which it would be tedious to note, distinguish the Friends from their fellow-Christians.

3. *Discipline*.—By the term discipline the Friends understand 'all those arrangements and regulations which are instituted for the civil and religious benefit of a Christian church.' The necessity for such discipline soon began to make itself felt, and the result was the institution of certain meetings or assemblies. These are four in number: the first, the *Preparative* meetings; second, the *Monthly* meetings; third, the *Quarterly* meetings; and, fourth, the *Yearly* meetings. The first are usually composed of the members in any given place, in which there are generally two or more Friends of each sex, whose duty is to act as overseers of the meeting, taking cognizance of births, marriages, burials, removals, &c., the conduct of members, &c., and reporting thereon to the monthly meetings, to whom the executive department of the discipline is chiefly confided. The monthly meetings decide in cases of violation of discipline, and have the power of cutting off or disowning all who by their improper conduct, false doctrines, or other gross errors, bring reproach on the Society, although the accused have the right of appeal to the quarterly meetings, and from these again to the yearly, whose decisions are final. The monthly meetings are also empowered to approve and acknowledge ministers, as well as to appoint 'serious, discreet, and judicious Friends, who are not ministers, tenderly to encourage and help young ministers, and advise others, as they, in the wisdom of God, see occasion.' They also execute a variety of other important duties. The quarterly meetings are composed of several monthly meetings, and exercise a sort of general supervision over the latter, and from whom they receive reports, and to whom they give such advice and decisions as they think right. The yearly meeting consists of select or representative members of the quarterly meetings. Its function is to consider generally the entire condition of the Society in all its aspects. It receives in

writing answers to questions it has previously addressed to the subordinate meetings, deliberates upon them, and legislates accordingly. To it exclusively the legislative power belongs. Though thus constituted somewhat according to Presbyterian order, yet any member of the Society may attend and take part in the proceedings.

Women have also a special sphere of discipline allotted to them: they inspect and relieve the wants of the poor of their own sex, take cognizance of proposals for marriage, deal with female delinquents privately, and under certain restrictions may even do so officially, though in the 'testimony of disownment' they have always the assistance of members of the other sex.

The Society of F., in the multitude of its regulations, has not forgotten the poor; charity in its narrower, as well as in its broader sense, has always been a beautiful feature of its members. The care of the poor was one of the earliest evidences which Christianity afforded to the Gentiles of the superiority and divine character of its principles; and it is honorable to the Society that a similar provision for those united to them in religious fellowship appears to have been one of the earliest occasions of their meetings for discipline. Nevertheless, in accordance with their ruling principle, that all Christian duty should be left for its fulfilment to the spontaneity of Christian love, and not performed under compulsion of any kind, 'the provision for the poor is purely voluntary; yet their liberality is proverbial throughout Britain and America.'

Their number at present amounts, it is believed, to about 120,000, of which more than 90,000 belong to the United States. See Fox's *Journal*; Sewel's *History of the Quakers* (1722); Gurney's *Observations on the Peculiarities of the S. of F.* (1824); Neale's *History of the Puritans*.

FRIES, ELIAS, a distinguished Swedish botanist, was born 15th August 1794, in the district of Femsjö, and studied at Lund, where he became demonstrator in botany in 1828. In 1834 he was translated to the university of Upsala, as professor of practical economics, with which, after the death of Professor Wallenberg, in 1851, the chair of botany was conjoined. F.'s researches embrace the entire field of botany, *phanerogamous* as well as *cryptogamous* plants, and he was the first to introduce into Sweden the morphological theory, the basis of which is to be found in his *Systema Orbis Vegetabilis* (Lund, 1825). His earliest important work was *Observationes Mycologice* (2 vols., Copen. 1815—1818). This was followed by his *Systema Mycologicum* (3 vols. Greifsw. 1821—1829; Supplement, 1830), which was completed in his *Elenchus Fungorum* (2 vols. Greifsw. 1828), and later in his *Novæ Symbolæ Mycologice* (Upsala, 1851). For another department of cryptogamic botany, the lichens, F. did very great service by his *Lichenographia Europæa Reformata* (Lund and Greifsw. 1831). Among his monographs the *Symbolæ ad Historiam Hieraciorum* (Upsala, 1848) deserves especial mention. He wrote a number of works on the *Flora* of Scandinavia, and his *Summa Vegetabilium Scandinaviæ* (Upsala, 1846, et seq.) is especially reckoned one of his best productions. His *Herbarium Normale* (Upsala, 1847), collected at great expense, and with incredible industry, contains dried specimens of all the rarest plants of Scandinavia. F. wrote at various times a multitude of small dissertations on his favorite subjects. In 1851 he was appointed director of the Botanical Museum and Garden attached to the university of Upsala, and in 1853 rector of the university. F., who was a member of the Swedish Academy, retired from work in 1859, and died 8th February 1878.

FRIES, JAKOB, FRIEDRICH, the founder of a philosophic school in Germany, was born at Barby, in Prussian Saxony, 23d August 1773, studied at Leipsic and Jena, and in 1805 went to Heidelberg, as professor of philosophy and mathematics. In 1816 he accepted a call to the chair of speculative philosophy at Jena, but was deprived of his professorship, on account of his participation in certain democratic disturbances of 1819. In 1824, however, he was appointed to the chair of physics and mathematics, which he occupied till his death, 10th August 1843. F.'s writings are very numerous. Some of the more important are his *System der Philosophie als evidente Wissenschaft* (Leip. 1804); *Neue oder anthropologische Kritik der Vernunft* (3 vols. Heidelb. 1807; 2d ed., 1828—1831); *System der Logik* (Heidelb. 1811; 3d ed., 1837); *Handbuch der physischen Anthropologie* (2 vols., Jena, 1820—1821; 2d ed. 1837—1839); *Die Lehren der Seele, des Glaubens, und der Hoffnung* (Heidelb. 1823); and *Geschichte der Philosophie* (2 vols. Halle, 1837—1840). In his philosophy, F. followed the method of Kant, but believing that method incomplete, he sought to supplant it by an analytical nature-doctrine (*analytischen naturlehre*) of the human soul, which he designated philosophic anthropology. His *Glaubenslehre*, or Doctrine of Faith, by which he hoped to repair the ravages which the critical philosophy had made upon the certainty of our knowledge, resembles, in some respects, Jacobi's doctrine of the Intuition of the Pure Reason. De Wette adopted it as the basis of his religious philosophy.

Some of his disciples, Apelt, Schleiden, Schönmilch, Friedrich Francke, and Schmidt, published at Leipzig in 1848—1849, several philosophic papers, entitled *Abhandlungen der Fries'schen Schule*.

FRIE'SLAND, or **VRIESLAND** (ancient *Frisia*), one of the most northern and wealthy provinces of the Netherlands, lies between 52° 40'—53° 30' N. lat. and 5° 30'—6° 20' E. long., and is bounded on the N. by the German Ocean, W. and S.W. by the Zuiderzee. It is sometimes called **WEST FRIESLAND** to distinguish it from **EAST FRIESLAND**, now a part of the Prussian province of Hanover (for which see below). The three divisions of F. are Leenwarden, Heerenveen, and Sneek. Pop. of the province of F. at the census of 1879, 329,877. (In 1875 it was 311,246.) A large import and export trade is carried on, especially with England. The exports to England include potatoes, oats, butter, and cheese.

The land is flat, in some parts below the level of the sea, and is intersected by canals and streams. Lakes and marshes are numerous. The dykes, sluices, and canals are under the care of a special board, and are kept up at the local expense. The inland waters abound with fish. Rich pastures, well suited for the rearing of horses, cattle, sheep, and pigs, cover a third part of the surface. Large quantities of peat are made. The land products are chiefly wheat, rye, barley, oats, buckwheat, beans, peas, potatoes, colza, flax, &c. F. is well supplied with schools and charitable institutions. A sixth part of the population is at school. The capital is Leenwarden (q. v.). Schiermonnikoog and Ameland carry on extensive fishing for cod, haddock, sole, turbot, &c.

East F., in 53° 8'—53° 40' N. lat., and 6° 50'—8° E. long., has an area of 1144 sq. miles, and a pop. amounting, in 1871, to 195,394. It now forms the Hanoverian district of Aurich; chief towns, Emden and Aurich. It is bounded, N. by the German Ocean, W. by the Netherlands, S. by Aremberg, and E. by Oldenburg. Like Netherlands Friesland, it is low and flat, requiring the protection of dikes and sluices. Fishing and agriculture constitute the chief employment of the inhabitants, who are the descendants of the ancient Frisians. This province has frequently changed owners since 1744, when the family of Zirksema, in whose possession it had been for 300 years, became extinct. It was first ceded to Prussia, next incorporated by Napoleon with Holland and France; in 1814 it was restored to Prussia; in 1815 it was ceded to Hanover, along with which it again forms part of Prussia.

FRIEZE, in classical architecture, the central portion of the entablature (q. v.). It is also called (by Vitruvius) the Zophorus (life-bearing) from its being frequently ornamented with sculpture. From the same cause, the term frieze is sometimes applied to any enriched horizontal band.

FRIGATE (probably connected with the Gothic *fargod*, a row-galley, and also with the Latin *aphractus*, an undecked galley),



Frigate—First Class, 50 guns.

formerly, a long narrow vessel propelled by oars and sails, used in the Mediterranean on occasions when speed was requisite. The name then came to be applied to men of war, of a class smaller than line-of-battle ships, and carrying from 20 to 50 guns, which were employed in the great wars of the 18th, and early part of the 19th centuries, as scouts and cruisers. The frigate was usually swift, easily managed, and capable of beating well up to the wind. She became, therefore, the favorite ship in wartime, and bore off a large proportion of the prize-money. Frigates also served to obtain information as to the movements of hostile fleets, and to guide the sailing of their own; but it was unusual for them to join in the line of battle, their exploits ordinarily occurring in engagements with single ships of their own class.

One of Nelson's commonest complaints was, that he had not a larger number of swift frigates to intercept the enemy's cruisers; it having then been notorious that the French built faster and finer craft than those our dockyards could turn out, although it must be added, that most of these rapid frigates had changed their flag before the war closed.

With steam, and the growth of the fleet in later times, frigates were developed more than any other men-of-war, and many of the largest ships in the navy belonged to this class; such as the *Diadem*, *Mersey*, *Orlando*, and the iron-plated *Warrior*, of 6000 tons, three times the burden of any ship of the line in Nelson's fleet. Now, however, these are all ships of the past, incapable of contending with the turreted monsters which carry modern artillery.

FRIGATE BIRD, or **MAN-OF-WAR BIRD**, *Tachypetes aquilus*, or *Fregata aquilus*, a bird of the Pelican family (*Pelecanidae*), the only well-ascertained species of its genus, which is allied to the Cormorants. It is a large bird with black plumage, sometimes



Frigate Bird (*Fregata aquilus*).

measuring ten feet—some say even fourteen feet—from tip to tip of its extended wings. It is a bird of very powerful and rapid flight, and there seems to be good reason for believing that it can remain on wing for days together. It inhabits the intertropical coasts, both of the Atlantic and Pacific Oceans, often flying out far to sea, but returning. Its aerial evolutions are extremely graceful, and it soars to a great elevation. It is said never to dive for its prey, but to seize fishes only when they appear at the surface or above it. Flying fishes constitute no small part of its food.

FRINGE TREE (*Chionanthus*), a genus of plants of the natural order *Oleaceae*, consisting of small trees or large shrubs, natives of America, the West Indies, Ceylon, and New Holland. The Common Fringe tree or **SNOWFLOWER** (*C. Virginica*) is found in the United States from lat. 39° to the Gulf of Mexico. It sometimes attains the height of 20 or 30 feet, but is rarely more than 8 or 10. has opposite oval leaves 6 or 7 inches long, and very numerous snow-white flowers in panicle racemes. The limb of the corolla is divided into four long linear segments, whence the name fringe tree. The fruit is an oval drupe. The tree is frequently cultivated as an ornamental plant.

FRINGES. In optics, those colored bands of diffraction (q. v.) which appear when a beam of light passes the clean edge of a screen, or is transmitted through a narrow slit or hole, are called fringes.

FRINGILLIDÆ, a family of birds of the order *Insectores*, tribe *Conirostres*, having a conical or nearly conical bill, sometimes short and thick, sometimes comparatively slender and elongated sometimes convex above, below, or at the sides, the commissure—line of junction of the mandibles—straight. The neck is short, and neither the legs nor the wings are long. The Fringillidæ are all small birds; they feed chiefly on seeds—to some extent also on insects. The family is an extremely numerous one, and distributed over all parts of the world; represented in Britain by finches, linnets, sparrows, grosbeaks, crossbills, &c., and including also weaver-birds, bob-a-links, cardinal-birds, whydahs, tanagers, &c. Some naturalists extend its limits so as to include in it other groups, as buntings, larks, &c., often regarded as forming distinct families.

FRISCHES HAFF ('Fresh-water Bay'), a large lagoon on the coast of Prussia, south-east of the Gulf of Dantzic. It is rather less than 60 miles in length from north-east to south-west, with a breadth which varies in different parts from 4 to 12 miles, and an area of 318 square miles. It was once entirely walled off from the Baltic by the Frische Nehrung, a narrow spit of land extending for about 40 miles along its northern shore. In 1510, however, the waters of the F. H. broke over the Frische Nehrung, and formed the passage called the 'Gatt,' which unites this shore-lake with the Baltic. The Gatt is only from 10 to 15 feet in

depth. All large vessels load and unload at Pillau, which is situated at the mouth of the Gatt, on the shore of the Gulf of Dantzic. Cargoes are conveyed to and from the ports on the P. H. by means of lighters. The Pregel, Frisching, Passarge, and two arms of the Vistula, fall into this lagoon.

FRISIANS. The Frisians (Lat. *Frisii*), an ancient Teutonic race, dwelt in the north-west of Germany. The origin of the name is lost in antiquity, though traditions, collected and written in *Thet oera Linda Bok*, in the 13th c., say that the Frisians came out of India, and that Frya, the mother of the race, was white as snow. The Frisians are mentioned by Tacitus and Pliny, and occupied the country between the middle arm of the Rhine, which fell into the sea at Katwyk, to the Ems or the Weser. Along with the Batavi, the Bructeri, and the Chauvi, the Frisians became subject to Rome under Drusus, and for a time remained faithful; but, in 28 A.D., these German tribes were driven to hostilities by the oppression of the Romans, and although partially subdued, they again rebelled, 70 A.D., under Claudius Civilis, a Batavian, who made a bold but unsuccessful attempt to overthrow the Roman power in German Gaul. When at a later period the Batavi were absorbed by the Franks, and with them moved southwards, the Frisians took possession of the abandoned districts, and occupied the country from the islands of the Scheldt to the Ems or Weser, so that the Netherlands, except some French and Saxon colonies, were peculiarly Frisian. These formed two branches, the one dwelling west of the Zuiderzee, and the other east of it. The Frisii of the south-west were brought under the Franks by Pepin d'Heristal who defeated them (689), and compelled them to embrace Christianity. The eastern branch (785) was subdued by Charlemagne, who sent Christian teachers to preach the gospel to them, and who (802) defined their right by the *Lex Frisionum*.

Later, the districts now called Friesland were reduced to their present limited boundaries by the formation of the hereditary countships of Holland, Zealand, Gueldres cum Zutphen, and the bishopric of Utrecht cum Yssel. Friesland was independent, and ruled by potentates chosen by the nation and endowed with limited powers, from 802 to 1498. The counts of Holland coveted the sovereignty of Friesland, and internal discord at length gave the Emperor of Germany a pretext for placing Duke Albert of Saxony (1498) as hereditary potentate. His son resigned the right, for a sum of money, to Charles V., who became lord of Friesland as of the rest of the Netherlands. After the revolution in the 16th c., the Frisians had a stadtholder of the house of Nassau-Dietz. Several of these fell in the contest for freedom. Count John William Friso became Prince of Orange on the death of William III. His son, William Karel Hendrik Friso, became stadtholder of the seven united districts. The Frisians are brave, attached to their manners and customs, upright, open-hearted, and intelligent. Their language is closely allied to the old Anglo-Saxon. The favorite poet of the peasantry is Gysbert Japiks. There is a set of laws for the Frisians, composed about 1200, and a complete collection of the laws still extant was published by Richtofen (*Fries Rechtsquellen*, Göttingen, 1840). A Frisian Society of History, Antiquity, and Language, at Leeuwarden, has done much to promote a revival of Frisian literature. Among the historical writers may be mentioned Simon Abbes Gabbema, 1628—1651; Petrus Wierdsma, 1729—1811; Foeke Sjoerds, 1713—1770, &c. Since the 15th c. the Frisian language has gradually given place to the Dutch. It is only used by the peasantry, and not in the schools or churches. Dutch is generally spoken in the towns. Efforts have been made to revive the Frisian by publishing the best specimens of the literature, annuals, &c. Among these are the poetical works of Gysbert Japiks, with a Friesch-Dutch Dictionary of the words, and *Thet oera Linda Bok*, edited and translated by Dr. Ottema, the authenticity of which, like Ossian's poems, has been disputed. The best Frisian dictionaries are the *Friesch-Latin-Nederlandsch Woordenboek* (1874), and Richtofen's *Alfriesisches Wörterbuch* (1840).

FRIT (*Oscinis Frit*, or *Chlorops Frit*), an insect of the same family with the house-fly; an active greenish-black fly of the size of a large flea, which does great injury to barley crops in some parts of the north of Europe. It lays its eggs in the flowers, and its larvæ live on the young grains. Linnaeus affirms that a tenth part of the barley in Sweden and Lapland is usually destroyed by it. It is not known in Britain, but is nearly allied to the insects called corn-fly and wheat-fly.

FRITH, or **FIRTH** (Lat. *fretum*, Gr. *porthmos*; from the same root as Ferry, q. v.), an arm or channel of the sea that is passed or crossed; the opening of a river into the sea.

FRITH, WILLIAM POWELL, R.A., an eminent English artist, the son of an innkeeper at Ripon, Yorkshire, was born in that town in 1819. In 1840, he first exhibited, at the Royal Academy, London, a scene from Shakspeare's *Twelfth Night*, 'Malvolio before the Countess Olivia,' which at once attracted attention, as giving promise of future excellence. In 1841, his painting of the

'Parting Interview of Leicester and his Countess Amy,' from Scott's *Kenilworth*, evinced a marked improvement in his style and manner. Thenceforth he rose rapidly in public estimation, and his subsequent productions amply confirmed the high anticipations that had been formed of his skill and power. Among the paintings exhibited by him in successive years were the following: 'My Wife would bid both stand up to see which was the Tallest,' a scene from the *Ficar of Wakefield*, in 1842; 'English Merry-making a Hundred Years ago,' in 1847; 'An Old Woman Accused of Witchcraft in the Time of James I.,' in 1848; and 'Coming of Age,' in 1849; &c. F. was elected an Associate of the Academy in 1845, and a Royal Academician in 1853. In 1854, his 'Life at the Seaside' was one of the leading features of the Exhibition. 'The Derby Day,' exhibited in 1858, and 'Claude Duval,' in 1860, are two of his most successful pictures. For the 'Railway Station' (1862), he is said to have received 8700 guineas. In 1865 he painted the 'Marriage of the Prince of Wales.' The series called the 'Road to Ruin' was produced in 1878. F. was elected an honorary member of the Imperial Academy of Fine Arts at Vienna in 1869; of the Royal Academy of Belgium in 1871; and of the Royal Academy of Sweden in 1873.

FRITHJOF'S SAGA, which was probably first written down at the end of the 13th or in the beginning of the 14th c., is an ancient Icelandic myth, which records the life and adventures of the hero Frithjof (properly *Fridthjofr*; i.e., 'peace-destroyer') who loved the beautiful Ingeborg, the daughter of a petty king of Norway. After being rejected by the brothers of Ingeborg, and having committed various acts of revenge on his enemies, he comes to the court of the old king Hring, to whom Ingeborg has been married, and is received with kindness. At the death of her husband, Ingeborg is married to her lover, who acquires with her hand the dominions of Hring, over which he rules prosperously to the end of his days. Frithjof is supposed to have lived in the 8th c.; but some writers assign to him a much earlier period. This Saga was included by Björner in his collection *Nordiska Kämpadater* (Stock. 1737); and by Rafn in his *Fornaldar Sögur Norðrlanda* (Copen. 1829). Attention has of late years been more especially drawn to this ancient Saga, which is, in fact, merely one of a number of similar mythical narratives, in consequence of the distinguished Swedish poet, Bishop Tegner, having selected it for the groundwork of a poem (*Frithjof's Saga*), which was published in its complete form in 1825, and at once became the most popular poem that ever appeared in Sweden, and raised its author to the height of his reputation. Tegner follows the Saga so closely, that the merits or demerits of the plan of the story must be ascribed more to the original than to himself; but to foreigners the poem scarcely seems to present the excellences that have been attributed to it by Swedish critics. The diversity of metre employed in the 24 cantos, of which each differs wholly from the others, detracts from the completeness of the whole, and produces an inharmonious effect. The *Frithjof's Saga* of Tegner has been translated into several other languages; among six or seven English translations, we may instance those by R. G. Latham (1838) and G. Stephens (1841).

FRITILLARY (*Fritillaria*), a genus of plants of the natural order *Liliaceæ*, herbaceous, bulbous-rooted, with bell-shaped perianth of six distinct segments, each having a conspicuous honey-pore (nectary) at the base. About twenty species are known, natives of Europe and other temperate regions of the northern hemisphere. All of them have drooping flowers; some of them are beautiful. One species only is a native of Britain, the **COMMON F.** (*F. meleagris*), which is found in meadows and pastures in the east and south of England, flowering in April or May. The stem, about a foot high, bears several linear leaves, and in general only one flower, which is flesh-colored, and marked with many dark spots. Many varieties are in cultivation. —This genus includes the **CROWN IMPERIAL** (*F. imperialis*), a native of Persia and the north of India, a well-known ornament of our gardens.

FRITILLARY, a name given to a number of species of butterfly, some of which are common in Britain, from the resemblance of the coloring of their wings to that of the petals of the common



Crown Imperial (*Fritillaria imperialis*).

fritillary. This resemblance appears only on the upper side of the wings, the under side being often remarkable for metallic brilliancy.

FRIULI (Ger. *Friuli*; anc. *Forum Julii*), the old name of a region lying at the head of the Gulf of Venice, early divided into *Austrian* and *Venetian F.* The former comprises the Austrian districts of Görz and Gradiska and Idria; the latter, the Italian province of Udine. F. is rich in corn and wine; has much metallic wealth and numerous mineral springs. The inhabitants of Venetian F. are mostly *Parlani*, speaking a dialect akin to Italian, mixed with Celtic elements. Austrian F. is peopled mainly by Slavs, with many Italians. F. constituted one of the 36 duchies into which the Lombards divided the north of Italy, and shared the vicissitudes of its neighbor states.

FRIVOLOUS AND VEXATION'S. By 9 Geo. IV. c. 22, s. 15, it was enacted, that if the Select Committee of the House of Commons, appointed to try a petition against an election, should be of opinion that any ground of objection stated against a voter was *frivolous* or *vexatious*, they should find the opposite party entitled to recover the full costs incurred by reason of such objection. Since 1868, jurisdiction in such cases has been transferred from the House of Commons Committee to her Majesty's judges. See **ELECTION.** Vexatious indictments for various crimes are prohibited by 22 and 23 Vict. c. 17. As to frivolous and vexatious actions at law, see 3 and 4 Vict. c. 24, and 4 and 5 Vict. c. 28.

FRÖBEL, or FROEBEL. FRIEDRICH W. A., founder of the Kindergarten (q. v.) system of education, was born at Oberweissbach, 21st April 1782. He followed various occupations ere he discovered where his real strength lay; but in 1805 he taught in a model school at Frankfurt-on-the-Maine with much success, and afterwards he entered Pestalozzi's institution at Yverdon. In the campaign of 1813, he served as a volunteer. In 1817 he established a school at Keilhau, in Thuringia, to carry out his principle of promoting the full and harmonious development of child nature. After fourteen years' labors, he went to Switzerland, where he founded several schools. On his return to Germany, he devoted himself to the education of very young children; and in 1837 he opened at Blankenburg, his celebrated *Kindergarten*, or 'Garden of Children,' which, however, languished for want of funds, and had ultimately to be given up. As F.'s views and his system were confounded with those of a socialist nephew, Karl F., the Prussian government actually prohibited the founding of schools on F.'s principles; and it was naturally not till after his death that the Kindergarten system—found acceptance in Germany. In the later years of his life, F. employed himself in training female teachers. He died at Marienthal, 21st June 1852. F. wrote *Die Menschenerziehung; Pädagogik des Kindergartens; and Mutter- und Koselieder.*—JULIUS, a nephew of F.'s, has distinguished himself as journalist and democratic politician.

FROBENIUS, JOANNES, the learned printer of Basel, was born in 1460. As correctors to the press, he employed such men as Ecolampadius and Erasmus; and between 1491 and 1527, the year of his death, he issued 300 works (including all those of Erasmus), well printed and very free of error.

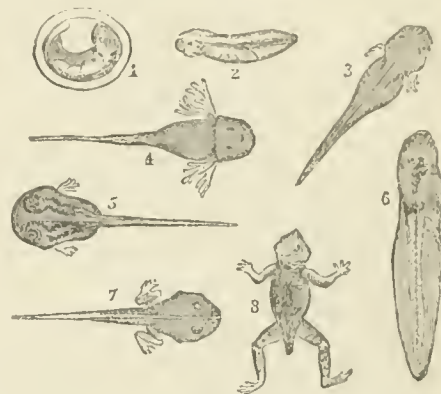
FROBISHER, SIR MARTIN, a distinguished naval adventurer of the Elizabethan period, the first Englishman who sought to discover a north-west passage to China, was a native of Doncaster, but the year of his birth is unknown. For many years, he in vain labored to impress English merchants with an idea of the importance of a north-west passage; but at length, being patronized by some persons of rank and fortune, he succeeded in raising money enough to fit out two small vessels of 25 tons each, and a pinnacle of ten tons. With these he sailed from Deptford on June 8, 1576, the queen, who was then at Greenwich, bidding them God speed on their venturesome way by 'shaking her hand at them out of the window.' Steering their course north, they, in lat. 61° N., sighted the southern part of Greenland, which F. took to be the Friesland of Zeno, on the 11th July, to the east point of which F. gave the name of 'Queen Elizabeth's Foreland;' and on the 28th, they sighted *Meta Incongnita*. On the 11th August, F. entered the inlet which bears his name, then thought to be one of the entrances from Davis' Strait into Hudson's Bay.

After about a fortnight's exploration of the coasts and islands, F.—having lost, through the treachery of the natives, a boat and five men—returned to England. He brought with him some ore picked up on one of the islands he discovered, in which some gold was found. Visions of immense wealth to be derived from further search in these northern lands floated before the eyes of the speculators of the time, who immediately fitted out another and better appointed expedition, giving the command to Frobisher. He sailed in May 1577, but his discoveries, hampered as he was by the gold-seeking operations, which turned out comparatively trifling, did not extend further than the neighborhood of the strait he had before reached. A third expedition was sent out in the year following; but geographical science appears to have been

but little benefited by it. F. afterwards served under Drake in the West Indies; and for his distinguished bravery in the fight with the Spanish Armada, July 26, 1588, he received the honor of knighthood. He afterwards commanded a squadron sent out to ravage the Spanish coast. He died on November 7, 1594, from the effects of a wound received while leading an attack by sea against Brest.

FROBISHER BAY, an inlet opening westward near the mouth of Davis' Strait into the territory called by Frobisher *Meta Incongnita*, at the southern end of Baffin Land. It is about 200 miles long by above 20 wide, with rugged mountainous shores. It was till Hall's voyage called Frobisher *Strait*, being erroneously regarded as a passage into Hudson's Bay.

FROG (*Rana*), a genus of *Batrachia* having in the adult state four legs and no tail, no gills, four toes on each of the fore-feet, five on each of the hind-feet, the feet more or less webbed; the head flat, the muzzle rounded; the mouth very large, a row of small teeth in the upper jaw, and an interrupted transverse row on the middle of the palate. The young (tadpoles) breathe by means of gills; external gills forming little fringes at the sides of the neck when they are very young, which, however, in a few days disappear; the gills, which remain until the tadpoles un-



Frog:
Successive stages—in the order of the numbers—from the egg almost to the perfect form.

dergo their final metamorphosis into frogs, being very numerous minute crests attached to four cartilaginous arches on each side of the neck in a cavity to which the water enters from the mouth, and from which it is expelled by one or two small orifices. Tadpoles have no legs, and the body tapers into a tail, and thus has a fish-like form, very different from that of the mature F., the tail being furnished with a membranous border like a fin. The mouth of the tadpole is a horny beak, which falls off when it becomes a frog. When this metamorphosis takes place, the hind-legs grow first, and afterwards the fore-legs begin to appear, the tail being gradually absorbed. Tadpoles are capable of living in water only; but the mature F. visits the water only occasionally, although generally capable of remaining long immersed, and always preferring moist places.

In respiration, frogs draw in air through the nostrils, by movements of the muscles of the throat, and expel it by contraction of those of the lower part of the abdomen. The thin smooth skin of frogs is also believed to be subservient to the aëration of the blood. The skeleton is destitute of ribs. The eye is large and very beautiful. The colors are often pleasing, and the general aspect agreeable, in some species very much so, forming a strong contrast to the repulsive appearance presented by toads, notwithstanding the close affinity between them both in structure and habits. The greater proportionate length and strength of the hind-legs enables frogs to leap to a distance wonderful for creatures of their size, instead of crawling as toads do, and their activity and liveliness complete the contrast. The males have on each side of the neck a delicate membrane, which becomes inflated with air when they croak. The power of voice in the females is much inferior. The croaking of numerous frogs in marshy places, or around ponds and ditches, often makes an amusing and curious concert; but the powers of voice possessed by the frogs of Britain are not to be compared with those of the great Bull-frogs (q. v.) of North America; whilst the neighborhood of Rio Janeiro is enlivened as night comes on by the Blacksmith F., which croaks so sonorously that the noise is like the clanging of a hammer on an anvil, the intermingled voices of some other kinds resembling the lowing of cattle at a distance; and in Peru, there is a F., of large dimensions, which has acquired the name of *Trapichero*, or Sugar-miller, because its voice has a grating sound like that produced by a sugar-mill. The confused blending of the voices of different

species of frogs, in these countries, destroying the stillness of night, is one of the things most certain to arrest the attention of the stranger. In colder climates, frogs usually bury themselves in mud, and spend the winter in torpidity. In dry weather, they conceal themselves under shrubs and in tufts of herbage, from which rain quickly causes them to come forth, multitudes often appearing where not one was to be seen before. They feed chiefly on insects, slugs, &c. The heads of tadpoles are adapted to the eating of leaves and other vegetable food, on which Cuvier says they entirely subsist; but the younger Buckland, in his *Curiosities of Natural History* (4th ed., Lond. 1859, pp. 2—4), in an amusing account of the habits of tadpoles, more correctly describes them as showing a great avidity for animal food, crowding round a dead kitten, and nibbling at the toes of little boys who wade in pools where they abound. The spawn of frogs is a gelatinous mass, in which the eggs are contained, and which swells greatly by imbibing moisture. Impregnation takes place after it is deposited, as with the spawn of fishes.

The only species of F. certainly known to be British is that called in France the RED F. (*R. temporaria*), which is abundant in most parts of England and Scotland, but is said not to be truly indigenous in Ireland, and to have been introduced into that island in 1696. Its generally reddish color, varied with black spots and patches, readily distinguishes it from the GREEN F. or EDIBLE F. (*R. esculenta*) of the south of Europe—sometimes said also to have been found in Britain—which is olive green, with yellow stripes along the back, and generally larger than the red species. The south of Europe produces a number of other species, and they are generally more numerous in warmer climates. A remarkable peculiarity is exhibited by some frogs of tropical countries in a hornlike prominence above each eye. These have been separated into a new genus (*Ceratophrys*). The TREE FROGS (q. v.), (*Hyla*), the most beautiful and interesting of all, have the extremities of the toes enlarged into a sort of cushion, secreting a viscid humor. Several other genera have been separated from the Linnean genus *Rana*, but there is a strong family likeness among them all.

The use of frogs for food is generally regarded with disgust in Britain, but it is very common in some of the southern countries of Europe, and they are regarded as particularly delicate. The species chiefly used as food in Europe is the GREEN F. (*Rana esculenta*), already mentioned, which greatly abounds in ponds and slow streams in France, Southern Germany, and Italy. It feeds chiefly on insects, after which it darts with great agility on the banks, and may often be seen swimming with its head above water, or basking in the sunshine. Frogs are there taken for the market by nets, and by a kind of rake. In Vienna, they are kept and fattened in preserves adapted to the purpose. In France, the hind-quarters alone are prepared for the table; in Germany, all the muscular parts. They are dressed in various ways, and with various sauces, of which a great part often consists of wine.—The GRUNTING F. (*R. grunniens*) of the West Indies, a very large species, six or eight inches long, capable of leaping over a five-foot wall, is much used for food, its flesh being very white and delicate, and is often fattened for the table. It shows a considerable capacity for domestication, and readily becomes familiar.—A species of F. (*Pyxicephalus adspersus* of Dr. Smith) is much used as food by the native tribes of South Africa. Dr. Livingstone says the Bechuanas suppose it to fall from thunder-clouds, because after a thunder-shower the pools become alive with frogs, till then hidden in holes. This species is nearly six inches long, and when cooked resembles chicken. See articles AMPHIBIA, BATRACHIA, and *The Common Frog*, St. Geo. Mivart, 1878.

FROG-BIT. See HYDROCHARIDEÆ.

FROG-FISH (*Batrachus*), a genus of Acanthopterygian fishes of the family Lophiidae, to which also the Angler (q. v.) or Fishing Frog belongs. They are remarkable for excessive ugliness. The head is larger than the body; flattened, and spiny; the mouth is very large, with many teeth; the lips are often furnished with filaments; the pectoral fins are supported by a short stalk or wrist. The skin is naked in some species, scaly in others. The species are numerous and widely distributed, but none of them is British. They hide themselves in the sand to surprise their prey.

FROGGED, a term used in regard to uniforms, and applied to stripes or workings of braid or lace, as ornaments, mostly on the breast, on the plain cloth of which a coat is made.

FROISSART, JEAN, a French poet and historian, was born at Valenciennes, in the year 1337. Being destined for the church, he received a liberal education, but soon displayed a passion for poetry and the charms of knightly society. At the age of 20, he began to write a history of the wars of his time, and made several journeys to examine the theater of the events he was about to relate. The composition of this work, which forms the first part of

his *Chronicles*, occupied him about three years (1357—1360). On its completion, he went over to England, where he was received with great favor by Philippa of Hainault, wife of Edward III. In 1362, she appointed him clerk of her chapel and secretary. Two years afterwards, he visited Scotland, where he became the guest of King David Bruce, and also of William Earl of Douglas. Everywhere the gay, poetical, quick-witted, and shrewdly observant Frenchman was welcomed and honored. In 1366, he accompanied the Black Prince to Aquitaine and Bordeaux. He afterwards went with the Duke of Clarence to Italy. F., along with Chaucer and Petrarch, was present at the marriage of this prince, at Milan, with the daughter of Galeazzo Visconti, and directed the festivities given by Amadeus VI., of Savoy, in honor of the duke. On the death of his protectress Philippa, F. gave up all connection with England, and, after many adventures, entered the service of Wenceslaus, Duke of Brabant, as private secretary. The duke was himself a poet, and F. made a collection of his verses, to which he added some of his own, and entitled the whole *Meliador, or the Knight of the Golden Sun*. On the death of Wenceslaus, he entered the service of Guy, Count of Blois, who encouraged him to continue his *Chronicles*. He now took a journey to the court of Gaston Phœbus, Count de Foix, that he might hear from the lips of the knights of Bearn and Gascony an account of their exploits. F. also made several other journeys, to collect information for his *Chronicles*. In 1394 he obtained the canonry and treasurer'ship of the collegiate church of Chinay; in the following year visited England, where he was courteously and generously entertained by King Richard II.; and on his return spent the remainder of his life in completing his great work. He died at Chinay in 1410. F.'s *Chronicles* embrace the events occurring 1326—1400. They are valuable documents for illustrating the character and manners of his age.

The pageantry of feudal times brightens his pages; the din of arms, the shouting of knights, and the marshalling of troops, is ever and anon heard; while 'visions of fair women' rise before us as we read. The gorgeous feasts and spectacles in which F. so much delighted are set forth in copious details; and through F. is no philosopher, his shrewd observations and richly minute descriptions have helped others to philosophize. F.'s *Chronicles* first appeared at Paris about the end of the 15th c., under the title of *Chroniques de France, d'Angleterre, d'Ecosse, d'Espagne de Bretagne, de Gascogne, Flandres et lieux d'alentour*. The best edition is that of Buchon (15 vols., Par. 1824—1826). His poems have likewise been published by Buchon (Par. 1829). The beautiful MS. of the *Chronicles* in the library at Breslau was executed in 1468, and was secured to the town in a separate article, when Breslau capitulated to the French in the year 1806. The *Chronicles* have also been translated into Latin and several modern languages. England has two versions: one executed in 1523—1525 by Bouchier Lord Berners (reprinted in 1812); and the other in 1803—1805 by Thomas Johnes (reprinted by Bohn in 1845). The latter is the more exact; but the former, according to Sir Walter Scott, is the more artless and lively.

FROME, or FROME SELWOOD, a parliamentary and municipal borough, in the east of Somersetshire, on the Frome, a branch of the Avon, 12 miles south-south-east of Bath. The surrounding country is very picturesque, and the town, until modernized early in the present century by the formation of two wide thoroughfares, was a strange old place, with narrow, crooked, and steep streets and lanes, many of which still remain. It manufactures woollens, hats, silk, and cards for dressing woollen cloth. F. has long been famed for its ale. Pop. (1881) 9376. It returns one member to parliament. The once celebrated forest of Selwood was in the vicinity, and part of it remains in its original state.

FROND, in Botany, a term often used to designate the leaves of cryptogamous plants. It was originally introduced as distinctive of organs in which the functions of stem and leaf are combined, and was applied to the leaves of palms, &c. The term *leaf* is now very generally used even as to mosses, ferns, &c., and the term *thallus* is employed as to lichens. In the case of many *Algae*, the term F. is often used to designate the whole plant except its organs of reproduction.

FRONDE, the name given to a political faction in France during the minority of Louis XIV., which was hostile to the court and the prime minister, Mazarin, and caused great domestic troubles from the year 1648 to 1654. The grasping and despotic policy of Mazarin, to whom Anne of Austria, the queen-regent, had abandoned the reins of government, had given offence to all classes. The princes and nobles saw themselves excluded from all high offices in the state, and their place supplied by foreigners; the parliament of Paris was threatened in its political rights, and the people groaned under the burden of taxes and administrative abuses. The parliament commenced a course of de-

terminated opposition, refusing to register the royal edicts, more especially the disgraceful financial measures.

Although the young king, then only nine years old, was obliged by several 'Beds of Justice' (q. v.) to compel the registration of the edicts, and to forbid the opposition of the parliament, the latter did not on that account change its bearing towards the court. Mazarin, therefore, adopted violent measures. On the 26th August 1648, he ordered the president, Potier de Blancmenil, and the councillor, Peter Broussel, to be arrested. The people took up arms, dispersed the Swiss guard, and on the 27th August (*la journée des barricades*), erected barricades in the streets around the Palais Royal. The court now yielded, repealed several taxes, and promised a better administration of justice. This victory gave parliament courage; those members who continued to keep a sharp look-out on the court measures, and were styled by the adherents of Mazarin *frondeurs*—i. e., censurers (literally, 'slingers')—formed the majority. The court now resolved to suppress the movement, in which the populace of the capital had also taken part, by force of arms, and, on the 6th January 1649, removed secretly to St. Germain, leaving Paris to be blockaded by the Prince of Condé with 7000 men. The parliament, whose cause was now publicly espoused by the Prince of Conti, the Dukes of Longueville, Beaufort, Orleans, Bouillon, Elbeuf, Vendôme, Nemours, the Cardinal De Retz, and the Maréchal de la Mothe, called upon the people to resist, and even negotiated with the stadtholder of the Netherlands for an auxiliary corps. In this critical position, the court, on the 11th March, concluded a compact at Ruel, in which both parties missed their object. After the return of the court to Paris in August, a new turn was given to the contest, the princes of the blood disputing the power with Mazarin. This, on the 18th January 1650, led to the sudden arrest of Condé, Longueville, and Conti. This arbitrary proceeding roused the provinces. Marshal Turenne assumed the title of lieutenant-general of the royal army for the liberation of the princes, united himself with the Arch-duke Leopold, and took several fortified towns, but was finally completely defeated by Mazarin's troops at Rhetel, on the 15th December. Mazarin returned in triumph to Paris, but found all parties against him, and his removal was insisted upon so urgently, that he was obliged to release the princes, and flee to the Netherlands. A disgraceful system of intrigue was now substituted for force of arms, which totally changed the position of parties, and converted the contest which had begun for the interests of the people into a court cabal. Turenne was gained over by the queen-regent, De Retz by Cardinal Mazarin, and Condé was obliged to flee for safety into Guienne. Meanwhile, Louis XIV., who had now attained his 14th year, endeavored to induce the Prince of Condé to return; but the latter, mistrusting these overtures, repaired to Bordeaux in 1651, where he had many adherents, whence he commenced a regular war against the court, which might have had dangerous consequences, had not Turenne opposed the prince. On the 2d July 1652, an engagement took place between the two parties in the neighborhood of Paris. Condé was on the eve of being defeated, when the gates of Paris were opened to him by the courage and zeal of his sister, the Duchess of Longueville, and thus a new turn was given to the contest.

Paris itself, weary of these fruitless dissensions, now entered into negotiations with the court, demanding the final removal of Mazarin, who had meanwhile returned. This demand was complied with by Louis XIV., and a general amnesty proclaimed. Condé, who refused to enter into the compact, relying upon an army of 12,000 men placed at his disposal by Charles, Duke of Lorraine, quitted Paris on the 15th October 1652, and repaired to Champagne; and finally finding no one disposed to take up arms in his cause, entered the Spanish service, for which he was declared a traitor. Soon after, Mazarin returned to Paris, and was again intrusted with the reins of government. Thus the royal power came forth victorious from this long contest, which, though it seemed to commence for the popular interests, gradually changed into a miserable party strife among the nobles. Compare Ste-Aulaire's *Histoire de la F.* (1827, 2d ed. 1860); Fitzpatrick's *Great Condé and the F.* (1873).

FRONTINUS, SEX. JULIUS, a Roman author who flourished in the second half of the first century. In 75 A.D. he was sent to Britain as governor of that island, and obtained a great reputation by his conquest of the Silures, and his vigorous maintenance of the imperial authority. He appears to have been twice consul in the course of his life, and to have held several other important offices. He died about 105 A.D. Several works are attributed to F., only two of which are certainly genuine, the *Strategemata*, a treatise on the Art of War, in four books; and the *De Aquæductibus Urbis Romæ*, in two. The best edition of the first is that of Oudendorp (reprinted with emendations in 1779); of the second, that of Dederich (Wesel, 1841). The *De Aquæductibus* is an important contribution to the history of architecture.

FRO'NTISPIECE, the name generally given to an engraved and decorated title-page of a volume, or an engraving placed opposite the title-page. The term is also sometimes used to denote the front or principal face of a building.

FRONTO, M. CORNELIUS, was born at Cirta, in Numidia, and came to Rome in the reign of the Emperor Hadrian, where he soon obtained a high reputation as a teacher of eloquence. Antoninus Pius intrusted to him the education of Marcus Aurelius and Lucius Verus, both of whom always retained the warmest admiration of their preceptor. F. gradually rose to the highest offices of the empire, became very wealthy, and died, it is thought, about 170 A.D. Until recently, nothing was known of F. as an author, except from a few fragments of a grammatical treatise (*De Differentiis Vocabulorum*); but in the year 1814, Angelo Mai discovered in the Ambrosian Library at Milan a palimpsest, which being deciphered, was found to contain a considerable number of F.'s letters with some short essays. These were published by Mai in 1815; and in the following year an edition was published at Berlin by Niebuhr, who wrote a critical preface, and also printed the commentaries of Buttmann and Heindorf. A few years afterwards, Mai found in the library of the Vatican at Rome another palimpsest containing more than 100 of F.'s letters. The result was a new edition of F. by Mai (Rome, 1823), embodying the new discoveries, which was republished at Ceile in Germany (1832). The contents of these letters are on the whole unimportant, although they help to confirm the good opinion which history has formed of the Emperor Marcus Aurelius; and the style is rapid and declamatory.

FRO'SCHDORF (originally, *Crottendorf*), called by the French *Frohsdorf*, is the name of a village in Lower Austria, rather more than thirty miles from Vienna, and not far from the frontiers of Hungary, on the right bank of the river Leitha. It is celebrated for its splendid castle, which in recent times has acquired a kind of political importance, from having been after 1844 the residence of the Duchess of Angoulême and the rendezvous of the elder Bourbon party. After the death of the duchess it came into the possession of the Comte de Chambord (q. v.), who has greatly beautified the interior.

FROSINO'NE (the *Frusino* of the Volscians) is a town of Italy in the former States of the Church, built on the slope of a hill above the junction of the river Cosa with the Saccro, about 48 miles east-south-east of Rome, on the high-road between Rome and Naples. It is the capital of a delegation of the same name, which used to be notorious for brigandage. The only interesting edifices are the palace of the papal delegate and the remains of an ancient amphitheater. The costumes of F. are among the most admired of Italy. Pop. about 8000.

FROST-BITE is caused by cold depressing the vitality of a part or the whole of the body. The frost-bitten part is at first blue and puffy, from the current of blood through it being suspended; then, should the cold be continued, it becomes pallid, and the painful tingling gives place to numbness and insensibility, and finally to actual death or mortification. Although a sudden violent application of cold may cause death of the tissues, by reducing the temperature to a degree incompatible with animal life, the most common cause of the destructive effects of frost-bite is undoubtedly the excessive reaction which occurs on sudden removal of the cold, or the application of heat; this is especially the case with moist cold.

Baron Larrey believed that 'cold was merely the predisposing cause of frost-bite, and mentions that after the battle of Eylau the French soldiers did not experience any painful sensations during the severe cold varying from 10° to 15° below zero of Reaumur's thermometer; but when the temperature rose from 18° to 20°, they felt the first sensations of cold, and applied for succor, complaining of acute pains in their feet, and of numbness, heaviness, and prickings in the extremities. The parts were scarcely swollen, and of an obscure red color. In some cases, a slight redness was perceptible about the roots of the toes, and on the back of the foot; in others, the toes were destitute of motion, sensibility, and warmth, being already black, and, as it were, dried.' Those of the men who indulged in the warmth of the bivouac fires suffered from frost-bite in much larger proportion than their more hardy comrades.

In this country, most cases of frost-bite are very trifling, the most common being Chilblains (q. v.). Occasionally, in severe winters, more severe cases present themselves at the hospitals in the persons of houseless, ill-nourished unfortunates, whose constitutions have in many instances been enfeebled by spirit-drinking.

The treatment of frost-bite consists in coaxing back by degrees the vitality of the part; this is most prudently effected by friction, at first with snow, then with water at ordinary temperature, no warmth being applied for some time. As the coldness subsides, the painful tingling returns, then redness and heat; in a short time the latter will be above the natural standard, and if not moderated, the part will inflame, and perhaps mortify. It is well to

remember that the part need not have been actually frozen for these symptoms to occur. The person with languid circulation who, coming home with cold wet feet, places them before the fire, or in warm water, may be 'frost-bitten' to all intents and purposes.

FROTH-FLY. FROTH-HOPPER. FROG-FLY, or FROG-HOPPER, the common names of those insects of which the young—larvæ and pupæ—are found in a frothy exudation on plants. They form the family *Cercopidæ* of the order Homoptera, and are allied to *Aphides*, and still more nearly to *Cicadas* and Lantern-flies. The larvæ and pupæ differ little in appearance from the perfect insect except that it possesses wings, which are four in number, and large. The frothy exudations in which they live are produced from the juices of the plants on which they are found; and as they are often in great numbers, crops of various kinds are not unfrequently destroyed or much injured by them, the plants being weakened by loss of sap. They have a proboscis adapted for piercing the bark of the plants on which they feed. They have considerable leaping powers. *Aphrophora spumaria* is an extremely common species in Britain. The frothy exudation is sometimes



Frog Hopper (*Aphrophora spumaria*):

a, larva; b, perfect insect, with wing-covers closed; c, perfect insect, in the act of flight; d, the froth on a plant.



Boecydium Cruciatum. Boecydium Globulæ.

called CUCKOO-SPIT, sometimes FROG-SPITTLE, from fancies entertained as to its origin. It is sometimes so abundant, particularly on willow-trees, that persons walking beneath are wetted by its continual dropping. In tropical countries, the *Cercopidæ* are still more plentiful. Some of the tropical insects of this family are remarkable for their extraordinary forms, resulting from peculiar developments of the first segment of the thorax. This is particularly the case in the genus *Boecydium*, of which two species are here figured.

FROUDE. JAMES ANTHONY, an English historian, was born at Totness, in Devonshire, in the year 1818; studied at Oriel College, Oxford, where he took his degree in 1840; and in 1842 was elected a fellow of Exeter College. Having abandoned his original intention of entering the church, he published, in 1847, a volume of stories, entitled *The Shadows of the Clouds*; and two years later, *The Nemesis of Faith*, a work in which the solemnity and sadness of religious scepticism are relieved by a singularly tender and earnest humanity. The book was written with great and even startling power, and not only cost F. his fellowship, but also a situation to which he had just been appointed at Tasmania. F., for the next few years, employed himself in writing for *Fraser's Magazine* and the *Westminster Review*. His *History of England from the fall of Wolsey to the defeat of the Spanish Armada*, appeared from 1856 to 1869. The peculiarity of this work consists in the use it makes of, and the value it places upon, the state documents of the time, the study of which led F. to reverse not a few historical verdicts, especially that upon Henry VIII. The justness of his views on these and other points has been keenly disputed. Four volumes of *Short Studies on Great Subjects* appeared between 1867 and 1882. F. was elected rector of St. Andrews University in 1869, and received the degree of LL.D. For a short time he was editor of *Fraser's Magazine*. *The English in Ireland in the Eighteenth Century* was published in 1874 (new ed. 1881). In 1874, and again in 1875, F. visited our South African Colonies on a mission from the home government; the result of this visit is embodied in his *Two Lectures on South Africa* (1880). As Carlyle's literary executor, F. edited his *Reminiscences* (1881), and Mrs. Carlyle's *Letters* (3 vols. 1882); and by giving to the world the copious personal criticism and family details contained in these works, he suggested to many, doubts as to his editorial discretion. He also gave us in 1882, two vols. of a biography of Carlyle.

FROZEN STRAIT, a passage separating Southampton Island, in the north of Hudson's Bay, from Melville Peninsula. It is

only 15 miles wide, and is almost constantly impervious to navigation.

FRUCTED. Trees when represented as bearing fruit are said heraldically to be fructed.

FRUCTIDOR (Eng. 'fruit-month') was the name given in the republican calendar of France to the period extending from the 18th of August to the 16th of September. The 18th Fructidor of the year 5 (4th September 1797) is celebrated as the day on which a *coup d'état* saved the republic from the machinations of the Royalists.

FRUCTIFICATION (Lat. the producing of fruit), a term frequently employed in cryptogamic botany, sometimes to denote the whole reproductive system, and sometimes the fruit itself.

FRUCTOSE, or FRUIT-SUGAR, known also as **INVERTED SUGAR**, occurs in association with glucose, or (according to the recent investigations of Buignet) with cane-sugar in many ripe acidulous fruits. In its composition, and in most of its properties, it closely resembles glucose, from which, however, it differs (1), in being incapable of crystallization; and (2), in its action on polarized light; while both glucose (or grape-sugar) and cane-sugar exert a right-handed rotation upon a ray of polarized light, this variety of sugar exerts a left-handed rotation; and hence the term *inverted* has been applied to it.

The composition of fructose is represented by the formula $C_6H_{12}O_6$. When boiled with dilute acids, fructose combines with the elements of water, and passes into glucose. A similar passage of this substance into glucose sometimes occurs spontaneously, as is seen in the gradual crystallization of the sugar in dried fruits. It appears to be procurable only from cane-sugar (or sucrose) by the action either of acids or of a peculiar albuminous ferment which exists in the juice of many ripening fruits.

FRUGO'NI. CARLO INNOCENZO, a much admired and versatile Italian poet, was born at Genoa in 1692, and educated for the church. In 1716 he began to teach rhetoric at Brescia, at which time he had already acquired the reputation of being an elegant writer of prose and verse, both in Latin and Italian. In 1719 he taught in Genoa, and subsequently at Bologna. At the court of Parma, through the patronage of the Cardinal Bentivoglio, he was appointed poet laureate, the stated and prescribed compositions of which post were highly uncongenial to his original and discursive muse; nevertheless the Dukes of Parma showed particular favor to the poet, who returned to Genoa on the death of Duke Antonio, and the accession of the Spanish Infante. In 1733, Pope Clement XII. released F. from his spiritual vows, which had at all times been highly distasteful to him. A grand ode, in celebration of the capture of Oran by the Spaniards, and some other poetic addresses to the king and queen of Spain, reinstated the poet in his former post at the Parmese court. He died in 1768. His numerous writings were published at Parma, 1779, and a complete edition at Luca, 1779. A selection from his works appeared at Brescia, 1782.

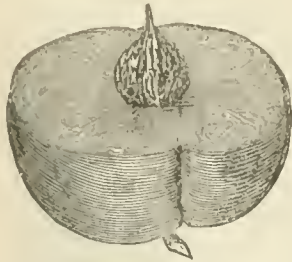
FRUIT (*fructus*), in the botanical use of the term, in phanerogamous plants, is a mature ovary containing a seed or seeds; and in cryptogamous plants, as pore-case (*sporangium* or *theca*) containing spores. Other parts of the flower, most frequently the calyx, sometimes remain after flowering is over, undergo a further development, become incorporated with the ovary, and form part of the fruit.

The development of the fruit in phanerogamous plants depends upon the fertilization of the ovules, and when this has not taken place, the flow of sap to the ovary usually soon ceases, and it drops off with all the other remains of the flower; although there are exceptional cases of seedless fruits, as seedless oranges, bananas, grapes, barberries, &c., in which, however, it may be supposed that fertilization takes place, and that unknown causes afterwards operate to prevent the development of the seed, and to direct the flow of sap more exclusively to the nourishment of the more succulent parts, which are thus increased and improved. This supposition is rendered more probable by the circumstance that the production of seedless fruits appears to be sometimes a consequence of age and diminished vigor in trees.

The fruit, like the ovary, may be composed of one carpel, or of more than one. But the fruit sometimes differs from the ovary, through the development of some of the parts, and the non-development or obliteration of others; so that an ovary with several cells may be converted into a one-celled fruit; and of several ovules, all but one may become abortive, so as to produce a one-seeded fruit. Thus the three-celled ovary of the oak and of the hazel with two ovules in each cell, becomes, by the non-development of two cells and five ovules, a fruit with one seed; and the two-celled ovary of the ash, and the three-celled ovary of the cocoa-

nut, likewise produce one-celled and one-seeded fruits. The number of cells may also be increased by the formation of false dissepiments. The structure, too, may be rendered more complex by the development of accessory parts, and is usually profoundly modified in ripening, these changes being in direct relation to the dispersal of the seeds. For the various forms of fruits see Balfour's or Henfrey's *Manual of Botany*; and for classification, see Dickson's *Journal of Botany*, October 1871.

All that is external to the proper integuments of the seed in the ripe fruit is called the *pericarp* (Gr. *peri*, around; and *karpós*, fruit); and this, which varies extremely in size and other characters,



Drupe (section of a Peach).

usually consists of three layers, the outermost of which is called the *epicarp* (Gr. *epi*, upon); the middle one, the *mesocarp* (Gr. *mesos*, middle), or sometimes the *sarcocarp* (Gr. *sarx*, flesh); and the innermost, the *endocarp* (Gr. *endon*, within). These parts exhibit great variety, but it is generally the mesocarp which becomes succulent or fleshy, as in the peach, cherry, plum, and other drupes; and in the pear, apple, and other pomes. In drupes, or stone-fruits, the endocarp is the hard shell which immediately covers the seed; in pomes, it is the scaly lining of the seed-bearing cavities in the center; in both drupes and pomes, the epicarp is the outer skin. So in melons, cucumbers, and gourds, the succulent part is the mesocarp, greatly developed, with a thin epicarp and a thinner endocarp. In the orange, however, and all of that family, the epicarp and mesocarp together form the rind, whilst the pulpy cells belong to the endocarp. In berries, as the gooseberry, grape, &c., the pulpy matter does not belong to any of the layers of the pericarp, but is formed from the placentas of the seeds.

When the fruit, as the fully developed ovary, is considered as a modified leaf or leaves, the epicarp is viewed as representing the epidermis of the lower surface, the endocarp the epidermis of the upper surface, and the mesocarp the substance (*parenchyma*) of the leaf. The midrib of the leaf is traced in the *dorsal suture* of the fruit or of each component carpel, and the *ventral suture* is formed by its folding together and the conjunction of its edges. The dorsal and ventral sutures are very obvious in the pods of pease, beans, &c.; and even in fruits formed of several carpels intimately combined, they often become very apparent when the ripened fruit opens to allow the escape of the seeds. The opening or *dehiscence* (Lat. *dehisco*, to open) of fruits takes place in various ways; thus, the fruit sometimes resolves itself into its original carpels by separation through the *dissepiments*, which divide into two plates forming the sides of the valves, and the carpels further open by their sutures; the pericarp sometimes splits at once by the dorsal sutures of the carpels; sometimes it divides transversely, and throws off a lid; sometimes it opens more partially by pores, &c. Many fruits, however, are indehiscent, some of which are fruits having a very hard pericarp, as nuts, and some are fruits having a soft pericarp and much pulp. The decay of the pericarp is in these cases necessary to the liberation of the seeds, unless when this is accomplished by such means as the fruit becoming the food of animals, by which also the seeds of plants are often widely distributed. The decay of the pericarp seems intended, in many cases, to provide the first nourishment for the young plants which spring from the seeds.

A classification of the different kinds of fruits is extremely difficult, although they afford characters of great importance in descriptive and systematic botany. A convenient primary division of fruits is into those which are formed from one flower, and those which are formed by incorporation of the ovaries of many flowers. Fruits formed from one flower, by far the most numerous of these two classes, are divided into *apocarpous* and *syncarpous*, or into *apocarpous*, *aggregate*, and *syncarpous*. Apocarpous fruits are formed of one carpel, and are either dry or succulent, dehiscent or indehiscent, one-seeded or many-seeded. Aggregate fruits, sometimes included among the apocarpous, are formed of several or many free carpels; sometimes dry, sometimes succulent; sometimes arranged on a convex or elevated receptacle; which becomes succulent in the strawberry, and constitutes the edible part of the fruit; sometimes within a concave receptacle covered by the enlarged tube of the calyx, as in the rose. Syncarpous fruits are formed of several carpels, intimately united in their mature state, so as to form a berry, capsule, pome, silique, &c. Syncarpous fruits sometimes so completely resolve themselves into their original carpels, that these may be regarded as becoming separate achenia. Fruits formed by incorporation of the ovaries of many flowers (collective or anthocarpous fruits) are sometimes dry, as the cones of firs; sometimes succulent, as the pine-apple, the mulberry, and the fig. For further notice of dif-

ferent kinds of fruit, we must refer to particular articles in which they are described, as achenium, berry, capsule, drupe, nut, pome, pod, silique, &c., and to articles on the plants which produce them.

A few plants, particularly the *Coniferae* and *Cycadaceae*, produce seeds really naked or destitute of pericarp. Many other seeds were formerly often described as naked, in which the pericarp exists intimately incorporated with the seed, as the seeds of grasses, *Boraginaceae*, *Labiatae*, *Umbelliferae*, &c. Their real nature is often made apparent by some trace of the style.

The production of ripe fruit is exhaustive to the energies of a plant, and plants ordinarily annual may be preserved in life for several years by preventing it. Very young fruit-trees generally fail to bring fruit to perfection, and the first flowers of melons and gourds are often, for a similar reason, abortive; whilst, on the contrary, any circumstance that favors an accumulation of sap in a particular season, tends to render fruit-trees unusually productive in the next, as when the whole blossoms of a year are killed by frost, or when, from the coldness of the previous summer, flower-buds have not been formed in abundance. Whilst the vital energies of a plant are directed mainly towards the increase of its size, flower-buds are sparingly formed or not at all, as is often the case with fruit-trees growing very luxuriantly, and various modes are adopted to cause the production of flower-buds and of fruit by checking this luxuriance of growth, as by root-pruning, by cutting into the stem of wall-trees to a moderate depth, or by taking off portions of the bark of the stem. Grafting (q. v.) is also of use in this respect, as well as for the propagation of improved varieties of fruit-trees, the qualities of which would, in all probability, not be found exactly the same in their offspring by seed.

In a very immature state, fruits are in general green and soft, and decompose carbonic acid gas in the sunlight, absorbing the carbon, and setting free the oxygen, like leaves and other green parts of plants. As they advance towards maturity, some of them become externally dry and hard, and cease to perform by their surface these functions of vegetation; others, as they become more succulent, change their color, and instead of absorbing carbon and liberating oxygen, absorb oxygen from the atmosphere, and exhale carbonic acid.

It would not be easy to enumerate the peculiar substances which are produced in fruits. Different parts of the same fruit are often extremely different from one another, as the milk and the kernel of the cocoa-nut, its hard shell, and its fibrous husk. Seeds are indeed generally very different in all their qualities from the pericarp or the pulp by which they are surrounded, and the integuments of the seed often not less different from the embryo, of all which a ready illustration may be found in the apple or the grape. The most different chemical products of vegetation are sometimes to be found in different parts of the same fruit, giving them the most varied qualities, as wholesome and poisonous; the succulent part of the fruit, from the kernel of which strychnia is obtained, is said to be harmless, and the seeds of plums contain so much hydrocyanic acid, that to eat many of them would be dangerous; the capsule of the poppy yields opium, but its seed contains nothing of the kind, and is bland and nutritious, abounding in a wholesome fixed oil.

The value of fruits to man—which may safely be asserted to exceed that of all other parts of plants—sometimes, as in the corn-plants, chiefly depends on the farinaceous matter of their seeds, containing starch, gluten, &c.; sometimes, as in the banana and bread-fruit, on the starchy matter of the pulpy part; sometimes, as in nuts, on fixed oils; sometimes, as in many succulent fruits, on sugar and various acids, with gum, pectine, &c. Other fruits, or parts of the same fruits, are valuable for the volatile oils which they yield, and for peculiar principles capable of application to medicinal and other uses, or making them capable of being used as condiments, perfumes, &c. Coffee, cocoa, pepper, vanilla, and many other articles of commerce, are obtained from fruits.

Whilst some fruits are of the highest value as articles of food, others are generally regarded rather as articles of luxury; yet the abundance of succulent fruits in tropical climates is a bountiful provision for real wants, contributing much to the health of the inhabitants. The coolness of succulent fruits render them peculiarly grateful amidst the heat of the tropics; their temperature, when newly gathered, being much below that of the surrounding atmosphere.

Cultivated Fruits.—In its popular use, the term fruit sometimes has almost the same signification as in the language of botanical science; sometimes it is employed as almost exclusively designating the edible succulent fruits. We cannot attempt an enumeration of edible fruits; many will be found noticed in other botanical articles; we can only here observe that they belong to many and very different natural orders, both of endogenous and exogenous, but chiefly of exogenous plants. We propose, however, to conclude this article by an enumeration of the principal cultivated

succulent fruits, including those which are important as articles of food or of commerce.

ENDOGENOUS PLANTS.

<i>Musacæ.</i>	Plantain and Banana.
<i>Bromeliacæ.</i>	Pine-apple.
<i>Palmeæ.</i>	Date.

EXOGENOUS PLANTS.

<i>Moracæ.</i>	Fig. Sycamore. Mulberry.
<i>Artocarpacæ.</i>	Bread-fruit.
<i>Lauracæ.</i>	Avocado Pear.
<i>Solanacæ.</i>	Love-apple, or Tomato. Egg-plant.
<i>Sapotacæ.</i>	Mammee Sapota. Sapodilla. Star-apple.
<i>Ebenacæ.</i>	Date Plum. Kaki.
<i>Oleacæ.</i>	Olive [Differs very much in its nature and uses from all the other fruits here enumerated.]
<i>Vacciniacæ.</i>	Cranberry.
<i>Cornacæ.</i>	Cornel.
<i>Myrtacæ.</i>	Rose-apple. Malay Apple. Ugni. Guava. Pomegranate.
<i>Grossulariacæ.</i>	Gooseberry. Red (and White) Currant. Black Currant.
<i>Cactacæ.</i>	Prickly Pear, or Indian Fig.
<i>Cucurbitacæ.</i>	Melon. Water-melon. Cucumber. Pumpkin. Squash. Gourd.
<i>Passifloracæ.</i>	Granadilla.
<i>Papayacæ.</i>	Papaw.
<i>Rosacæ.</i>	Apple. Pear. Quince. Medlar. Loquat. Peach and Nectarine. Apricot. Plum. Cherry. Raspberry. Strawberry.
<i>Leguminosæ.</i>	Tamarind.
<i>Anacardiaceæ.</i>	Cashew-apple. Mango. Hog-plum. Otaheite Apple.
<i>Rhamnaceæ.</i>	Jujube.
<i>Oxalidacæ.</i>	Carambola.
<i>Vitacæ.</i>	Grape.
<i>Sapindacæ.</i>	Akee. Litchi. Longan. Rambutan. Honey Berry.
<i>Malpighiacæ.</i>	Barbadoes Cherry.
<i>Clusiaceæ.</i>	Mammee Apple. Mangosteen.
<i>Aurantiacæ.</i>	Orange. Lemon. Citron. Shaddock. Forbidden Fruit. Lime. Wampee. Marmelos.
<i>Sterculiacæ.</i>	Durion.
<i>Anonacæ.</i>	Custard Apple.

Nuts, and along with them some fruits, which, although not botanically nuts, resemble them in qualities and uses, will be noticed in a separate article.

Chemical Composition of Fruits.—Our principal knowledge of the composition of different kinds of fruit is due to the important investigations of Fresenius, which are published in *Annalen der*

Chemie und Pharmacie for 1857. In that memoir, he gives the results of upwards of fifty analyses of different fruits, including gooseberries, currants, strawberries, raspberries, mulberries, grapes, cherries, plums, apricots, peaches, apples, and pears. We select the following analyses as representing the composition of some of our most important fruits—viz., (1) the gooseberry; (2) the grape; (3) the cherry; (4) the peach; (5) the apple; and (6) the pear. For the purpose of comparison, the free acid which is present, whether it be malic, citric, or tartaric (all of which occur in fruits), is calculated as hydrated malic acid.

	1.	2.	3.	4.	5.	6.
Water.....	85.36	79.98	79.70	82.01	85.04	83.95
Solid Constituents.....	14.64	20.02	20.30	17.89	14.96	16.05
Glucose and Fruit sugar.....	7.51	13.78	10.70	1.53	7.68	7.00
Free Acid.....	1.33	1.02	0.56	0.77	1.04	0.07
Albuminous Substances.....	0.37	0.83	1.01	0.39	0.22	0.26
Soluble Pectine, Gum, &c.....	2.11	0.50	0.67	9.28	2.72	3.28
Soluble Mineral Constituents.....	0.24	0.46	0.60	0.76	0.44	0.28
Insoluble. Stone or Seeds.....	2.08	2.59	5.73	3.21	0.38	0.39
Insoluble. Skin and Cellulose, &c.....	0.96	0.94	0.66	1.00	1.16	1.34
Insoluble. Pectose.....						
Insoluble Mineral Constituents....	0.17	0.12	0.08	0.10	0.03	0.05

Glucose and fruit-sugar or fructose, are described in the article devoted to these subjects. Under the heading 'Soluble Pectine, Gum, &c.' are included coloring matters, fatty or oily matter in a state of suspension, and organic acids in combination with bases. We shall endeavor to explain briefly the nature of the substances designated in these analyses as pectine and pectose. The term *pectine matters* is applied to a very widely distributed class of substances occurring in the vegetable kingdom, and especially abundant in fleshy fruits and in roots, but whose properties and composition require further investigation. The substance termed *pectose*, which is insoluble in water, occurs in plants, which likewise possess a ferment in solution which converts pectose into *pectine*, which is soluble in water, and is the main constituents of apple and other fruit jellies. (According to Fremy, *pectic acid*, which is closely allied to pectine, is formed in fruits that yield jellies: he has assigned formulas to both these substances, but they are not generally accepted.)

The ratio in which the free acid stands to the sugar varies extremely. For a unit of free acid, the sugar is represented by 1.63 in plums, by 3.00 in currants, by 4.37 in strawberries, by 4.93 in gooseberries, by 7.03 in damsons, by 11.16 in apples, by 17.29 in sweet cherries, by 20.18 in grapes, and by 94.60 in pears; the percentage of sugar is least (1.57 per cent.) in peaches, and greatest (14.93 per cent.) in grapes; while the percentage of free acid is least in pears (0.07 per cent.), and greatest in currants (2.04 per cent.).

Fresenius observes, that as all the fruits contain albuminous or proteine matters, they are serviceable as tissue-forming food; but the albuminous matters are present in such small quantity, that these fruits will not serve without other nitrogenous food to keep the body in health. Thus, to obtain an amount of albuminous matter equivalent to the contents of one egg, we must eat more than a pound of cherries, nearly a pound and a half of grapes, two pound of strawberries, more than two pounds and a half of apples or four pounds of pears. They are, however, of more use as respiratory or heat-giving foods. Fresenius calculates that 1 pound of starch (which is equivalent to about 5.5 pounds of potatoes) may be replaced by 5.4 pounds of grapes, 6.7 of cherries or apples, 10.8 of currants, or 12.3 of strawberries. Fruits are, however, taken not so much for their amount of material nourishment as for their vegetable salts (which are of great therapeutic utility), and for their agreeable flavor. In tracing the connection between the flavor and the chemical composition of fruits, Fresenius finds that the former depends (1) on the ratio in which the acid stands to the sugar, gum, pectine, &c. (the last-named substances masking the ratio in which the acid stands to the sugar); (2) on the presence and delicacy of the aroma; (3) on the proportions between the soluble matters, the insoluble matters, and the water; thus, we usually attach the highest value to those fruits which contain the largest amount of soluble, and the smallest amount of insoluble matters—a peach or a green-gage almost melts in the mouth, because these fruits are relatively poor in cellulose and pectose; while, on the other hand, bilberries represent the opposite extreme, and are rich insoluble ingredients; (4) on cultivation, which is found to cause an increase in the quantity of sugar, and a diminution of the amount of free acid and of insoluble matters; (5) and on favorable seasons, which augment the sugar and other soluble constituents.

The different berries contain, as a general rule, a larger proportion of free acid than stone-fruit or apples and pears; and their acidity is the more obvious to the taste from their containing relatively small quantities of gum and pectine. The following remarks on some of our common varieties of fruits are of practical value.

In *gooseberries*, we recognize an agreeable proportion between the sugar and the acid, the ratio being as 6 to 1 in the sweeter

kinds, and 4 to 1 in less sweet varieties of this fruit. The yellow kinds are far richer in soluble ingredients than the red.

In *Currants*, the ratio of the sugar to the acid is only about 3 to 1; they are therefore very acid to the taste, and when eaten require the addition of sugar.

In *strawberries*, it is the aroma that we chiefly prize. The ratio of the sugar to the acid varies with the season and the species from 2 to 1 to 6·7 to 1 (in the pie-apple strawberry).

A similar remark applies to *raspberries*. In wild raspberries, the ratio is as low as 1·8 to 1, while in cultivated kinds it is as high as 3·5 to 1.

Grapes exceed all other fruits in their amount of sugar, which is seldom less than 12, and sometimes reaches 26 per cent. In good kinds, and in favorable seasons, the ratio of the sugar to the acid is as 29 to 1; in inferior kinds, and in ordinary seasons, it is as 16 to 1; when the ratio falls to 10 to 1, the grapes are unripe and acid. In other fruits, this would be a high ratio, and they would be regarded as sweet. The anomaly may be thus explained. In unripe grapes, the skins are very thick, and contain an extremely acid juice, which overcomes the sugar contained in the interior of the berry. The juice of such grapes is found to be far sweeter than the grapes themselves.

From their large amount of sugar, and from the fact that their acidity for the most part depends on the acid tartrate of potash, which is almost entirely precipitated from the wine, grapes are incomparably superior to any other fruits, in the preparation of wines; and in their fermentation, different varieties of ether of a delicate odor are formed, which, in association with volatile oils that are also present, communicate to the more valued wines their special bouquet.

The ratio of the acid to the sugar in the must (the expressed juice before the commencement of fermentation) affords the best evidence of the season. Thus, in the very bad wine-year of 1847, the ratio was 1:12; in the better wine-year of 1854, it was 1:16; while in the good wine-year of 1848 it was 1:24, the same kind of grape being experimented upon in all the cases.

Apricots and *peaches* consist almost entirely of juice, their solid constituents, after the removal of the stone, being only 1 or 2 per cent. These fruits are esteemed both for their juicy and tender flesh, and for their powerful but delicate aroma.

In *apples* and *pears*, we have an increased quantity of cellulose and pectine, and consequently a relative preponderance of the insoluble constituents. The cellulose contributes to the firmness or hardness of these fruits, while it is to the pectine that they owe their property of gelatinizing when boiled. The well-marked differences of taste, &c., presented by different kinds of apples and pears, are due to the very varying relations that occur between the acid, the sugar, and the pectine, to the greater or less abundance of cellulose, and to the varying nature of the aroma. For equal quantities of sugar, pears contain less acid than apples. In the different kinds of dessert apples, the ratio of the sugar to the acid ranges between 12 to 1 and 22 to 1, while in cooking-apples it averages not more than 8 to 1.

The chemical changes which take place in the fruit during the process of ripening are described in the article *PHYSIOLOGY, VEGETABLE*.

Keeping of Fruit.—Many of the finest fruits undergo very speedy decomposition; and on this account, some of those most highly esteemed in the countries which produce them, have never become articles of commerce, and are only to be enjoyed—except in the state of *jam* or *preserves*—during the season of their ripening. Decomposition takes place most rapidly when fruits are exposed to the air, and particularly to stagnant air, when there is any dampness about them, and when they are subjected to considerable or frequent changes of temperature.

Grapes are imported into Britain from the south of Europe, packed in saw-dust. Unripe gooseberries are kept for making tarts in winter, in bottles or jars, filled up with perfectly dry sand, saw-dust, bran, or the like, closely corked and sealed, after a gentle heat has been applied to expel moisture as much as possible, and placed in a moderate and equable temperature, which is sometimes accomplished by burying them to some depth in the earth. A similar method may be employed with many other fruits. Pears, the finest kinds of which are very apt to rot almost immediately after they reach their perfect maturity, may be kept for months in glazed earthen-ware jars very closely covered, and placed in a cool airy situation, out of the reach of frost. The layers of fruit are separated by the substance used for filling up the interstices, and the pears of the same layer are likewise kept apart, that rottenness in one may not infect the rest, which, with every kind of fruit, is very apt to take place. Another method is to keep them in drawers, the temperature being carefully regulated. Large gardens are often provided with a fruit-room, in which shelves and drawers are allotted to the different kinds of fruit. A moderate and equable temperature, dryness, and careful ventilation, are the principal requisites of the fruit room. Fruit

intended for keeping should be carefully gathered, when almost quite ripe, and all bruising avoided. Pears or apples shaken from the tree cannot be expected to keep so well as those gathered by the hand. Of all the succulent fruits produced in Britain, the apple keeps best, and is therefore most generally used. Fruit intended for keeping is sometimes *sweated* before being placed in the jars or shelves; being laid in heaps for a short time—varying according to the kind of fruit, and extending, in the case of winter-apples to a fortnight or more—that some of the juice may exude through the skin; but the propriety of the practice is doubtful. Some kinds of winter pears and apples can scarcely be said to be ripened till after they are placed in the fruit-room; and medlars are not fit for use till they have reached a state of incipient decay.

FRUIT-GARDEN. Some kinds of fruits have been cultivated from the earliest historic ages. To say nothing of the garden of Eden, and the vineyard which Noah planted after the Deluge, we find in the books of Moses evidence that the cultivation of fruits was much practised in Egypt before the time of the exode of the Israelites; and amongst the Babylonians, the Persians, the Chinese, and the inhabitants of India, it can in like manner be traced back to the most remote antiquity. The Greeks and Romans probably derived their knowledge of the art, as well as many of their finest varieties of fruit-trees, from the East; Charlemagne required attention to be paid to it throughout his wide dominions, and contributed much to its extension in regions of Europe previously too rude for its prevalence; and during the middle ages it was most successfully prosecuted by the monks in the gardens of the monasteries.

The grape, the fig, the melon, and the pomegranate, are among the first fruits of which we find any particular notice in history. The cultivation of the apple, the pear, and some others, is also unquestionably of very great antiquity. Interesting particulars concerning the most important kinds of fruit, will be found under their respective heads.

The cultivation of fruits is generally carried on in connection with that of culinary vegetables, flowers, and other objects of the gardener's care; and the fruit-garden is almost necessarily more or less combined with the kitchen-garden, &c. The term fruit-garden is generally used when the ground between fruit-trees is regularly tilled and made to produce other garden crops; the term Orchard (q. v.), when it is laid down in grass, or cultivated for grain and other agricultural crops. The latter method is practicable only with some, and these the more hardy kinds of fruit-trees.

Fruit-trees, in the open air, are cultivated either as wall-trees, espalier-trees, or standards. The walls intended for fruit-trees are either of brick or stone, the former, however, being preferable, and are generally from ten to fourteen feet high. Walls serve not only for protection from winds, but for the radiation of heat, and thus counterbalance in part the disadvantages of cold climates. The training of wall-trees will be noticed in a separate article. See **WALL-TREES**. Espaliers (q. v.) serve in an inferior degree the purposes of walls. Walls are sometimes flued and artificially heated, by which means early ripening is secured, and varieties of fruit are produced which could not otherwise in the same locality be grown in the open air. The production of fruits belonging to warm climates is also effected in the colder parts of the world by means of Hothouses (q. v.), in which the trees are generally trained either as wall-trees or on frames stretched almost horizontally, both methods being commonly adopted in the same hothouse. Standard trees, which receive no other training than mere pruning, or the occasional tying of a principal branch, to guide it in a particular direction, are further distinguished according to the height of their stem before branching, as *full standards*, with stems six or seven feet high, more common in orchards where cattle are sometimes allowed to graze, than in gardens; *half-standards*, with stems three to five feet high; and *dwarf standards*, which, being otherwise also of small dimensions, and often bearing very fine fruit, and in great abundance, are particularly suitable for many situations, and for small gardens. The height of the stem is determined in the nursery, before grafting; but much depends upon the kind of tree; and all the varieties of some kinds may be permanently dwarfed by grafting on particular kinds of stock, as apple-trees by grafting on *paradise* stocks. Other means of still further dwarfing are practised as to trees intended for Forcing (q. v.), and to a remarkable extent by the Chinese in the cultivation of the Dwarfed Trees (q. v.), for which they are famous.

The soil of the fruit-garden requires particular attention. Different kinds of fruit-trees differ, indeed, as to the soils to which they are specially adapted, or in which they will succeed; but a rich and rather open soil is the most generally suitable. This soil must be of the depth of at least two feet, and it is better that it should be three or more; it must extend to a distance of at least eight or twelve feet from the trees, if they are not very dwarf. If

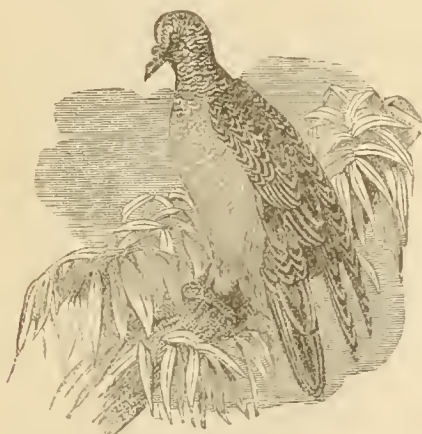
the roots reach a bad subsoil, such as gravel or *till*, canker is almost sure to ensue.

The care bestowed on the preparation of the soil for fruit-trees by the monks of the middle ages has seldom been equalled, and never exceeded in modern times. The whole soil of large gardens appears in some instances to have been artificially prepared; and the descent of the roots to an unfavorable subsoil was prevented by pavements. It is, of course, absolutely requisite that a fruit-garden be thoroughly drained. Manuring is sometimes unavoidable, but is apt, when injudiciously applied, to cause diseases in the trees; and when the soil requires to be enriched, road-scrappings, the scourings of ditches, rotten leaves, &c., are to be preferred. The use of guano and other artificial manures requires great caution. Where full crops of culinary vegetables are taken from the soil around the trees, there is less danger of injury from manures, although the practice, however necessary in many cases, is not the best either for the quality of the vegetables or the fruit.

The fruit-trees cultivated in Britain are almost always grafted or budded on seedling stocks either of the same or a nearly allied species. See GRAFTING. The raising and grafting of these stocks are generally carried on in the Nursery (q. v.). Some kinds of trees are propagated by layers or by suckers, and some by cuttings, the common method of propagating the varieties of gooseberries and currants. In warmer climates, these methods of propagation are more extensively used, and ungrafted seedlings are also more frequently allowed to become trees and to produce fruit. Concerning the transplanting of young fruit-trees, see TRANSPLANTING.—PRUNING will also be noticed in a separate article.—The methods of preserving the blossom from spring frosts being almost exclusively applicable to wall-trees, will be noticed under that head.

Besides fruit-trees, properly so called, some shrubs or bushes are much cultivated in Britain for the fruit which they produce, particularly the gooseberry, the red and white currant, and the black currant. Some of the fruits of tropical countries are in like manner produced by shrubs. The raspberry is only half-shrubby, the strawberry completely herbaceous; and these are the only half-shrubby or herbaceous plants much cultivated in the open air in Britain for their fruit. But in warmer climates, some of the most valuable fruits are produced by herbaceous plants, as the melon, cucumber, pumpkin, and all the kinds of gourds, the pineapple, and, notwithstanding the tree-like size of the plants, the plantain and banana.

FRUIT-PIGEON (*Carpophaga*), a genus of *Columbidae* (q. v.), having the bill considerably depressed at the base, compressed and



Fruit Pigeon (*Carpophaga Oceanica*).

moderately arched at the tip, the membrane in which the nostrils are pierced little prominent or swollen, the forehead low, and the feathers advancing on the soft part of the bill, the wings moderately long, the feet, and particularly the hinder claw, large, and formed for grasping. During the breeding-season, a curious gristly knob grows on the base of the upper mandible of some of the species, and soon after disappears. They are birds of splendid plumage, natives of the forests of India, the Indian Archipelago, the warmer parts of Australia, and the islands of the Pacific Ocean. Their food consists of fruits.

FRUITS, in Law. The fruits of the soil, in their legal aspects, fall under various categories, and follow different destinations according to their nature, and the situation in which they are placed. If not yet separated from the soil which produced them, they are said to be *pendentes*, and as parts of the soil (*partes soli*), pass to the heir on the death of the ancestor, or are carried by a sale to the purchaser. To this, however, there is an exception in the case of industrial fruits (*fructus industriales*), such as growing corn, and all those other fruits which require yearly seed and in-

dustry. These are called in England *emblements*, and 'though still in union with the soil, follow nevertheless, in several particulars, the nature of personal, as distinguished from real estate.' Stephen's *Com.* ii 227. The rule is the same in Scotland, but it is strictly construed, and does not include trees or planting, natural grass, or even fruit not yet plucked from the tree. To this again, however, there is an exception in horticultural subjects, in favor of nursery-trees and plants, not of larger or longer growth than such as are usually dealt in by nurserymen. See FIXTURES. Fruits that are separated from the soil (*fructus percepti*), on the other hand, are the property of the possessor who separated them in good faith; of the tenant or former proprietor in the case of a sale; and of the personal representatives of the deceased in case of death, and not of the heir of his real or heritable estate.

The act 7 and 8 Geo. IV. c. 30, 'for consolidating and amending the laws of England relative to malicious injuries to property,' applies to trees, saplings, shrubs, and underwood; to plants, fruits, and vegetable productions in gardens, orchards, nursery-grounds, hothouses, green-houses, or conservatories; and to various kinds of cultivated roots and plants not growing in a garden, orchard, or nursery-ground. The punishments are proportioned to the injury done, whipping in certain cases being added to the statutory punishments in the case of males, by 16 and 17 Vict. c. 99, and 20 and 21 Vict. c. 3. This statute (7 and 8 Geo. IV. c. 30) is limited to England, but there is an Irish statute in some respects corresponding to it (16 and 17 Vict. c. 38). In Scotland, the trees of an orchard fall under the act for preserving planting (1698 c. 16), and several still earlier enactments; and the breaking of orchard is an offence punishable by the sheriff (Ersk. i. 4, 4). See ORCHARD, PLANTATION. Injuries done to trees or other fruits of the soil are punishable at common law, independently of all statutory provisions, as malicious mischief, both in England and in Scotland.

FRUIT-TRADE. The trade in fruit is divided into two distinct branches—the *fresh* and the *dried* fruits. Fresh fruits, such as those which grow abundantly in England, are sold for London consumption almost entirely at Covent Garden Market; the sales at the Borough and other metropolitan markets being comparatively small.

There are many fruit-gardens within twenty miles of the metropolis which depend almost wholly on London consumption; but since the extensive spread of railway accommodation, fruit can now be brought up from distant parts of England with great facility; and provincial towns and the metropolis can alike be well supplied. Rapid conveyance and prompt sale and delivery are essential conditions to this kind of trade, owing to the tendency of the fruit to spoil by keeping. The higher the quality of the fruit, the more certain is the sale in London. There are in the island of Jersey pear-orchards, the produce of which is contracted for at very high prices by some of the Covent Garden dealers. The orange and lemon trades are managed in rather a peculiar manner; the produce is brought to England in very swift vessels, and is mostly consigned to fruit-merchants in the neighborhood of Lower Thames Street, who sell it to the fruiterers and the street-dealers, as well as to the markets.

Dried fruit comprises raisins, currants, figs, and the like. Grown and dried in foreign countries, chiefly bordering on the Mediterranean, these kinds of fruit mostly arrive in cases and casks; and the dealings connected with them are conducted much in the same way as those with what is called colonial produce, such as grocery.

Of raisins, currants, oranges, and lemons, the quantity and value imported into the United Kingdom in 1880 were as follows:

Raisins, 395,290 cwt.	£728,934
Currants, 820,146 cwt.	£1,072,926
Oranges and Lemons, 3,653,799 bushels.	£1,463,019

We present the numbers for one year, but it was a year of more than average activity in this branch of trade. Of other kinds of fruit, the official tables present the following quantities, in round numbers, for the same year—Almonds, 86,763 cwt.; figs, 85,913 cwt.; plums (French), 13,029 cwt.; prunes, 37,372 cwt.; nuts, unenumerated, to the value of £510,277; raw fruit, unenumerated, 5,133,432 bushels, value £2,239,473; dried fruit, 146,599 bushels, of the value of £106,343; preserved fruit (without sugar), 15,307,601 lbs., of the value of £155,060.

Some years ago, statistical papers in the *Morning Chronicle* gave returns concerning the quantity of fruit sold in Covent Garden and other London markets annually, estimated in the usual way by bushels, cwt., pottles, &c. About the same period, Mr. Braithwaite Poole, goods-manager on the London and North-western Railway, gave tables of the amount, estimated in tons, of the fruit brought to London generally. The sources of information are not very clearly stated in either case; and as the two accounts are inconsistent one with another, they need not be given here.

FRUMENTIUS, St., apostle of Ethiopia and the Abyssinians, born in Phœnicia towards the beginning of the 4th century. At a very early age, he and another youth, named Edesius, accom-

panied their uncle Meropius, a Greek philosopher from Tyre, on a voyage undertaken for mercantile, or, according to others, for scientific purposes. On their return, they landed on the coast of Abyssinia or Ethiopia, to procure fresh water; but the savage inhabitants, under the pretext of their hostility with the Romans, made an onslaught upon them, and murdered Meropius and the whole crew, sparing only the two boys, whom they found sitting under a tree and reading. They were taken as slaves into the service of the king; and made themselves so beloved that Egedesius was soon raised to the office of cupbearer, while the more sagacious F. became the king's private secretary and accountant. After the death of the monarch, F. was appointed instructor to the young Prince Aizanes, and in this capacity he obtained a still greater influence on the administration of the state affairs. He aided the Christian merchants who sought these parts, in founding a church, and gradually paved the way for the formal introduction of the new creed. In 326, he went to Alexandria—Egedesius having returned to Tyre, where he was made presbyter—and convinced Athanasius, who had recently been nominated Bishop of Alexandria, of the necessity of appointing a special ecclesiastical dignitary for Abyssinia, who should carry out vigorously the work of conversion. Athanasius, in full synod, and with its unanimous approbation, consecrated F. himself Bishop of Axum (Aexuma). The new bishop repaired to Abyssinia, and succeeded in proselytizing large numbers. He is also supposed to have translated the Bible into Ethiopian. See ETHIOPIA. On his subsequent theological disputations with Theophilus the Arian—F. himself being in all probability an Athanasian—we cannot enlarge here. F. died about 360, and his day is celebrated by the Latins on the 27th of October, by the Greeks on the 30th of November, and by the Abyssinians on the 18th of December.—Socrates, i. 15; Rufin, *Hist. Eccl.* i. 9; Theodoret, i. 22; Ludolf, *Hist. Eth.* iii. 7, 17, &c.

FRUSTUM, in Geometry, is the part of a solid next the base, left on cutting off the top by a plane parallel to the base. The frustum of a sphere or spheroid, however, is any part of these solids comprised between two circular sections; and the middle frustum of a sphere is that whose ends are equal circles, having the center of the sphere in the middle of it, and equally distant from both ends.

FRY, ELIZABETH, an eminent female philanthropist and preacher of the Society of Friends, third daughter of John Gurney, Esq. of Earham Hall, near Norwich, was born May 21, 1780. Her active and untiring exertions in the cause of suffering humanity, unparalleled in one of her own sex, acquired for her in her lifetime the name of 'the female Howard.' When not more than eighteen years of age, she established a school for eighty poor children in her father's house, with his entire sanction. In 1800, at the age of twenty, she married Joseph Fry, Esq., of Upton, Essex, then engaged in business in London, to whom she had a family of eight children. In the year 1813, the deplorable condition of the female prisoners in Newgate attracted her attention, and she resolved upon visiting them.

Alone and unprotected, she entered the part of the prison where 160 of the most disorderly were immured, and addressed them with a dignity, power, and gentleness which at once fixed their attention. She then read and expounded a portion of Scripture, many of those unhappy beings having on that occasion heard the word of God for the first time. It was not, however, till about Christmas 1816 that she commenced her systematic visits to Newgate, being then particularly induced thereto by the reports of the gentlemen who, in 1815, originated the 'Society for the Improvement of Prison Discipline.' She instituted a school within the prison walls, provided work for the females, and the means of Christian instruction, and established a committee of ladies for the reformation of female prisoners. The almost immediate result was order, sobriety, and neatness, in the place of riot, licentiousness, idleness, and filth, which had previously prevailed. In 1818, her exertions were directed to making provision for the benefit of female convicts sentenced to transportation. For the relief of females in foreign prisons, she made frequent continental journeys. She also interested herself in the abolition of slavery, the advance of education, and the distribution of Bibles and tracts. Her labors for the improvement of British seamen, by furnishing the ships of the Coast Guard and the Royal Navy with libraries of religious and instructive books, received the sanction and assistance of government. To the poor and helpless, her charities were unbounded. As a preacher among her own sect, she was held in high estimation; and she often engaged in gospel missions, not only throughout England, Scotland, and Ireland, but to various countries on the continent. She died at Ramsgate, October 12, 1845, aged sixty-five. Soon after her death, a public meeting was held in London, the lord mayor in the chair, for establishing, as the best monument to her memory, 'The Elizabeth Fry Refuge,' for affording temporary food and shelter to destitute females, on their discharge from metropolitan prisons. Compare *Memoirs of the Life of Elizabeth Fry*, 2 vols. (Lond. 1847), published by her daughters.

FRYING. See FOOD AND DRINK.

FRYXELL, ANDERS, a Swedish historian, was born in 1795 at Hesselkog, in Dalaland; studied at Upsala; took priests orders in 1820; and in 1828, became rector of St. Mary's School, Stockholm. He afterwards became Provost of North Vermland, but resigned this post in 1847. F. first required a reputation by his *Berättelser ur Svenska Historien* (Narratives from Swedish History, vols. i.—xviii., Stockh. 1832—1852). These narratives, strung together on something of the same plan as Sir Walter Scott's *Tales of a Grandfather*, are marked not only by their patriotic sentiment, but by their fresh and natural conception, their richness of biographic detail, their naive and vivacious execution, and soon obtained a wide popularity in Sweden. The first volumes of this truly national work have been repeatedly published, and have been translated into almost all European languages; for example, into English by Schoultz (1841), and German by Homberg (1843).

The part devoted to the history of Gustavus Adolphus has also been translated into German by Homberg (1842—1843), into French by Mlle. N. du Puget (1839), and into Dutch by Radjjs (Utrecht, 1844); and that devoted to the history of Gustavus Vasa into German by Ekendahl (1831). F.'s *Characteristics of the Period from 1592 to 1600 in Sweden* obtained a prize offered by the Swedish Academy. Another work, entitled *Om Aristokrat-fördommet i Svenska Historien* (4 vols. Upsala, 1845—1850), in which he endeavors to clear the Swedish aristocracy from the accusations urged against them by Geijer and others, involved him in a keen controversy with the democratic liberal party in Sweden. F. also addicted himself to poetry and music; and an opera of his, called *Vermland's Flickan* (or 'The Lass of Vermland'), has proved very attractive to his countrymen. F. died at Stockholm, 21st March 1881.

FUAD-MEHMED, Pasha, a Turkish statesman and litterateur, was born at Constantinople in 1814. He was the son of the celebrated poet, Izzet-Effendi-Kitchegizadé, better known under the name of Izzet-Mollah, and nephew of Leila Khatun, one of the very few Turkish poetesses. Having received an education more literary than that of the majority of young men destined for public affairs in Turkey, he began to make himself known as an author, when the exile of his father, who had fallen into disgrace with the Sultan Mahmud, and the confiscation of the paternal property, compelled him to choose a profession. He betook himself to medicine, and studied at Galata-Seraï from 1828 to 1832. In 1834 he was appointed Admiralty physician, and accompanied the grand admiral in his expedition against Tripoli; but on his return to Constantinople, he abruptly forsook medicine, and entered the more unquiet arena of politics. For several years, he employed himself in the study of diplomacy, history, modern languages, the rights of nations, and political economy. In 1840, he became first secretary to the Turkish embassy at London, where his skill and sagacity first made themselves conspicuous. In 1843 he was named second dragoman of the Sublime Porte, and shortly after was chosen to proceed to Spain to felicitate the queen of that country on her accession to the throne. F. was very popular at the court of Madrid. It was almost impossible to believe him to be a Turk. He spoke French marvelously well, made *bon-mots* like Talleyrand, and showed himself as gallant as an Abencerrage. Curiously enough, although a *Mohammedan*, he obtained, while in Spain, among other honors, the Grand Cord of Isabella the Catholic. Here also he composed a poem on the Alhambra, which Turkish critics praise highly for its novel and interesting reflections. On his return to Constantinople, he was appointed to discharge the functions of grand interpreter to the Porte, which brought him into contact with the Duke of Montpensier, who arrived at Constantinople in 1845, and who, on his return to France, invested him with the Cross of Commander of the Legion of Honor.

In 1850 he went on a mission to St. Petersburg, and in 1853 on another to Egypt. On his return from the first of these, he became minister of foreign affairs under the grand viziership of Aali Pasha (August 1852). On the question of the 'Holy Places,' F., by his attitude, and by a brochure very hostile to the pretensions of Russia, entitled *La Vérité sur la Question des Lieux Saints*, gave great dissatisfaction to the czar. In 1854, F. went to Epirus along with Omar Pasha, acting sometimes as a diplomatist and sometimes as a general. In the following year he received the title of Pasha, and was again appointed minister of foreign affairs. From 1861 to 1866 he held the office of Grand Vizier. He died in 1869. To him especially it is said Turkey owes the hatti-sherif of 1856, ordering the consolidation of the external defences of the Porte and the institution of telegraphs and light-houses.

When the Turkish Academy of Science and Belles-Lettres was established in 1851, F. was one of the first members, and in the following year he published a *Turkish Grammar*, which is highly esteemed by native scholars. He was loaded with distinctions by European sovereigns.

FUCA, STRAIT OF, a passage separating Washington Territory in the United States from Vancouver's Island, and connecting the Chambers' Cyclo. Vol. III.—44.

Pacific Ocean with the Gulf of Georgia, has its outer or western entrance in lat. $48^{\circ} 10' N.$, and long. $124^{\circ} W.$ It contains several islands, one of which, San Juan, became, in 1859, the subject of a dispute between Great Britain and the United States; the question being, whether it was to be regarded as an appendage of Washington Territory or British Columbia. The question was submitted in 1872, to the Emperor of Germany as arbiter; and he decided that the line of boundary should be run through the Strait of Haro, west of San Juan, thus awarding that island to the United States.

FUCA'CEÆ, according to Lindley, a natural order of Acotyledonous plants; but more generally regarded by botanists as a sub-order of *Algae*. The species are numerous, about 500 being known, mostly growing in salt water. They are distinguished from the other algae by their organs of reproduction, which consist of spores and antheridia, contained in common chambers or conceptacles, which are united in club-shaped receptacles at the end or margins of the fronds. The antheridia contain phytozoa. The frond is sometimes a stalk expanding into a broad blade, and sometimes exhibits no such expansion, and is either simple or variously branched. Many of the F. are provided with vesicles containing air, by the aid of which they are enabled to float in the water. Some attain a great size—*Macrocystis pyrifera* is said to have fronds of 500 to 1500 feet in length; its stem not being thicker than the finger, and the upper branches as slender as pack-thread. Most of the F. contain iodine in very considerable quantity, and some of them are therefore much used for the manufacture of KELP (q. v.), particularly different species of *Fucus*, or Wrack, and *Laminaria*, or Tangle. On account of the soda which they contain, they are also valuable as a manure. Some of them are eatable, containing large quantities of gelatinous matter, as the DULSE (q. v.) TANGLE (q. v.), and BADDERLOCKS (q. v.) of the British coasts, and certain species of *Sargassum* in other parts of the world. The medicinal uses of some of them seem to depend upon the iodine which they contain, and which it is now considered preferable to exhibit in other forms, after it has been extracted.

FU-CHOW-FOO (Happy City), a city and port of China, and capital of the province of Fuh-keen. It is beautifully situated on the left bank of the Min, 25 miles distant from the mouth of that river, in lat. $26^{\circ} 3' N.$, long. about $119^{\circ} 50' E.$, and was opened to foreign commerce by the treaty of 1842. The walls of the city are about 30 feet in height, and 6 miles in circumference, and have seven gates, the gateways of which are constructed of bricks, resting on a foundation of granite. The bridge of forty or fifty arches over the river Min is 12 feet wide, and about 1200 feet long. A Buddhist monastery on Wu-shi-shan has been converted into the city residence of the British consul. The lacquered ware of F. is of special excellence, and the method of preparing it is known only to one family, by whom the secret is jealously kept. The exports during the season 1881 amounted to 97,455,733 lbs. of tea, of the value of about four and a half millions sterling, of which about two-thirds went to Great Britain. The total imports and exports in 1881 amounted to £4,281,140 (mainly imports). Of the 597 vessels which entered and cleared, 459 were British. The chief imports are lead, cotton, woollen goods, and opium. The duties on foreign trade are greater in amount than those received at any port in China, except Shanghai. The population of the city is about 600,000.

FU'CHSIA, a genus of *Onagraceæ* (calycifloral oxogens), containing a large number of species, natives of South America. They are half-shrubby plants, shrubs, sometimes climbers, and small trees, and have generally pendulous red flowers; of which the calyx is funnel-shaped, 4-cleft, finely colored; the corolla 4-petaled; the fruit is a 4-celled berry; the leaves are opposite; the flower-stalks 1-flowered, springing from the axils of the leaves, or sometimes forming racemes at the top of the branches. Some of the species, as *F. coccinea*, *F. gracilis*, *F. globosa*, *F. fulgens*, *F. macrostemon*, *F. longiflora*, are much cultivated in gardens and greenhouses for the beauty of their flowers. Most of the species are too delicate for the climate, at



Fuchsia.

least of the northern parts of Britain; but some of them, although

killed to the ground every winter by frost, spring again from the root, and flower beautifully in autumn. A little protection around the root is of great use in preserving them in vigor. All of them are propagated with extreme facility by cuttings, which has no doubt contributed to their present abundance, even in the gardens and windows of the poor.

No flowering shrubs of recent introduction into Britain have become nearly so popular as those of this genus; and new varieties and hybrids have been produced in vast numbers, of which those with white flowers are particularly prized. The berries of a number of the species are eaten in South America, and preserved with sugar; and they are occasionally used in both these ways in Britain, although in Scotland the fruit even of the most hardy ripens only in favorable situations, for the most part on the west coast. Where the climate admits of it, a F. hedge is extremely ornamental. The wood of some species is employed in their native regions for dyeing black. The genus is named in honor of Leonhard Fuchs, one of the fathers of modern botany, born in Swabia in 1501, died at Tübingen, where he was a professor, in 1565.

FUCHS'S SOLUBLE GLASS is a peculiar silicate, which is prepared by melting together 8 parts of carbonate of soda, or 19 parts of carbonate of potash, with 15 of pure quartz sand, and 1 part of charcoal, which is added to facilitate the decomposition of the alkaline carbonate. A black glass is thus obtained, which is not soluble in cold water, but dissolves in about six times its weight of boiling water. Fuchs commenced his experiments on this subject in 1825, and continued and varied them for many years. The above is, however, we believe the most approved formula. The practical uses of the soluble glass to which he especially directed his attention were two—viz. (1), as a varnish, which, applied in the fluid form to stone surfaces, would harden into a glass, and prevent the ordinary effects of atmospheric influences; and (2) as a means of fixing fresco-colors by the process known as stereochromy. See FRESCO. Professor Kuhlmann of Lille in 1857 published his method of producing a stone-protecting silicate; and used it successfully for preventing the decay of walls and houses built of inferior stone. He also employed soluble glass in print-works and tapestry factories for fixing colors on cotton and on paper. It has also been utilized in washing wool, 40 parts of water being mixed with 1 of soluble glass at a heat of about $130^{\circ} F.$ Mr. Ransome of Ipswich has not only employed concentrated solutions of silicate of potash, or of soda, as a cement for consolidating silicious sand into a very hard, durable, artificial sandstone, capable, before it is fired, of being moulded into any desired form, but has likewise produced a vitreous varnish, consisting of silicate of potash, after which he applies a coating of a solution of chloride of calcium: a silicate of lime is thus formed, which is stated to be very successful in protecting the surface of stone from external influence. Wood that has been painted with these varieties of soluble glass is rendered nearly if not quite fire-proof.

FUCI'NO, LAKE OF, or LAGO DI CELANO (ancient *Fucinus Lacus*), a lake of Italy, in the province of Abruzzo Ultra II., remarkable as the only one of any extent found in the Central Apennines. It is 10 miles long by 7 broad; and is situated at an elevation of 2176 feet above the sea-level. It is subject to sudden risings; and in ancient times, by order of the Emperor Claudius, a magnificent subterranean channel more than three miles in length, to carry off the surplus waters, was cut partly through the solid rock of Monte Salviano, rising 1000 feet above. This tunnel became obstructed in the middle ages, and long remained so, notwithstanding many attempts to clear it. In recent times the surrounding country has been often submerged. In 1855, operations were commenced for the restoration of the Claudian aqueduct, and on the 9th of August 1862 the work was completed. Down till 1871, about £20,000,000 were expended upon the drainage of this lake.

FUCUS. See FUCACEÆ and WRACK.

FUEL. This term is generally applied to combustibles used for the production of heat; also, less frequently, to combustibles such as oil, Paraffine Oil (q. v.), used for lighting. Under articles COAL, COKE, &c., will be found details of the physical properties and chemical composition of the various fuels; the following observations bear chiefly on their economical application as sources of motive power.

The two elementary bodies to which we owe the heating powers of all our fuels, natural and artificial, are carbon and hydrogen. Coke, wood charcoal, peat charcoal, and anthracite, contain little or none of the latter element, and may be regarded as purely carbonaceous fuels. But wood, peat, and most varieties of coal, contain hydrogen as well as carbon; and in their combustion, these two substances combine to produce volatile and combustible hydro-carbons, which are volatilized previous to being consumed, while a purely carbonaceous fuel evolves no volatile matter until combustion has been effected.

These hydrocarbons are numerous and varied in composition (see CARBOHYDROGENS); but when combustion is perfect, the amount of heat produced by any hydrocarbon is exactly what would have been produced had the hydrogen and carbon been burned separately. It will be of advantage, therefore, to study these two elementary combustibles in succession, in order to estimate subsequently the combined effect where they come together in the same fuel.

The heating power of a combustible, or the amount of heat generated by it, is usually expressed in degrees Fahrenheit on so many pounds' weight of water. But in estimating the temperature, or intensity of heat produced, we have to keep in view that different substances have different capacities for heat—that of water being generally assumed as unity. The number expressing this capacity is called the specific heat of the substance. Water 1000, carbonic acid 221, imply that while 1000 units of heat are required to elevate the temperature of water any given number of degrees, only 221 units are required to elevate the same temperature an equal weight of carbonic acid.

CARBON AS FUEL.—1. *Amount of air required for combustion.*—Burned in air, carbon combines with the oxygen to form carbonic acid (CO_2), mingled with nitrogen, the other atmospheric element. The chemical change may be thus represented, atomically:

Products of Combustion.			
Carbon,	6.0	Carbonic acid,	25.0
Air (69.6) { Oxygen,	16.0		
{ Nitrogen,	53.6		53.6
	75.6		75.6

Or, assuming carbon as unity:

Carbon,	1.000	Carbonic acid,	3.667
Air (11.6) { Oxygen,	2.667		
{ Nitrogen,	8.933		8.933
	12.600		12.600

Carbon, therefore, requires about twelve times its own weight of air for perfect combustion.

2. *Amount of Heat produced.*—Andrews found that 1 lb. of carbon produced heat equal to 1°F. in 14,220 lbs. of water. Other observations agree very closely. This may be otherwise stated thus: 1 lb. carbon will raise from freezing to boiling point (32° to $212^\circ = 180^\circ$) $\frac{14220}{180} = 79$ lbs. water; from mean tem-

perature to boiling-point (60° to $212^\circ = 152^\circ$) $\frac{14220}{152} = 93.5$ lbs. water; will boil off in steam from mean temperature (60° to $212^\circ = 152^\circ$, add latent heat in steam. $965^\circ = 1117^\circ$), $\frac{14220}{1117} = 12.73$ lbs. water; and will boil off in steam from boiling-point (latent heat in steam, 965°) $\frac{14220}{965} = 14.74$ lbs.

3. *Utmost Temperature or Intensity of Heat from Carbon.*—Here we suppose the combustion effected in a space enclosed by non-conducting material, so that all the heat produced by 1 lb. carbon is retained by the products of its combustion. Caloric sufficient to raise 14,220 lbs. water 1°F. is thus compressed, as it were, into 12.6 lbs. of carbonic acid and nitrogen. To determine the temperature thus produced, we require to know the specific heat of this gaseous compound, that of water being 1.

3.667 lbs. carbonic acid.	Specific heat,	.2210
8.933 " nitrogen.	" "	.2754
12.600 " products of combustion.	Mean sp. "	.2596

14,220° on water at 1.000 specific heat, will give 54.776° on these products per pound-weight. Distributed over 12.6 lbs., this heat will raise the temperature to $\frac{54776}{12.6} = 4347^\circ \text{F.}$, which is therefore the utmost intensity of heat attainable in burning carbon, supposing no loss by absorption or radiation.

4. *Effect of Excess of Air.*—Excess of air has been proved to have no effect on the quantity of heat produced where combustion is perfect; but the intensity of temperature is diminished. Suppose two equivalents of air admitted; we then have as the products of combustion—

3.667 lbs. carbonic acid.	Specific heat,	.2210
8.933 " nitrogen.	" "	.2754
11.600 " air in excess.	" "	.2669
24.200 " products.	Mean sp. "	.2631

14,220° on water = $54,045^\circ$ on this new mixture of gases. But

the heat is now diffused over 24.2 lbs. matter instead of 12.6 lbs., $\frac{54048}{24.2} = 2234^\circ \text{F.}$: the utmost temperature produced by carbon burned in two equivalents of air.

The utmost temperatures attainable, with various proportions of air, are given below, and also the appearance which the interior of the furnace would exhibit. Flame at these temperatures will present the same differences in color.

Weight.		Ratio of Fuel to Air	Highest Possible Temperature.	Appearance of a Body exposed to such Temperature.
Carbon.	Air.			
lbs.	lbs.			
1.	11.6	1 to 1	4357°	Intensely brilliant.
1.	17.4	1 " $1\frac{1}{2}$	2941	Dazzling white.
1.	23.2	1 " 2	2233	Bright ignition.
1.	29.0	1 " $2\frac{1}{2}$	1797	Full cherry red.
1.	34.8	1 " 3	1503	Commencing cherry red.
1.	58.	1 " 5	908	Incipient red.
1.	69.6	1 " 6	758	Black.

5. *Effect of Deficiency of Air.*—If, before reaching the upper layers of carbon or cinder, the air has parted with all its oxygen to form carbonic acid with the production of heat, then the carbonic acid combines with part of the remaining carbon to form Carbonic Oxide, CO (q. v.), but without producing heat. The loss may amount, therefore, to one-half of the fuel: some have stated it as high as three-fourths. If this oxide, when it gets above the fuel, meet with air before cooling, it burns with a pale blue flame, restoring part of the lost heat; but to what extent has not yet been determined.

6. *Effect of Water Present.*—Passing into vapor, water absorbs both sensible and latent heat, and thus diminishes the temperature. Heating power is also lost, as products of combustion are generally passed into the atmosphere at a high temperature.

HYDROGEN AS FUEL.—1. *Air required.*—Hydrogen combines with the oxygen of the air to form vapor of water, mingled with nitrogen:

Products of Combustion.			
Hydrogen,	1.	Vapor of water,	9.
Air (34.8) { Oxygen,	8.		
{ Nitrogen,	26.8		26.8
	35.8		35.8

1 lb. hydrogen therefore requires 34.8 lbs. air, while 1 lb. carbon requires only 11.6 lbs.

2. *Amount of Heat Produced.*—The amount of heat produced from hydrogen is much greater than that from carbon; the caloric from 1 lb. heating 60,840 lbs. water 1°F. Part of this is, however, latent in the water-vapor, and must be deducted in calculating intensity of heat, and also heating effect under all ordinary circumstances. This deduction amounts to 9 lbs. water $\times 965^\circ$ latent = 8685° , leaving 52,155° as the effective heating power of 1 lb. hydrogen.

3. *Utmost Temperature and Intensity of Heat.*—This is less than in the case of carbon, from the high specific heat and greater quantity of the products. We have—

Vapor of water.	9. lbs.	Specific heat,	.8470
Nitrogen.	26.8 "	" "	.2754
	35.8 "	Mean sp. "	.4191

52,155° on water will be $124,445^\circ$ on these products; and $\frac{124445}{35.8}$

lbs. = 3476° , is the utmost possible temperature.

4. *Effect of Excess of Air.*—As in the case of carbon, the intensity of heat is diminished, as under:

Weight.		Ratio of Fuel to Air.	Highest Possible Temperature.
Hydrogen.	Air.		
lbs.	lbs.		
1.	34.8	1 to 1	3476°
1.	69.6	1 " 2	2187
1.	104.4	1 " 3	1591
1.	139.2	1 " 4	1250

5. *Effect of Deficiency of Air.*—No new product is the result of deficiency of air, as in combustion of carbon; the hydrogen simply escapes unconsumed.

6. *Effect of water-vapor present* is diminution of intensity and ultimate loss of heat in application, as in the case of carbon.

Temperature of Ignition of Carbon and Hydrogen.—These substances must be themselves heated before they can burn. Hydrogen begins to burn at or below 300° , while carbon requires a red-

heat (800° to 1000° F.), and even at that temperature burns very slowly. Consequently, where they are combined, as in common coal, the temperature present is often sufficiently high to ignite and consume the hydrogen, while the carbon remains unchanged as cinder, or passes away as smoke, unconsumed in either case.

All that has been said above, of carbon, as to air required, heating power or value, utmost temperature, temperature of ignition, effect of water present, and of excess or deficiency of air, applies, without modification, to one class of fuels—the purely carbonaceous, including anthracite, coke from coal, charcoal from wood and peat, and the cinder of any description of fuel. The incombustible ash must be allowed for in calculating heating power or value; and also the volatile bodies—nitrogen, sulphur, &c.—the latter of which frequently renders the fuel unsuitable for many purposes in the arts and manufactures.

Peat, wood, and coal, with the exception of anthracite, contain hydrogen to an extent rarely exceeding 5 per cent. We have seen that, compared with carbon, hydrogen requires three times as much air, and generates nearly four times as much heat, but produces 20 per cent. less intensity of heat, and ignites at a much lower temperature; and the combustion of wood, coal, &c., is in these respects modified according to the proportion of hydrogen present in them.

The following table shows the composition of British coal, as determined by Playfair and De la Beche. Columns 8 to 12 are added to illustrate the process of combustion.

Locality.	Average Composition.					On Distillation, there is							Proportion of Hydrogen to Carbon.
						Left as Coke or Cinder.		Expelled in Gaseous Form.					
	Water, Sulphur, and Nitrogen.	As Volatile Hydrocarbons.											
		Carbon.	Hydrogen.	Water= Hydrogen and Oxygen.	Sulphur and Nitrogen.	Incombustible Ash.	Ash.	Carbon.	Hydrogen.	Carbon.	Total.		
Wales.....	83.78	4.27	4.67	2.41	4.91	4.91	67.69	6.68	4.27	16.09	20.36	1 to 3.8	
Newcastle.....	82.12	4.60	6.40	2.59	3.77	3.77	56.90	8.99	4.60	25.22	29.82	1 " 5.5	
Lancashire.....	77.90	4.53	10.72	2.74	4.88	4.88	55.34	13.46	4.53	22.56	26.69	1 " 5.4	
Scotland.....	78.53	4.40	10.90	2.11	4.03	4.03	50.19	13.01	4.40	28.34	32.74	1 " 6.4	
Derbyshire.....	79.68	3.66	11.56	2.42	2.65	2.65	56.67	13.98	3.66	23.01	26.67	1 " 6.3	
	1	2	3	4	5	6	7	8	9	10	11	12	

When coal is heated in a retort, it yields volatile Hydrocarbons (q. v.), amounting to 20 to 32 per cent. of its weight (see column 11). The hydrogen has robbed the fuel of six times its own weight of carbon. When fresh fuel is added to live coal in a furnace, the same result ensues; so that in using coal, 50 to 67 per cent. of carbon burn on the grate, and 20 to 32 per cent. carbon and hydrogen have to be burned in the open space above the fuel, or escape unconsumed.

The elements of a hydrocarbon are consumed, not simultaneously, but in succession. First, the carbon is separated from the hydrogen in light floating particles, subsequently seen as soot or smoke (if not consumed); then the hydrogen burns, and communicates heat to the carbon particles, which then appear as flame. The color of the flame indicates the temperature present; and if the temperature is sufficiently high, the carbon of which the flame is composed burns also, producing a further increase of heat. If not, the flame, as it moves onward, cools, becoming red, dull red, and finally black and smoky, passing away as such. For complete combustion of common coal, we therefore require not only air in sufficient quantity, but also intensity of heat above the fuel. We require a low temperature to separate the carbon from the hydrogen; a higher temperature to consume the hydrogen; and a still higher to consume the carbon of the flame. In closed furnaces, such as those of steam-boilers, while the current of air supplied continues pretty uniform in quantity, the volatile bodies are evolved almost immediately after fueling; and would require, for the moment, perhaps four times the quantity of air which is passing through. The volatile fuel is, in consequence of the want of air, carried off partly unconsumed; and the temperature in such furnaces is frequently too low for the ignition of carbon, as may be seen from the color of the flame; the cold boiler having abstracted the heat before the flame has been subjected to its influence. We refer to the article SMOKE, CONSUMPTION OF, for an account of the plans which have been adopted to secure perfect combustion, and thus prevent smoke.

From the principles involved, we should expect most success where the fuel is supplied by mechanical arrangements as regularly and uniformly as the air, and where, in addition, the body of the furnace is protected or removed so far from boiler-surface and other cooling agents as is necessary to maintain a temperature within it sufficient for the thorough ignition of the flame. In house-fires, where the heat is lost if not radiated forward into the room, the cinders should be drawn to the front, and the fresh fuel laid into the vacant space behind. The gases rise between the two

and being highly heated, form a sheet of flame above and behind the red-hot fuel in front. If, as is commonly done, we throw the fresh fuel on the top of the live coal, we interrupt the process of radiation, and the gaseous part of the fuel is thrown off rapidly into the cool atmosphere above the grate, and does not take fire until a considerable period has elapsed. To our ordinary fire utensils, we might with advantage add one of a rake shape, suited for drawing forward the fuel.

For dimensions of furnaces, &c., see STEAM-ENGINE.

Economy of fuel will be best secured, first, by accomplishing perfect combustion both of the fixed and volatile parts of the fuel; and secondly, by regulating the amount of air, as any excess of this has to be passed on to the chimney at the same high temperature as the true products of combustion.

The abundance or scarcity of fuel has a great effect on the general interests of a country and the comfort of its inhabitants. The wealth and prosperity of Britain must be attributed in no small degree to the abundance of coal in those districts both of England and Scotland in which ironstone is most abundant, and in which, therefore, the coal is required as fuel for smelting it. But even for the most ordinary uses of domestic economy, the scarcity of fuel in some parts of the world, causes much hardship to their inhabitants, whilst its abundance in others is one of their greatest natural advantages. Coal, wood, and peat are the three kinds of fuel principally used; coal being indeed the vegetation of former ages—or rather of former geological periods—the product of their

sunshine and their showers, treasured up for the present; peat, a recent formation. Coal may be said in general to be of about twice the value of wood as fuel, weight for weight, in its heating power. In those parts of the world in which coal is not found, or to which it cannot be easily—or as yet profitably—conveyed, the preservation of forests is of great importance; and trees are not unfrequently planted, as in some parts of Europe, in hedge-rows and otherwise, chiefly in order to provide a supply of fuel. For the same reason, pollarding is resorted to, the branches being used as fuel, and the trunk left to produce new branches. Only some kinds of trees are adapted to this mode of treatment. In some regions, as on some of the steppes of Asia and other treeless plains, the dried dung of herbivorous animals is much used as fuel. In cases of less extreme necessity, all kinds of vegetable refuse are used. Thus, in many parts of the continent of Europe, things are carefully gathered up for fuel which in any part of Britain would most probably be burned on the field, to get them out of the way. But it is not easy to compute the benefit derived by many parts even of Britain, particularly the inland parts, from the recent great increase of the facilities of communication and of the trade in coal.

FUENTÉ A'LAMO, a town of Spain, in the province of Murcia, 18 miles south from Murcia, at the northern base of a range of hills, and at a short distance from the canal of Murcia. Pop. (1877) 7901.

FUENTE DE OVEJUNA (The Sheep-well), a small walled town of Spain, in the province of Cordova, and 44 miles north-west of the town of that name, is situated on the crest and sides of a conical hill, between two of the upper branches of the Guadiala. At the foot of the hill, and on its western side, are the wells from which this town has derived its name. It has manufactures of finens, woollens, and leather. Coal-seams occur in the vicinity. Pop. about 5500.

FUENTES DE ONORO (The Fountains of Honor), a small village of Salamanca, Spain, on the Portuguese frontier, 14 miles west of Ciudad Rodrigo, is well-known as the scene of one of the important battles of the Peninsula War, between the English under Wellington, and the French under Massena. Wellington, who had resolved to abide battle, drew up his forces between the Coa and the Agueda, his line extending north and south for about seven miles, and his right wing stretching two miles south of F. de Onoro. On the 3d May 1811, this village was fiercely attacked by a strong body of French troops, who forced the

English from the streets, and were not dislodged until the English, reinforced by three regiments, drove them by a terrific charge from their position, with a loss in all of 300 men. On the 5th, the battle proper commenced. The French, much stronger than their enemies both in cavalry and infantry, assailed Wellington's right with overwhelming numbers, and although prodigies of valor were performed by the English—as in the case of Ramsey's brigade of horse artillery, which cut its way through a solid body of cavalry—their right wing was turned, and their position lost. Never during the war were the English forces more perilously situated. Meanwhile, at F. de O., on which Wellington's left wing now rested, a fierce battle was being fought. The three English regiments who had been left in occupation made a desperate resistance against assailing multitudes. The fight lasted here till evening, reinforcements having been brought up on both sides; and the night closed upon the English holding the crags above the town, and the retiring regiments of the French. The loss of the allies amounted to 1500, while that of the French was stated at the time to be nearly 5000, and was certainly greater than that of the allies. Neither army could claim a decided advantage in this battle; but its result was, that on the 10th, the French were forced across the Portuguese frontier; and thus ended the French invasion of Portugal.

FUERO, a Spanish word derived from Lat. *forum*, signifies strictly, the seat of justice, jurisdiction. In this last sense, it was transferred to collections of laws, and specially to the civic rights granted by the kings to individual cities, the most famous of which were the fuero of Leon and that of Naxera. As these city charters contained for the most part special liberties, concessions, and privileges, the word fuero became current chiefly in this sense, and was particularly so applied to designate the body of privileges and liberties that made up the constitution of Navarre, and of the three Basque provinces of Biscaya, Alava, and Guipuzcoa. These are the fueros the maintenance of which gave rise to wars in the Basque provinces in 1833. The fueros of other provinces and cities of Spain have long been extinct.

These Basque fueros were grounded on the old laws of the Visigoths, and grew up in the period between the irruption of the Moors into the Spanish peninsula and the consolidation of the Spanish monarchy under the House of Hapsburg. The same was the case in the half-Basque province of Navarre, which formed an independent kingdom under its own sovereigns. The fueros were thus the product of the ancient Gothic laws—those fertile sources of modern rights—and the new circumstances in which they were placed. They resulted by degrees, here as elsewhere, in a struggle between the people and the princes; and their development forms an interesting chapter in the history of modern constitutionalism. They were at first only privileges and statutory rights granted to single places, and from these were extended to others. By the introduction of the representative element of the Cortes, and extension over whole provinces, they were then transformed, in virtue of the general law of custom, into constitutional rights of these provinces; and were in time collected and formally embodied and sanctioned as such. It was in this way that the fueros of Navarre, which had been growing into consistency for centuries previously, were, in 1236, during the contests between King Theobald and his Cortes, collected and recorded, and remain yet under the title of *Cartulario del Rey Tibaldo*. Ferdinand the Catholic, who united Navarre with the crown of Castile, maintained the fueros, adapting them to the new relation to Castile. Their leading provisions were these: The Cortes, chosen for three years, and consisting of the three estates of clergy, nobles, and commons, are to meet yearly; and without their consent, no law can be passed, or anything of importance undertaken. The government consists of the viceory, who presides in the Cortes and Great Council of Navarre (a body similar to the old French parliaments); and the Contaduria, before which all accounts of revenue and expenditure must be laid. There is no custom-house or toll but at the frontier, and except the trifling grant of 176,000 reals, nothing flows into the royal treasury. All these fueros the king had to bind himself by a royal oath to maintain.

In the lordship (Señoría) of Biscaya, the fueros grew up in the contests of the inhabitants with their counts. They were first collected into a code by Count Juan in 1371, which, after the final union of Biscaya with Castile, was recast (1526), completed, and confirmed by King Charles I. (the German emperor Charles V.). According to this charter of rights, every new 'Lord'—for only so do the Biscayans style the king of Spain as their prince—fourteen years old, must come into the country within a year, and take the oath to uphold the fueros in certain places appointed for that purpose. The government consists of a corregidor, appointed by the 'Lord,' and two deputies; these, aided by six regidores, and forming the regimiento, conduct the administration. But the supreme power resides in the General Assembly (Junta General), which meets yearly under the tree at Guernica,

and regulates all the affairs of the lordship, and appoints the deputies and regidores. Justice is administered, in the first instance, by the lieutenants (Tenientes) of the corregidor; in the second, by the corregidor and deputies; and in the third, by the royal court at Valladolid. Other privileges were, that every Biscayan of pure blood was counted noble; that except the post-office there was to be no royal governing board in the province; that Biscayans were not bound to serve in the Spanish army.

The fueros of Alava and Guipuzcoa were of analogous origin and character, but differing in details. Abolished by Espartero, these fueros were restored by Queen Isabella in 1844. In 1876 a law abolishing the Basque fueros was adopted, and in 1877 a decree was passed, assimilating the administration of the Basque provinces to that of Spain.

FUERTÉ DE ANDALGA'LA, sometimes more briefly called ANDALGALA, a town of the Argentine Confederation, in the province of Catamarca, 72 miles north by west from Catamarca, in a mountainous district. Pop. 5500.

FUERTE, or VILLA DEL FUERTE, a town of Mexico, in the province of Sinaloa, 75 miles north by west from Sinaloa, on the Rio del Fuerte, which flows into the Gulf of California. It is a place of some commercial importance. Pop. 8000.

FUGÆ. See MEDITATIO FUGÆ.

FUGA'RO, the name of a well-known stop of the flute kind in continental organs of 4-foot pitch, and sometimes of 8-foot pitch, of a small scale, made of wood or tin; in tone it is as piercing as the *gamba*, but much clearer.

FUGGER, one of the most remarkable families in Germany, which, rising by industry and commerce, has founded numerous lines of counts, and even princes. The ancestor of the family was John F., master-weaver in Graben, near Augsburg. His eldest son, John F., acquired by marriage, in 1370, the freedom of Augsburg, and began to carry on a trade in linen along with weaving. By a second marriage, in 1382, with the daughter of a councillor, he had two sons and four daughters. This John F. was one of the council of twelve (Ger. *Die Zwölfer*, 'the twelves') in the weaver-guild, and an assessor of the famous *Fehngericht* (q. v.) or secret tribunal of Westphalia. He died in 1409, and left what was a large fortune for the time—3000 guildens or florins.

His eldest son, Andrew F., made such good use of his share of the inheritance that he got the name of 'the Rich Fugger.' By marriage, he founded a noble line, which, however, died out in 1585. John's second son, Jacob F., who died in 1469, was superior and 'twelver' of the weaver-guild, and a man held in high esteem by his fellow-citizens; he was the first of the Fuggers that had a house in Augsburg, and he already carried on an extensive commerce.

Of his seven sons, three, Ulrich, George, and Jacob II., by means of industry, ability, and integrity, extended their business to an extraordinary degree, and laid the foundation for the palmy days of the family. They married into the noblest houses, and were raised by the Emperor Maximilian to the rank of nobles. The emperor mortgaged to them, for 70,000 gold guildens, the country of Kirchberg and the lordship of Weissenhorn, and received from them afterwards, through the mediation of Pope Julius II., 170,000 ducats, to assist in carrying on the war against Venice. Ulrich F., born 1441, died 1510, devoted himself specially to the commerce that he opened up with Austria, and there was almost no object that did not enter into his speculations; even the master-pieces of Albert Dürer went through his hands to Italy. Jacob F., born 1459, died 1525, engaged in mining; he farmed the mines in Tyrol, and accumulated immense wealth; he lent to the Archduke of Austria 150,000 guildens, and built the magnificent castle of Fuggeran, in Tyrol. Thus the wealth of the Fuggers went on increasing. Their wares went to all lands, and scarce a road or sea but bore their wagons or ships.

But it was under Charles V. that the House attained its greatest splendor. Jacob having died childless, and the family of Ulrich being also extinct, the fortunes and splendor of the House rested on the sons of George F., who died in 1506. At his death he left three sons, one of whom, Marcus, entered the church; the two younger, Raimund and Antony, carried on the business, and became the founders of the two chief and still flourishing lines of the House of Fugger. The two brothers were zealous Catholics, and with their wealth supported Eck in his opposition to Luther. During the diet held by Charles V. at Augsburg, in 1530, the emperor lived in Antony F.'s splendid house in the Wine Market. On this occasion, he raised both brothers to the rank of counts, and invested them with the still mortgaged properties of Kirchberg and Weissenhorn; and a letter under the imperial seal conferred on them the rights of princes. For the support they afforded him in his expedition against Algiers in 1535, they received the right of coining money. Antony F., at his death, left six millions gold crowns in ready money, besides jewels and possessions in all parts of Europe and in both Indies. It is of him that the Emperor

Charles is said to have remarked while being shown the royal treasury in Paris: 'There is a linen-weaver in Augsburg that could pay all that out of his own purse.'

The Emperor Ferdinand II. raised the splendor of the House of F. still higher while confirming the imperial letter of Charles, by conferring great additional privileges on the two oldest of the family, Counts John and Jerome. The Fuggers continued still as nobles to carry on their commerce, and further increased their immense wealth. They attained the highest posts in the empire, and several princely houses prided themselves on their alliance with the House of Fugger. They possessed the most extensive libraries and collections of objects of art, maintained painters and musicians, and liberally encouraged art and science. Their houses and gardens were master-pieces of the architecture and taste of the times. There is thus nothing incredible in the story that Antony F., on one occasion when Charles V. was his visitor, lighted a fire of cinnamon wood with the emperor's bond for money lent him.

While thus indulging in splendor, they were not less bent on doing good. Ulrich, George, and Jacob, the sons of the beneficent Jacob, bought houses in one of the suburbs of Augsburg, pulled them down, and built 108 smaller houses, which they let to poor citizens at a low rent. This was the origin of the 'Fuggerei,' which still remains under the same name, with its own walls and gates. Many other benevolent institutions were set on foot by Antony F. and his sons. It is questionable if we are to rank among their benefactions their calling the Jesuits to Augsburg, and giving them buildings and revenues for a college, church, and school. The race is still continued in the two principal lines of Raimund and Antony, besides collateral branches. The domains are chiefly in Bavaria. A collection of portraits of the most important members of this great house, executed by Domin. Custos of Antwerp, appeared at Augsburg (1593 et seq.). This collection (increased to 127, with genealogies written in Latin) was republished by the brothers Kilian (Augsburg 1618); and in 1754, a new edition of the work, still further improved,

and containing 139 portraits, was published at Ulm, under the title *Pinacotheca Fuggerorum*.

FUGUE, in Music, is the name of a composition wherein the parts do not all begin at once, but follow or pursue one another at certain distances; thence the name, *Fuga*, a flight or chase, each part successively taking up the subject or melody. Any of the parts may begin the fugue, but the others follow according to fixed rules. The subject is generally a few bars of melody, which is given out in the principal key by the part which begins. The next part which enters repeats the same melody, but a fifth higher or a fourth lower, and is called the answer. The third part follows with the subject again in the principal key, but an octave higher or lower than the first part, and is answered by the fourth part in the same manner as the second part answers the first. After the subject is completed, the melody which follows it, so as to form a continuation of the part, is called the counterpoint, in the construction of which, facilities for ingenious double counterpoints of various kinds are afforded. When the subject and answer have been introduced in all the parts, the first section of the fugue is said to be completed; an intermediate harmony of a few bars then follows, sometimes in its form like part of the subject, and with a modulation into a nearly related key. The subject and answer are again brought forward, but following in a different order from the first section; while at the same time all the parts are continued, and in some of them the original counterpoint appears either simply or inverted, the subject and answer forming the predominating idea throughout the whole composition, and towards the end appearing in a variety of forms, intervals, and modifications. When the subject does not extend in compass beyond the half of an octave, the answer is invariably made in the other half; and to avoid modulation out of the key, the progression of a fifth is answered by a fourth.

A fugue consisting of one subject with a counterpoint throughout, is called a strict fugue, as in the following example by J. Sebastian Bach, in which the first progression of a fifth is answered by a fourth:

When a second subject is introduced in the middle of the composition, and afterwards worked up with the first subject, it is then called a fugue on two subjects, as in the following from Graun's *Tod Jesu*:

A double fugue begins at once with two subjects in different parts, both of which are strictly treated throughout as in the following from Mozart's *Requiem*:

2d Subject.

Christe ele-is-on, &c.

Ky-ri-e ele-is-on e-le-is-on

A free fugue is that in which the subject and counterpoint are not strictly treated throughout, but mixed up with intermediate harmonies and ideas not connected with the subject, while the rules of the fugue are not rigidly adhered to.

The fugue has always been, and will continue to be, esteemed by every sound musician, not from its being the most difficult style of composition, but from its not being subject to caprice and fashion. The fugues of Bach, Handel, and other composers possess the same interest for the present time as they have done for generations past. Although the fugue is held by many to be a mere mechanical study, which can be composed or written purely by rule and calculation, still, it undoubtedly holds out to a composer of genius a wide field for great and beautiful effects, as well as peculiar artistic combinations. The best works on the fugue are by Marpurg, Albrechtsberger, Kirnberger, and the late Professor S. W. Dehn of Berlin.

FUGITATION. A sentence of fugitation in Scotland corresponds to outlawry in a criminal process in England, and is pronounced where a person fails to appear to answer to a criminal prosecution against him. Amongst other consequences, it entails the escheat of his whole movable property to the crown. See **ESCHEAT**.

FUGITIVE SLAVE LAW. Slaves being regarded as property, things and not persons, as the Roman law puts it, the existence in every state in which slavery exists of a law recognizing the right of the master to reclaim his property follows as a logical consequence. Accordingly, the constitution of the United States of America having recognized slavery, or 'service,' as it was gently termed, by American writers, necessarily used to contain a number of enactments for its enforcement. By art. 4, s. 2 of that document, it was declared that persons held to service or labor in one state, under the laws thereof, and escaping into another, should be delivered up, on claim of the party to whom such service or labor might be due. In furtherance of this provision, the laws of New York provided for the arrest of such fugitives, on *habeas corpus*, founded on due proof, and for a certificate in favor of the right of the claimant, and delivery of the fugitive to him, to be removed. This obsolete law, as narrated in the latest edition of Kent, seems to have been to the following purport: The act of 1793, providing for the reclamation of fugitives from justice and from service, had, so far as relates to the latter, been amended, and to a considerable extent superseded, by the act of September 18, 1850. The judicial duties imposed by the latter act were to be performed by the United States commissioners, who might have the power of arresting or imprisoning for offences against the United States, by the judges of the circuit and district courts of the United States, and of the superior courts of territories, and by such special commissioners as the respective courts might appoint. It was the duty of all United States marshals to obey and execute all warrants and process of such judges and commissioners; and after the arrest of any fugitives, such officers were liable for an escape with or without their assent. When any fugitive escaped into another state or territory, the owner, or his duly authorized agent, might pursue and personally arrest said fugitive, or might demand a warrant and arrest from the officer having due authority. The fugitive was then to be taken before a commissioner or judge, whose duty it was to hear and determine the complaint in a summary manner. Should he have been satisfied of the validity of the claim and the identity of the slave, it was his duty to deliver to the claimant a certificate of the proceeding had, with authority to remove the fugitive to the place from which he fled. The testimony of the fugitive was not admissible. Any assistance rendered to a fugitive to enable him to escape from the claimant, or any obstruction offered to his arrest, was penal, and also subjected the party to damages at the suit of the owner. All citizens of the United States were required, when called upon, to render the officers personal assistance in the performance of their duties. These provisions applied to all the states previously to the war, whether slavery was recognized by their special laws or not; the principle being, that 'the constitu-

tion and laws of the United States secure the right to reclaim fugitive slaves against state legislation.'

In some of the slave-holding states it was held, that if a slave from such a state went lawfully into a non slave-holding state, and acquired a domicile there with his master, or was emancipated there, he became emancipated, and ceased to be a slave on his return; but if he were carried there for a temporary purpose, and returned, his state of slavery was resumed. These provisions did not apply to the fugitive slave (Kent, *ut sup.* ii. p. 297).

FUGLEMAN, (properly, *Fülgelman*, from the German *flügel*, a wing), an intelligent soldier posted in front of a line of men at drill, to give the time and an example of the motions in the manual and platoon exercises. He originally stood in front of the right wing, and hence the name.

FU-HU, or FU-HU-SHE, the first of the five emperors of China that flourished in the mythological period. He instructed the people in the art of rearing cattle, and invented the *pa-kua*, or eight combinations of four strokes, to express the changes of nature. His chief invention, however, was that of letters, by drawing up the two linear tables called Ho-too and Lo-shoo, which he copied from the back of a dragon rising from the deep. According to another account, knotted cords, 20 inches long, were used for writing, till Tsang-ke, the minister of F., conceived the idea of characters from seeing the footprints of birds on the sands. F. instituted marriage, invented the musical instrument called *kin*, and taught the art of fishing. It is clear that he personifies a condition of society. He had a head with projections like the horns of an ox, and the body of a dragon.—*San-tsze-king*, l. 21, 22; Kang-keen-e-che-luh, i. p. 6; Gutzlaff, *Sketch of Chinese History*, i. p. 119.

FU-HU-KEEN, or FU-KIAN (Happy Established, or The Consummation of Happiness), one of the eastern maritime provinces of China. It lies to the south of Che-keang, between the parallels of 23° 35' and 28° 47', and is backed by the great southern range of mountains that separates South-eastern China from the inland provinces. F. belongs to the hilly portion of China proper.

It is a black-tea district, and produces barley, wheat, rice, tobacco, yams, and other Chinese vegetables. The principal fruits are the orange, li-chee, olive, plum, pomello (a fruit of the subacid order, somewhat like an orange), plantain, and mulberry. On its coast are situated the ports of Fu-chow (q. v.) and Amoy, or Hia-mum (the gate or harbor of Hia), opened by the treaty of Nankin, 29th August 1842. See **CHINA**. The island of Formosa and the Pang-hoo group are included in this province. Area, 53,480 square miles; pop. 14,800,000.

FÜHNEN (Dan., *Fyen*), the largest of the Danish islands after Seeland, is bounded on the W. by the Little Belt, which separates it from Jutland and Slesvig; on the N. by the Odensee Fjord; on the E. by the Great Belt; and on the S. by the Little Belt, and by the small island of Langeland, which is incorporated with it in one circle, or *stift*, of the kingdom. The area of this stift is 1302 square miles; the population (1870) was 236,311. The coast is generally rugged, and much indented with bays or fjords; but the interior is flat, except towards the south and west, where there is a range of hills rising to about 500 feet. The land, which is well watered by several small streams, is fruitful and well cultivated, producing abundant crops of cereals. Barley, oats, buckwheat, rye, flax, and hemp are grown in larger quantities than are required for home consumption. Honey is also largely exported. The F. horses are in great request, and large numbers of these animals, and of a fine breed of horned cattle, are annually sent out of the island. The province of F. is divided into the two bailiwicks of Odensee and Svendborg. The principal towns are Odensee (q. v.), Svendborg (q. v.), and Nyborg—pop. (1870) 4812—a fortified town on the east coast, and the most direct port of communication with Seeland, and memorable as having been the seat of the annual Danehof, or meeting of the States, instituted in 1354 by Valdemar IV., and for the victory gained in 1659 by the Danes and their allies over the Swedes.

FULAHS [properly, *Fülbe* (sing. *Pullo*), called also *Féllani* (sing. *Baféllanelli*), *Felláta*, and *Fulán*], the name of a widely spread negro people in Upper Súdán, regarding whose origin there is much diversity of opinion. M. Eichwaldt (see *Journal de la Société Ethnologique*, 1841, vol. i. p. 2, et seq.) has endeavored to connect them with the Malays in the far East, but, according to Dr. Barth, 'none of his arguments are of any consequence.' Yet Dr. Barth himself is of opinion that 'their origin is to be sought for in the direction of the East; but this,' he adds, 'refers to an

age which for us is enveloped in impenetrable darkness.' The F. first emerge into the light of history about the beginning of the 14th c., when, as we learn from Ahmed Bárá's *History of Súdán*, two members of the tribe went on a religious mission from Melle, on the borders of Senegambia, to the king of Bórnu. The importance of this incident lies in the fact, that it shows that in the dawn of their history—as has invariably been the case in later times—the course of the tribe was from west to east, and also, that at the early period referred to, they were distinguished for that religious learning which still characterizes them. After the 14th c., successive swarms of F. appear to have left the kingdom of Melle, or the mountainous regions of Fuládu, and to have spread themselves over the greater portion of Súdán, absorbing and incorporating with themselves different and quite distinct national elements, which have given to their community a rather varying and undecided character. Hence originate the conflicting accounts of travelers, some of whom speak of F. as differing little from the negroes; others, as having their features and skulls cast in the European mould; while Bowen describes those of Yoruba as being some black, some almost white, and many of a mulatto color, varying from dark to very bright.

Many other tribes, which have not been quite absorbed by the F., are yet so far blended with them, that they have lost their native idiom altogether, and speak the language of the predominant race, which is termed the Fulfúlde. The F. are not all under one ruler; they are a *race*, not a *nation*; and have founded many kingdoms, such as those of Sókoto, Gando, Timbo, &c. The endless tribes belonging to their stock are generally divided into four groups or families, the Jel, the B'aa, the Só, and the Beri. Most of them became converted to Mohammedanism about the middle of the 18th c., and in 1802, under the Imám Othman, commenced a religious war on the surrounding pagans, which terminated prosperously in the establishment of the great Fulah empire of Sókoto. Othman died in a sort of fanatical ecstasy or madness in 1818. The F. are industrious and inclined to trade; they work iron and silver, manufacture with great neatness articles in wood and leather, and weave various durable fabrics. They are by far the most intelligent of the inhabitants of Súdán, and have, besides mosques, schools in almost all their towns.

FULCRUM, in Mechanics, is the prop or fixed point on which a lever moves. See LEVER.

FULDA, a town of Germany, in the Prussian province of Hesse-Nassau, 54 miles south of Cassel, is pleasantly situated on a rising-ground on the right bank of the Fulda, a considerable stream, which, rising from the western base of the Rhöngebirge, in Bavaria, flows northward through Hesse-Cassel, and unites with the Werra on the Hanoverian border, after a course of 110 miles. It is a pretty town, surrounded by old walls, and has a market-place, two squares, and eight suburbs. One of the chief buildings is the cathedral, the fourth church that has been built on this site. It is a handsome modern structure, and covers the shrine in which the body of St. Bonifacius was deposited after his murder by the Frisians in 754. The other notable structures are the palace, formerly the residence of the prince-bishops of F.; the church of St. Michael, founded in 822; a gymnasium, schools of art and manufactures, and a public library. F. has acquired a reputation for its linen manufactures; it has also extensive establishments for the manufacture of vinegar and beer; with dye-works, tanneries, and weaving. Pop. (1880) 11,507, mostly Roman Catholics. The district of which F. is the capital, forms part of what was formerly the grand-duchy of Fulda. This territory was incorporated with the grand-duchy of Frankfurt by Napoleon in 1810, and ceded to Prussia in 1815, but immediately afterwards was made over to Hesse-Cassel (q. v.).

FULGORA. See LANTERN-FLY.

FULGURITES (Lat., *fulgur*, lightning), tubes formed of vitrified sand, which are found in sand-banks, and in soils consisting chiefly of silicious sand, and are attributed to the action of lightning melting and vitrifying the sand. They were first discovered in 1711 by the pastor Herman, at Massel, in Silesia, and have since been found in many places; but their origin was first pointed out by Dr. Hentzen in 1805. They are from a quarter of an inch to two inches and a half in diameter, their internal surface of a perfectly glassy substance, hard enough to scratch glass, and to give fire with steel. They are usually, but not always, placed vertically in the sand, become narrower downwards, and sometimes divide and sub-divide into branches.—The effects of lightning seem to be exhibited also in some places on rocks by vitrification and the production of a sort of enamel, sometimes assuming the form of beads.

FULHAM, formerly a village, but now a suburb of London, in the south of Middlesex, on the left bank of the Thames, six miles south-west of St. Paul's. Here is the palace of the bishops of London.

FULICA. See COOT.

FULIGULA. See POCHARD.

FULLER, ANDREW, an eminent Baptist minister, and theological and controversial writer, the son of a small farmer, was born at Wicken, Cambridgeshire, February 6, 1754. He received the rudiments of his education at the free school of Soham, and in his youth was principally engaged in agricultural labors. In his 17th year, he became a member of a Baptist church at Soham, and in 1775 he was chosen pastor of a congregation at that place. His small stipend of £21 per annum he endeavored to increase by keeping, first a small shop, and then a school. In 1792, he removed to Kettering, Northamptonshire, to take the pastorate of a congregation there. On the formation, in 1792, of the Baptist Missionary Society by Dr. Carey, himself, and eleven other ministers, he was appointed its secretary, and the whole of his future life was devoted to the administration of its affairs. In 1794 he published a controversial treatise, entitled *The Calvinistic and Socinian Systems, examined and compared as to their Moral Tendency* (Lond. 8vo.). This work was attacked by Dr. Toulmin and Mr. Kentish, and F. replied in a pamphlet, entitled *Socinianism Indefensible* (Lond. 1797, 8vo.). His other principal publications are *The Gospel its own Witness* (Clipstone, 1797), and *Expository Discourse on the Book of Genesis* (2 vols. 8vo, Lond. 1806). He was also the author of a variety of single sermons and pamphlets. The sense, sagacity, and thoroughly practical knowledge of mankind which these writings display, have won for F. the title of 'the Franklin of Theology.' He died May 7, 1815. Three collected editions of his works have been published, besides American reprints; the first in 10 vols. 8vo, the second in 5, and the third in 1 royal 8vo. A volume of his treatises was republished in Bohn's Standard Library, with a Memoir by his son. F.'s *Memoir of the Rev. Samuel Pearce of Birmingham* is much esteemed as a religious biography.

FULLER, SARAH MARGARET, MARCHIONESS OSSOLI, one of the most remarkable women of the time, was born at Cambridge-Port, Massachusetts, May 23, 1810. Her father, Timothy Fuller, was an advocate, and gave his daughter an excellent education, and nurtured her with great care. At eight years of age she wrote Latin verses; and philosophy, history, and aesthetics were her favorite studies. At ten she read Tasso and Ariosto in the original, and subsequently made herself familiar with the German writers, Tieck, Schelling, and Novalis. After her father's death she assisted her family by private teaching, and in 1839 she founded a society for ladies, where she herself delivered lectures. From 1839 to 1844, she edited *The Dial*, to which she contributed many admirable articles. In compliance with an invitation she received from Horace Greeley, the editor of the *Tribune*, she proceeded to New York in 1844, and contributed to that journal a series of articles on literature and art, which have since appeared in a collected form under the title of *Papers on Literature and Art* (London, 1846). In 1850, she published *Women in the Nineteenth Century*, in which she very ably discusses the nature and destiny of women, and claims for the sex rights which have been long denied it. In 1846, she proceeded to England, where she made the acquaintance of Carlyle, for whom she had long entertained a high esteem. At Paris she gained the friendship of Madame Dudevant, better known by her pseudonym of *Georges Sand*. Proceeding next to Rome, she there came in contact with the Marquis d'Ossoli, to whom she was afterwards married in December 1847. She took an active share in the political questions that agitated those times. In 1849, during the siege of Rome, she took the charge of an hospital; and viewed with feelings of pain the downfall of the new and ephemeral Roman Republic. In 1850, she set out on her return journey to America, accompanied by her husband and newly-born infant; but just as they came within sight of New York, on the 16th of July, a hurricane burst upon the devoted ship which carried them, and the three perished in the waves. Her memoirs were published by Emerson and Channing under the title of *Memoirs of Margaret Fuller, Marchesa Ossoli* (London, 1852).

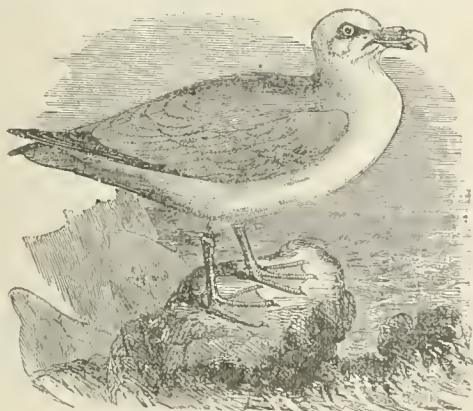
FULLER, THOMAS, D.D., an eminent English historian and divine, was born in 1608 at Aldwinkle, Northamptonshire, of which parish his father was rector. He was educated at Queen's College, Cambridge, and greatly distinguished himself by his application to study. He took the degree of A.B. in 1624, and that of A.M. in 1628. He stood so high in the estimation of his college that, before he was 23 years of age, he was appointed to St. Benets, Cambridge, and acquired great popularity as a preacher. Soon after, he was collated to a prebend in Salisbury Cathedral, and obtained a fellowship in Sidney Sussex College. His first publication was a poem, entitled *David's Heinous Sin, Hearty Repentance and Heavy Punishments* (1631, 8vo.). He was next presented to the rectory of Broad Windsor, Dorsetshire; published his *History of the Holy War at Cambridge* in 1639; and in 1640 removed to London, where he was chosen lecturer at the Savoy Church in the Strand.

The same year, he was a member of the Convocation at West-

minster, and one of the select committee appointed to draw up new canons for the better government of the church. During the civil war he adhered firmly to the royal cause; and shared in its reverses. In 1546, however, he was chosen lecturer, first, at St. Clement's Lane, Lombard Street, and afterwards at St. Bride's. About 1648, he was presented to the living of Waltham, in Essex. In 1650, he published a geographical account of the Holy Land, entitled *A Pisgah sight of Palestine and the Confines thereof* (folio, with maps and views), and *Abel Redivivus*, a collection of lives of modern divines. In 1655, he published at London *The Church History of Brittain from the Birth of Jesus Christ until the year 1648* (folio). In 1658, he received the living of Cranford, Middlesex, and at the Restoration he was reinstated in his prebend of Salisbury, of which he had been deprived by the Parliamentarians. He was also appointed chaplain extraordinary to the king, and created D.D. at Cambridge by royal mandamus. He died August 16, 1661. His principal work, *The Worthies of England*, was published at London in 1662 (folio). Valuable for the information it contains on provincial history, it abounds in biographical anecdote, witty remark, and acute observation on men and manners. A new edition with his life prefixed, appeared in 1810 (2 vols. 4to). His *Holy and Profane States* were republished in America in 1831. Quaint humor is one of F.'s peculiar characteristics; but his writings are no less remarkable for wisdom, imagination, and, when occasion demands, even for pathos. 'Next to Shakspeare,' says Coleridge, 'I am not certain whether Thomas Fuller, beyond all other writers, does not excite in me the sense and emulation of the marvelous. . . . He was incomparably the most sensible, the least prejudiced great man, in an age that boasted of a galaxy of great men.'

FULLER'S EARTH, a mineral consisting chiefly of silica, alumina, and water, with a little magnesia, lime, and peroxide of iron. The silica is about 50, the alumina 20, and the water 24 per cent. of the whole. It is regarded as essentially a hydrous bisilicate of alumina. It occurs in beds, associated with chalk, oolite, &c.; is usually of a greenish-brown or a slate-blue color, sometimes white; has an uneven earthy fracture, and a dull appearance; its specific gravity is from 1.8 to 2.2; it is soft enough to yield readily to the nail; is very greasy to the touch; scarcely adheres to the tongue; falls to pieces in water, but does not become plastic. It has a remarkable power of absorbing oil or grease; and was formerly very much used for fulling cloth (see **WOOLLEN MANUFACTURE**), for which purpose it was considered so valuable, that the exportation of it from England was prohibited under severe penalties; it is still used to a considerable extent. The annual consumption in England is said to have at one time exceeded 6000 tons. It is found at Nutfield, near Reigate, in Surrey, in cretaceous strata; where there are two distinct beds, the upper one of a greenish color, and 5 feet thick, resting on the other, which has a bluish tint, and is 11 feet thick. It is also found in Bedfordshire, Nottinghamshire, and Kent; and on the continent in Saxony, Bohemia, and near Aix-la-Chapelle. There is a considerable deposit of it at Bath, where the group of associated blue and yellow clays and marl has received the name of 'the Fuller's Earth Series.' It is also found at Maxton, in Scotland.

FULMAR, or **FULMAR PETREL** (*Procellaria* or *Fulmarus*), a genus of birds generally referred to the gull family (*Laridae*),



Northern Fulmar (*Procellaria glacialis*).

and containing some of the most strictly oceanic birds. See **PETREL**. The bill is not longer than the head—large, strong, and subcylindrical; the upper mandible suddenly hooked at the point; the lower mandible with the tip curved upwards; the tips of both mandibles appearing as separate pieces firmly joined to the straight part of the bill, which is marked by longitudinal grooves;

the nostrils enclosed in a tube open at the extremity, and extending along the ridge of the upper mandible. The tarsi are compressed; the hind-toe rudimentary, a mere claw. The tail is short, and slightly rounded; the wings are long.—The **COMMON** or **NORTHERN F.** (*P.* or *F. glacialis*) is a bird about the size of a duck, gray above, white beneath, the head and neck pure white, the tail white, the bill yellow; the young brownish gray. It inhabits the most northern seas, in which its numbers are prodigious; breeds on the rocky shores of the Farøe Islands, Iceland, Greenland, Spitzbergen, &c., on the grassy shelves of the precipices, making a slight nest or a mere excavation, in which it lays one egg. It is rarely to be seen on the southern coasts of Britain, but more frequently in Orkney and Shetland, where, however, it does not often breed, although it breeds in great numbers in St. Kilda and the adjacent islets of Borrera and Soa. It greatly frequents these isles, and is of importance to the inhabitants of St. Kilda, who esteem its eggs and flesh above those of any other bird, and seek them in the most perilous manner, descending by ropes from the summit of the precipices. The fulmars are also valued for their feathers, for their down, and for their oil, which is one of the principal products of St. Kilda, and is obtained from their stomachs. The old are said to feed the young with it; and when they are caught or assailed, generally lighten themselves by disgorging it. It is amber-colored, and has a peculiar and very disagreeable odor. Fulmars feed on all animal substances which come in their way, giving an evident preference to fat, and delighting in the blubber of whales. They pursue whales to prey on the cirrhopods which are attached to them, or imbedded in their skin. Multitudes of them gather around a dead whale, and they are so bold as to advance within a few yards of the men who are cutting it up. When food is abundant, they often glut themselves till they are unable to fly. They follow the greasy track of a whaler, and, indeed, some of them are always in attendance on ships immediately after they pass north of the Shetland Islands, ready to seize any garbage that may be thrown overboard. Sailors often amuse themselves in catching them by means of lines and hooks baited with fat.

Another species of *F.* (*P.* or *F. Pacifica*) exists in the Pacific Ocean, and the **MOTHER CAREY'S GOOSE** of sailors, a large bird of the southern seas, is sometimes referred to the same genus.

FULMINATE OF MERCURY, or **FULMINATING MERCURY** ($2\text{HgO}, \text{C}_4\text{N}_2\text{O}_2$), is best prepared by dissolving 3 parts of mercury in 36 of nitric acid of specific gravity 1.34, without the application of heat, in a flask capable of holding 18 times the bulk of the acid. The solution is then to be poured into a large vessel containing 17 parts of alcohol of specific gravity 0.830, and immediately to be re-transferred to the flask, which is still full of nitrous vapors, and with which it must be well shaken, in order to effect their absorption. Effervescence commences in a few minutes, and soon becomes extremely violent; and at the same time there is a deposit of metallic mercury, which is gradually re-dissolved. The reaction must be moderated by the gradual addition of 17 parts more of alcohol; and on cooling, crystals of the fulminate, amounting to 4.6 parts, are deposited. These must be washed with cold water, and dried at 100°F . Fulminate of mercury forms white silky needles. It may be handled without much danger when moist; but when dry, it explodes with violence when struck by a hard body, or when touched with nitric or strong sulphuric acid. A mixture of 1 part of this salt with 6 parts of nitre, or of 3 parts of the fulminate, 5 of chlorate of potash, 1 of sulphur, and 1 of ground glass, is employed as the priming of percussion-caps. It is applied as a dry powder, and is made to adhere to the cap by the application of a drop of shell-lac varnish.

FULMINATE OF SILVER, or **FULMINATING SILVER** ($2\text{AgO}, \text{C}_4\text{N}_2\text{O}_2$), is prepared in nearly the same manner as the fulminate of mercury. It is more powerfully explosive than the last-named salt. Even when moist or under water, pressure with a hard body will cause its explosion; and when quite dry, the slightest friction between two hard bodies produces a similar result.

The preparation of the fulminates is attended with very considerable danger, and should be attempted by none but professed chemists.

FULMINIC ACID has never been isolated in the hydrated form, but from the composition of its salts, its formula doubtless is $2\text{HO}, \text{C}_4\text{N}_2\text{O}_2$. It is thus isomeric with cyanic acid. Fulminic acid may be separated from the oxide of mercury and silver, and combined with other bases, such as potash; and all such compounds are more or less explosive.

FULTON, **ROBERT**, a celebrated American engineer, was born at Little Britain, Pennsylvania. His parents belonged to Ireland, whence they emigrated to America; and being in poor circumstances, all the education young F. acquired was the ability to read and write. He made good use, however, of what he had acquired, and passed in study the time allowed him for recrea-

tion. When he was old enough, his mother apprenticed him to a jeweler in Philadelphia. In addition to his labors at this trade, he devoted himself to painting; and the sale of his portraits and landscapes enabled him, in the space of four years, to purchase a small farm on which he placed his mother, his father being dead. At the age of 22 he proceeded to London, where he studied painting under West; but after several years spent thus, he felt that this was not his true vocation. Accordingly, abandoning painting, he applied himself wholly to mechanics. Some works he performed in Devonshire obtained him the patronage of the Duke of Bridgewater, and likewise that of the Earl of Stanhope.

In 1794, he obtained from the British government a patent for an inclined plane, the object of which was to set aside the use of locks; and in the same year, he invented a mill for sawing and polishing marble. His next invention was a machine for spinning flax, followed by one for making ropes. He was received as a civil engineer in 1795; and wrote a work on canals, in which he developed his system. Accepting an invitation from the United States minister at Paris, he proceeded to that city in 1793, and remained there for seven years, devoting himself to new projects and inventions. Amongst his inventions here was the *nautilus* or submarine boat, intended to be used in naval warfare, which he in vain sought the French government to accept; nor was he more successful with the British government, which he next tried, though commissions were appointed in both cases to test the value of his invention. Having failed in this matter, he next turned his attention to a subject that had frequently occupied his mind before, and about which he had written a treatise in 1793—viz., the application of steam to navigation. In 1803, he constructed a small steamboat, and his experiments with it on the Seine were attended with great success. Disgusted with the reception he met, he returned in 1806 to New York, and pursued his experiments there. He perfected his *Torpedo* (q. v.) system, which was afterwards employed effectively in the war between Britain and America. In 1807, he launched a steam-vessel upon the Hudson, which made a successful start, in the presence of thousands of astonished spectators. From this period, steamers (for the construction of which F. received a patent from the legislature) came into pretty general use upon the rivers of the United States. Although F. was not the first to apply steam to navigation, as a steam-vessel had been tried upon the Forth and Clyde Canal as early as 1789, yet he was the first to apply it with any degree of success (see STEAM-NAVIGATION). His reputation was now firmly established, and he was employed by the United States government in the execution of various projects with reference to canals and other works. In 1814, he obtained the assent of the legislature to construct a steam-frigate, which was launched in the following year. Though the labors of F. were attended with such great success, various lawsuits in which he was engaged in reference to the use of some of his patents, prevented him from ever becoming wealthy; and anxiety, as well as excessive application, tended to shorten his days. His death in 1815 produced extraordinary demonstrations of mourning throughout the United States. F. had married, in 1806, a niece of Robert Livingston, U. S. minister in France.

FUM, or, more properly, FUNG—the first being the Portuguese pronunciation of the word; the Chinese Phoenix—one of the four symbolical animals supposed to preside over the destinies of the Chinese empire. Its appearance indicates an age of universal virtue, the influence of which has extended throughout creation. It is supposed to originate from the element of fire, and to be born in the Tan-Henē, or Hill of the Fiery Halo of the Sun; to have the forepart of a goose, hind-quarters of a stag, neck of a snake, fish's tail, fowl's forehead, down of a duck, dragon's marks, the back of a tortoise, face of a swallow, and beak of a cock, with beak, claws, and feathers of various colors, red crest, and golden beak. It is about six cubits high, and comes from the East.

In mystical language, it is called the Leih-kwan, or 'mandarin of time,' and it is said to have a forehead like heaven, eyes like the sun, back like the moon, wings like the wind, feet like earth, and a tail like the planets. On its body are inscribed the five cardinal virtues. According to some authors, it only perches on the woo-tung tree, and eats the seeds of the bamboo; others describe it as swallowing small carp. Other accounts say it eats no living insect, and treads on no growing plant. Its voice is said to be like a flute, drum, or even thunder. When seen, it is followed by birds. According to Chinese history, it has occasionally appeared; and a celebrated female flute-player, named Lung-yn, is said to have enticed it from heaven with her music, and then fled away with it. Like the phoenix of the Egyptians and roe of the Arabs, the bird may have had a historical origin, subsequently disfigured by fiction. It is often represented on Chinese works of art, under the form of a gallinaceous bird, and is embroidered on the dresses of mandarins of a certain rank. It is mentioned by some modern English poets.—Kidd, *History of China*, p. 267; Ching-tsze-tung, 172 sect.; Yuen-keen-luy-han, 148 sect.

FU'MAGE, in the Law of England, was properly smoke-farthing, or a customary payment for every house that had a chimney or fire-hearth. This tax is mentioned in Domesday as paid by custom to the king for every chimney in the house. Edward the Black Prince is said to have imposed a tax of a florin for every hearth in his French dominions. The first statutory enactment on the subject in England is by 13 and 14 Car. II. c. 10, whereby a tax of 2s. on every hearth in all houses paying to church and poor was granted to the king for ever. This tax was abolished 1 William and Mary, st. 1. c. 10.

FUMARIA'CEÆ, a natural order of exogenous plants; herbaceous, with a watery juice; their leaves alternate, much divided; the calyx of two deciduous sepals; the corolla of four very irregular petals; the stamens sometimes four and distinct, more generally six and in two bundles; the ovary free, one-celled, one-seeded, or many-seeded; the seeds having large albumen. The F. are regarded as in their botanical characters approaching most nearly to the *Papaveraceæ* (Poppy, &c.); but their general aspect is very different, and they do not possess the same powerful properties. Both the foliage and flowers of some have considerable beauty. *Dielytra spectabilis* is a well-known favorite in gardens and green-houses. More than one hundred species are known, mostly natives of temperate climates in the northern hemisphere. Several species of *Fumaria* and *Corydalis* are natives of Britain. The COMMON FUMITORY (*Fumaria officinalis*) is a very frequent weed in gardens and cornfields, but of rather delicate and beautiful appearance. It is annual, and easy of extirpation, where it springs up in excessive abundance. It was formerly much employed in medicine, having a high reputation as a tonic and diaphoretic, and although disused in Britain, is still esteemed in France as a remedy in scorbutic affections, chronic eruptions, &c. Some of the other species of fumitory possess similar properties. The leaves have an intensely bitter saline taste.



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FUMA'RIC ACID, known also as Boletic Acid ($2\text{H}_2\text{O}, \text{C}_4\text{H}_2\text{O}_4$), is of frequent occurrence in the vegetable kingdom. It was first obtained by Braconnot from a species of boletus, and has since been found in many other fungi, in numerous lichens, in various species of *Fumaria*, in *Corydalis bulbosa*, &c.

Fumaric acid may also be obtained, in association with malæic acid, by heating Malic Acid (q. v.) to 350°F .

It crystallizes in prisms, which have a very acid taste, are only slightly soluble in water, but dissolve readily in alcohol and ether. At a temperature of 392°F , it volatilizes without fusing, and is converted into the malæic acid already mentioned, which possess the same composition as fumaric acid, but different properties. If malæic acid is exposed for a long time to a temperature of 266° , it again passes into fumaric acid, so that these acids are mutually convertible.

Kekulé has shown (*Annalen d. Chemie*, 1861) that both fumaric acid and malæic acid combine directly with bromine, and produce crystals of dibromo-succinic acid; and further, that if fumaric acid be dissolved in water, and digested with an amalgam of sodium, the nascent hydrogen from the decomposed water combines with the acid, and converts it into succinic acid. Its compounds are of no special interest.

FU'MIGATING PA'STILS are composed of various ingredients, which, by their smouldering combustion, evolve agreeable odors. The following recipe for their composition is given in the *Württemberg Pharmacopie*: Take of benzoin and dry balsam of Peru, each 16 parts; of yellow sandalwood, 4 parts; of labdanum, 1 part; of charcoal from lime-tree wood, 96 parts; of nitrate of potash, 2 parts; and of mucilage of tragacanth, enough to form the mixture into a paste, from which conical pastils are to be made by a small mould.

The 'Ribbon of Bruges' is also employed for aromatic fumigation in the same manner as pastils. It is prepared as follows: Dissolve two ounces of nitrate of potash in a pint of water; in this fluid, steep good undressed cotton-tape, and hang it up to dry. Prepare a tincture composed of spirit, half a pint; musk, half an ounce; otto of roses, one drachm; benzoin, four ounces; myrrh, half an ounce; orris-root, half a pound. When this tincture has stood for a month, steep the prepared tape in it. The

tape when dried is fit for use. Light it, blow out the flame; and as it smoulders, a fragrant vapor will rise into the air. For further information on this and allied subjects, see Piesse's *Art of Perfumery*.

FUMIGATION (Lat. *fumigatio*, from *fumus*, smoke), the cleansing or medicating of the air of an apartment by means of vapors, employed chiefly for the purpose of detaching infectious poisons from clothing, furniture, &c. See **CONTAGION**, **INFECTIO**. Most of the methods of fumigation formerly employed have little real value, and are to be looked on chiefly as grateful to the senses; as, for instance, the burning of frankincense, camphor, &c. The really active processes are noticed under the article **DISINFECTANTS**.

FUNARIA, a genus of Mosses, with terminal fruit-stalks, and oblique double peristome, both the inner and outer having sixteen teeth. A few species are found in Britain, one of which, *P. hygrometrica*, is an object of particular interest on account of the hygrometric properties of its fruit-stalk, which, if moistened in the lower part, twists several times round in one direction, and if moistened in the upper part twists several times round in the opposite direction. This is owing to a peculiar arrangement of the cellular tissue, which is spiral in one direction at the base of the stalk, then straight, then spiral in the opposite direction. The structure of the fruit-stalk has been closely examined and commented on by Dr. Lankester (*Annals of Nat. Hist.* vol. iv.). *P. hygrometrica* has very concave, ovate, entire, apiculate leaves. It is very common on old buildings and on dry barren soils; and is said to be almost always found where a wood-fire has been burning on the ground, as on the site of gipsies' encampments, &c.

FUNCHIA'L, the capital and the only town of the island of Madeira (q. v.), is situated on the south side of the island, and consists chiefly of one street, extending for about a mile along the shore, and of numerous streets and lanes at right angles with the main street, and leading up the hill which backs the town. Its roadstead is open, and its anchorage rocky and uneven. F. has a cathedral, numerous churches, and small convents, and is defended by four forts. From it all the produce of the island is exported. Pop. (1178) 20,606.

FUNCTIONS, a mathematical term. When two or more variables are combined with constants in an equation, and are such that a change of value of one implies a corresponding change of value of one or more of the others, then such variables are said to depend on, and to be functions of each other; and the expression of the mode of dependence is said to be a *function* of such variables. If such an expression involves but one variable, it is said to be a function of one variable; if two are involved, to be a function of two variables; and so on. Thus $\sin x$, e^{ax} , $\log. x$, $\sqrt{a^2 - x^2}$ are functions of one variable—viz. of x ; e^{ax+by} , $\tan(ax+by)$, xy , are functions of two variables, x and y ; so xyz , $x^2 + y^2 + z^2$ are functions of three variables, and so on. Functions are denoted by the symbols, F , f , ϕ , ψ , &c. Thus $F(x)$ means a function of one variable, x , combined with constants or not, as the case may be; $\psi(xyz)$ a function of three variables. These functional symbols are *general*, and their specific forms are the particular functions which arise from operations in algebra, trigonometry, &c.

Functions are implicit or explicit. When one variable is expressed in terms of others, it is said to be an explicit function of them; but when all the variables remain involved in one expression, the function is said to be implicit. Thus, $x^2 + y^2 - r^2 = 0$ is an implicit function of two variables, but $y = \sqrt{r^2 - x^2}$ is an explicit function of one variable. In explicit functions, the variable which is expressed in terms of the others is called the *dependent* variable, and the others the *independent* variables. Explicit functions are usually written in the form $z = f(xy)$; implicit in the form $u = F(xyz) = 0$. Functions, again, are algebraical or transcendental. Algebraical functions are those which involve the operations of addition, subtraction, &c., and of involution and evolution. Transcendental functions are those where the operations symbolized are such as e^x , $\log. x$, $\sin x$, &c.—i. e., exponential, logarithmic, or circular. Functions, also, are simple or compound according as they involve one or several operations. $y = \sin x$ is a simple function; but $y = \log. \sin x$ is compound. Further, functions are divided into continuous and the discontinuous, the circulating and the periodic. Continuous functions are such as are subject to the following conditions: 1. As the variable gradually changes, the function must gradually change; 2. The law symbolized by the functional character must not abruptly change. Circulating functions are those whose values lie within certain limits for all values of the variables. $y = \sin x$ is an example at once of a continuous and of a circulating function. A function is said to be periodic when it takes the form $f^n(x) = x$

signifying that if on x the operation f be performed n times, the resulting value will be x . Thus, $f(x) = \frac{1}{1-x}$ is a periodic function of the third order. For performing the operation indicated by f the second time on $\frac{1}{1-x}$ as the variable, we have $f^2(x) = \frac{1}{1 - \frac{1}{1-x}} = -\frac{1-x}{x}$; and the third time we have $f^3(x) = \frac{1}{1 - (-\frac{1-x}{x})} = x$. The functional calculus is a recent growth of

the transcendental analysis. The object of the Differential Calculus (q. v.) is generally to ascertain the changes in functions arising from the continuous and infinitesimal variation of their subject variables. The object of the new functional calculus is, speaking generally, to investigate the forms of functions and their growth, when they are subject to a continuous and infinitesimal change as to form. According to Mr. Price (treatise on the Infinitesimal Calculus), as the differential calculus investigates properties of continuous numbers, so does the new calculus the properties of continuous functions; and as there is an integral calculus of numbers, so there is an inverse calculus of functions. Of the new calculus, the Calculus of Variations (q. v.) may be considered the main branch. It includes, of course, the subject of functional equations. Functional equations are those in which it is required to determine from equations the forms of functions entering them; e. g., what is the function of x and y which satisfies the equation $f(x) \times f(y) = f(x+y)$? See article **CALCULUS OF FUNCTIONS** in the *Encyclopædia Metropolitana*.

FUND, FUNDING SYSTEM. Fund (Lat. *fundus*, ground, foundation) means a supply of money or a source whence money may be obtained. When we speak of 'the funds' in this country, we mean that great organization for buying and selling the right to become a public creditor, and receive a share of the interest of the national debt. See **DEBT, NATIONAL**. When money has in this country been borrowed for public purposes, and it has been found that it cannot be repaid as a temporary loan, the resolution to hold it as a perpetual loan at a certain interest has been called 'funding' it; and hence we read from time to time that certain obligations were converted from floating into funded debts.

FUND, SINKING, a plan pursued for a considerable period for the purpose of collecting money for the payment of the national debt of Great Britain. It was begun in 1716 by Sir Robert Walpole. Certain taxes which had previously been laid on for limited periods were then rendered perpetual, for the purpose of paying the interest of the funded debt. They produced more than enough for this purpose, and the surplus was laid aside, that it might accumulate into a fund for extinguishing the debt. It appeared to operate well, since, in 1728, after it had existed for twelve years, debt was wiped off to the extent of £6,648,000. It was not observed that, during the wiping off, new debt had been created to about the same extent, so that the nation was just in the position in which it would have been had it neither borrowed nor repaid. It is supposed that Sir Robert may have seen the fallacy of the sinking fund, since in 1732 he took half a million from it to meet the expenditure of the year, instead of raising a new loan. It was in 1786, however, that the system was established on a great scale by the younger Pitt, who, notwithstanding his great practical abilities, was entirely misled by the theories of Dr. Price in his work on Annuities. The system continued to be conducted on an enormous scale, until another student of economy and figures conclusively proved it to be useless; this was accomplished in 1813 by Dr. Hamilton, in his *Inquiry concerning the Rise and Progress, the Redemption and Present State, and the Management of the National Debt of Great Britain*. The fallacy which Dr. Hamilton showed to pervade a sinking fund may be best explained by a single example. Suppose that one requires to borrow £100, and lays by £5 a year as a fund to pay it up with. Accumulating at compound interest, this fund will pay back the loan in about fifteen years. The borrower will, however, gain no more by the process than if he paid the £5 a year to his creditor, for his debt would be diminishing to precisely the same extent as the fund to pay it off would be increasing.

Suppose that while requiring only £100, the borrower raises £200, and lends out one of them, accumulating the interest until the whole amounts to £200; the borrower will no doubt be receiving interest on £100, but he will be at the same time paying interest on £200; and he would repay his debt at the same cost and with more simplicity if, instead of borrowing the second hundred at 5 per cent., he paid over £5 a year to his creditor. In these instances, nothing is lost by the sinking fund. But suppose that in the last case the creditor had agreed to lend the £100 at 5 per cent., but in consideration of the greater risk, would not lend

the £200 at less than 6 per cent., while the borrower can only get 5 per cent. for the half which he relends—here the transaction would cause a dead loss of £2 a year over the plan of repaying by instalments. This was exactly the case with the British sinking fund. The more money the chancellor of the exchequer wanted, the higher were the terms demanded by the lenders, and the addition to each loan for setting aside a sinking fund increased the rate of interest paid on it.

FUNDAMENTAL BASS, in Music, is the root or fundamental note of the harmony. See HARMONY.

FUNDI, or **FUNDUNGI** (*Paspalum exile*), a kind of grain much cultivated in the west of Africa. It is allied to the millets, and still more nearly to some of the kinds of grain cultivated in India. See PASPALUM. It is wholesome and nutritious, and has been recommended to attention in Britain as a light and delicate food for invalids. The natives of Western Africa throw it into boiling water, pour off the water, and add palm-oil, butter, or milk. By Europeans and negroes in Sierra Leone, it is much used with stewed meat, and sometimes made into porridge with milk.

FUNDY BAY, an arm of the Atlantic, separates Nova Scotia from New Brunswick and the state of Maine. With an average breadth of 35 miles, it extends 180 miles in length from north-east to south-west. It forks, at its head, into two inlets, the northern called Chignecto Bay, and the southern, Minas Channel, which are divided by narrow necks of land from the Gulf of St. Lawrence. Along its north-west side, reckoning downwards, it receives the St. John, which is the principal river of New Brunswick, and the St. Croix, which, through its entire course, forms the international boundary. The navigation is rendered perilous by the peculiarity of the tides, which are said to rise and fall fully 70 feet.

FUNERAL EXPENSES, in Law. If limited to the degree and quality of the deceased, funeral expenses are a privileged debt, allowed before all other debts and charges, both in England (3 Inst. 202) and in Scotland (Stair, iv. 35, 3). If the parties primarily liable neglect the duty of giving decent burial to the dead, a stranger may do so, and claim reimbursement out of his effects before all others having right, whether heirs or executors; yet this was not clear until very recently in the law of England. There is no fixed sum allowed in English practice, but if one dies in debt, it is usual to restrict the funeral expenses to £10. As against legatees, more liberal sums are allowed. In Scotland, it is held (Buchanan v. Ferrier, 14th February 1822) that mourning for the widow and such of the children of the deceased as were present at the funeral is a valid charge; but the reverse is the case in England, it having been decided (Johnson v. Baker, 2 C. and P. 207) that the widow has no claim for mournings either against the executor or the creditors of her husband. All along there seems to have been rather greater liberality in this matter in Scotland than in England, where Lord Holt held that nothing was allowable against a creditor except for the coffin, ringing the bell, parson and clerk (1 Salk. 296).

FUNERAL RITES. The methods of disposing of the dead have been so various, and connected with so many ceremonial observances dictated by affection, religious conviction, or superstition, that a full consideration of the subject would occupy a volume. Under the article BURIAL will be found a description of the principal modes of interment, and the accompanying funeral rites of the ancients.

With the spread of Christianity came the decorous interring of the dead with religious ceremonials indicative of hopes of a blessed resurrection. From the moment of death until interment, the body is the object of solemn ceremonial in the Roman Catholic Church. At death, a crucifix is placed in the hand, or at the feet, and holy-water is sprinkled. The chief funeral rites are solemnized in the church, into which the coffin is borne and placed on a bier. Throughout France, the Netherlands, and continental Europe generally, the ordinary cortege of a funeral is a hearse with a bier, on which is the coffin, covered with a pall, followed by carriages all in black, with black horses. The same arrangement is pursued in England, but the hearse, sometimes over-decorated with dark plumes, is closed instead of being open. In the more common class of funerals, the coffin shrouded in a pall, is borne on spokes, or on the shoulders of bearers. All the attendants are in black. A certain etiquette as to pall-bearers (parties who hold ribbons attached to the pall) is observed; the relatives of the deceased taking their place nearest the head in the degree of consanguinity, and the same arrangement is maintained in lowering the coffin by cords into the grave. Only in exceptional cases are bodies put in leaden coffins and deposited in vaults; the common sense of the people now appreciating the propriety of allowing corpses to dissolve and mingle with the earth of the grave; and for this practice, the numerous new cemeteries offer facilities. Scottish Presbyterians, as in the case with some English dissenters, have

no funeral-service, unless we reckon as such a prayer, and occasionally the reading of a chapter of Scripture, by a clergyman before the body is borne from the house; but in other respects the Scottish ceremonial differs little from the English. Formerly, in the case of important personages, the hearse was preceded by a class of undertaker's men to clear the way, designated *saulies*, and gumpheon-men—these last bearing a pole shrouded at the top with black silk, called a gumpheon (*gonfalone*, a banner), being a relic of an ancient heraldic ceremonial; but this custom has nearly, if not altogether, disappeared. At Scotch funerals, the relatives, and in some cases the friends of the deceased, wear white cambric *weepers* at the wrists. Till within the present century, there was a practice of giving a series of expensive entertainments to guests at Scottish funerals, beginning with the *lykwake*, and ending with the *dredgy* (dirge); but all this is gone, or nearly so. The giving of costly entertainments was not, however, confined to Scotland, or to Ireland.

Taking its rise in ancient customs which were perpetuated by the Anglo-Saxons, the practice of consuming meat and drink in a species of gloomy festivity at funerals was common in England, and carried to an extravagant length at the decease of persons of distinction, on which occasion Doles (q. v.) were also given. It had even its counterpart in the usages of the ancients. The *nekrodeipnon*, or funeral-banquet, is mentioned by Lucian and Cicero. It was always celebrated in the house of the nearest relative of the deceased, and Demosthenes, the patriot orator of Greece, tells us in his Oration, *On the Crown*, that the relatives of those who were slain at Chaeroneia, were entertained by him in his own mansion, as if he were the nearest kinsman of the fallen heroes. The *nekrodeipnon* is often represented on funeral monuments. For some curious information respecting old funeral entertainments, we refer to Brand's *Popular Antiquities*, edited by Ellis. Without losing as regards decorum, funeral arrangements have been greatly cheapened in most large towns in England and Scotland by means of funeral-conducting establishments belonging to societies or private speculators.

FÜNFHAUS, **FÜNFHÄUSEL**, or **HA'NGENDENLISSEN**, a town of Austria, about two miles north from Vienna, of which it is a suburb. It has silk, satin, woollen, cotton, and red leather manufactures. Pop. (1880) 39,967.

FÜNFKIRCHEN ('Five Churches'; Hungarian, *Pees*), an important town of Hungary, capital of the county of Baranya, is situated on the southern slope of the Mecseg Mountains, near the Slavonian boundary, 105 miles south-south-west of Pesth. It is the seat of a bishop, and is one of the oldest, as well as one of the most pleasantly situated and beautiful towns of Hungary. It formerly possessed a university. The most important of its buildings are the large and imposing cathedral, the bishop's palace, an Italian structure, the town-house, lyceum, gymnasium, seminary, and the churches, which are numerous and beautiful. It has important tanneries, woollen and flannel weaving and silk-spinning; produces wine, fruit, and tobacco, has coal-mines and iron-works, and a flourishing trade in hogs and gall-nuts. Pop. (1880) 28,702.

FUNGI, an order of acotyledonous or cryptogamous plants, containing a very great number of species, nearly 5000 being known, whilst it is probable that the whole number existing is very much greater. They are amongst the lowest forms of vegetable life, and some naturalists of no mean reputation have entertained the notion that they spring into existence in certain circumstances, not from germs previously existing, but from a mucus capable of organization, or through changes in the cells of more highly organized plants, and of animals in states of disease or of decay; an opinion which, however, is more generally rejected as having no foundation in accurate observation, as not necessary to explain the readiness with which certain fungi almost invariably spring up in certain circumstances—from which is derived the chief argument in its favor, as opposed to all analogy of ascertained facts, and as rendered improbable by the abundant provision which all the fungi possess for the perpetuation and diffusion of the species.

Fungi are cellular plants, the cells sometimes elongated so as to become filaments. They consist of a *thallus*, which spreads in a matrix, and is nourished by it, and from which stems are thrown up into the air, bearing the fructification. The organs connected with fructification are often the principal part of fungi, and the thallus very small, consisting of a few cottony threads, or closely compacted cells, or even altogether undiscernible. Not unfrequently, however, the proportion of the thallus is comparatively great, and in circumstances unfavorable to the development of the organs of fructification, it extends itself greatly in the matrix, as in the case of Dry Rot, Ergot, &c. (q. v.) and even of the common mushroom. The thallus of fungi is called *mycelium* (Gr., *mykes*, a mushroom), and in mushrooms and some other kinds is further popularly known as the *spawen*. Fungi are nearly related to algæ and to lichens, but differ from both in deriving their nourishment

from the earth or from the bodies upon which they grow, not from the medium by which they are surrounded. They differ also from lichens in their generally much softer substance and their fugacious character; also in being quite destitute of green granules (*gonidia*) in the thallus, which are characteristic of that order. They differ from algae in not living immersed in water or other liquid, but producing their fructification in air. The lowest forms of fungi, and the lowest forms of algae, are sometimes, however, not easily distinguished; and the mycelium of some fungi is capable of spreading in a liquid, and assuming a modified appearance extremely resembling that of some algae. It is supposed to be the presence of the *mycelium* of certain fungi which makes liquors 'mothy'; and to a similar cause is ascribed the ropiness of the dough in some bakehouses, an evil not easily cured.—From other plants in general, fungi differ in their chemical composition, which is remarkably nitrogenous, and assimilates them to animal organisms; whilst unlike other plants, they do not absorb carbonic acid from the air, and give out oxygen, but, like animals, absorb oxygen, and give out carbonic acid; so that some naturalists have proposed to constitute for them a distinct kingdom of nature intermediate between the animal and the vegetable.

Fungi are very various in size, many being scarcely visible without a microscope, whilst others are some feet in diameter. Even the same species, however, often exhibits great variety, not only in size, but in other particulars, according to the different circumstances of its growth, causing great difficulty to the botanist, whilst further difficulty arises from the modifications of imperfectly developed mycelium, of which many spurious genera have been constituted. A great resemblance in general appearance to fungi is sometimes exhibited by diseased portions of leaves, &c., and by the secretions caused by the attacks of insects.

When the spore (seed) of a fungus germinates, it sends out radiating filaments, which generally branch and interlace, and portions of this mycelium removed to another favorable situation, grow there, so that fungi are propagated by this means as higher plants are propagated by their tubers or by the division of their roots.

The fungi of simplest structure or lowest organization consist of nothing more, when they have reached their fullest development, than masses of spheroidal cells, spores, breaking up into a fine powder, as in some of the small parasitic species which are very injurious to corn. Sometimes these cells are united into jointed threads. In species of rather higher organization, the plant consists of jointed threads, but the spores are formed in the enlarged terminal joints, and are dispersed by their bursting. In the higher kinds, the spores are produced in or on peculiar organs of extremely various shape and character. In some, as puff-balls, the whole interior of the plant is filled with the fructification. In agarics, boleti, morels, &c., the fructification takes place on a particular membrane, a part of the external surface of the plant, called the *hymenium*, variously situated (in agarics on the under side of the *pileus* or cap), the extent of which is often greatly increased by wrinkles, plates or *gills*, pits, pores, &c. These form the highest division of fungi, called *Hymenomycetes*, in the system of Fries, the greatest continental authority in mycology, as this department of botany is sometimes termed. Berkeley, who, without any near rival, occupies the first place among the mycologists of Britain, divides fungi into two 'classes'; the first class not having the spores enclosed in tubular sacs (*asci*) or vesicles, and containing the 'orders' *Hymenomycetes* (agarics, boleti, &c.), *Gasteromycetes* (puff-balls, &c.), *Coniomycetes* (rust, smut, &c.), *Hyphomycetes* (mould, mildew, *botrytis*, *oidium*, &c.); the second class containing two orders, *Ascomycetes* (morels, truffles, &c.), in which the spores are definitely arranged in *asci*, and *Phycomycetes* (some kinds of mould, plants which grow on fermenting substances, and some of the minute pests of cultivated plants) in which the spores are in vesicles without definite arrangement.

Fungi generally grow in damp situations, but there are many which occur chiefly on dry soils or on dry substances; and some appear in their greatest perfection in the finest summer weather, although many are most abundant in the colder and moister seasons of the year. It has been commonly asserted that they abound more in the colder parts of the world than within the tropics, but it is not improbable that this opinion has its origin merely in imperfect observation of tropical species. The extreme rapidity of their growth, the briefness of their whole existence, the readiness with which they pass into decomposition, and the difficulty of preserving most of them in a form fit for examination, have been great obstacles to their scientific study. It is known, however, that some species are of very wide geographic distribution, whilst others are comparatively very limited. Some species grow in earth, others in various kinds of putrescent or fermenting animal or vegetable matter, many in decaying parts of trees or on dead wood, others on diseased animal and vegetable tissues, &c. It appears to be the office of many of them to hasten the decomposition of animal, and more particularly of vegetable

substances. Some of the minute kinds appear to be the cause of disease in the higher kinds of plants which they attack, and are formidable to the farmer and the gardener. Some are in like manner destructive to animal life, as in the case of the Muscardine (q. v.) or Silk-worm Rot, and certain species of *Spharia* which grow from living caterpillars. See *ENTOPHYTES*.

Some fungi are remarkably phosphorescent. Thus the undeveloped mycelium of some kind produces a very beautiful luminosity in some German coal-mines; and a species of agaric (*Agaricus Gardneri*), growing on palms in Brazil, shines brightly in the night. *Agaricus olearius*, a native of the south of Europe, is also luminous.

The chemical examination of fungi yields in large quantity a substance called *Fungine*, which, however, is now regarded as consisting of cellulose and fatty matter, several other nitrogenous substances, an acid called *Fungic Acid*, a kind of sugar, &c. The poisonous properties of some are ascribed to an alkaloid called *Amanitine*. Others appear to owe their poisonous character to an acrid volatile substance. Many of the smaller fungi are important because of the injury which they cause to crops, timber, &c. A few species are used in medicine, of which the only one really important is Ergot of Rye. One or two are used as tinder (see *AMADOU*), Moxa (q. v.), &c. The smoke produced by burning the dust (spores) of ripened puff-balls has anæsthetic properties, and is used for stupifying bees. *Polyporus squamosus* cut into slices makes the best of razor-strops. But the chief economical use of fungi is for food, and in the manufacture of the sauce called Ketchup (q. v.).

Edible Fungi.—Many fungi of the sub-orders *Hymenomycetes*, *Gasteromycetes*, and *Ascomycetes* are edible; and some of them are much esteemed as delicacies, whilst in many countries they constitute an important part of the food of the people. In Britain, very few are used, many of those species which are most esteemed on the continent of Europe being utterly disregarded, and indeed classed in popular estimation with toad-stools as poisonous. The truth appears to be, not that the greater number are poisonous, and only a few edible, but that the noxious species are comparatively few, the principal danger arising from the similarity of some of the poisonous and some of the edible agarics, and from the liability of some of the edible species to acquire poisonous properties in particular situations and circumstances. This is notably the case with the common mushroom (*Agaricus campestris*), which is far more generally used in Britain than any other edible fungus, but of which some varieties are unsafe, apparently in consequence of the circumstances of their growth. From the markets of Rome, and other cities of Italy, where numerous species of fungi are extensively sold, this species is rigorously excluded. So important an article of food are fungi in Italy, that in the market of Rome alone they are supposed to be sold to the value of about £4000 a year. For weeks, both in spring and in autumn, fungi form the principal and almost the sole food of multitudes of the poor in Italy, Germany, and France, and besides those which are eaten fresh, great quantities are used dried or preserved in oil, vinegar, or brine. The soaking of fungi in vinegar or brine takes away the acrid qualities of some which are dangerous when fresh, and renders them perfectly safe. So valuable are fungi esteemed, that some species are frequently cultivated.

The cultivation of the Common Mushroom (q. v.) is familiar to us in Britain, but other species of *Agaricus*, *Boletus*, &c., are plentifully raised in some parts of the continent of Europe, by watering the ground in places appropriate for them with water in which mature plants abounding in spores have been bruised; others are obtained by merely placing in favorable circumstances substances in which their spores are already contained. Thus, a species of *Polyporus*, much esteemed, is procured in Italy by moistening a porous stone (Ital., *Pietra funghia*) over which a little earth has been scattered; another species of *Polyporus* by slightly charring and then watering blocks of the wood of the common hazel; a species of *Agaricus*, by cutting off and then watering the heads of black poplar trees; and another *Agaricus*, by placing the grounds of coffee in circumstances favorable for its growth.

It is a common notion, but utterly destitute of foundation, that dangerous fungi may be distinguished from those which it is safe to eat by their discoloring a silver spoon if they are stirred with it whilst they are being cooked. Nor is greater dependence to be placed on the rule that the more readily deliquescent fungi are poisonous; nor on peculiarities of color of the flesh or juice, except in so far as these characters may avail for the discrimination of particular species, the qualities of which are known. The edible fungi have generally an agreeable smell and taste, whilst some of the poisonous kinds are offensive both to the nostrils and the palate, but no trustworthy general rule can be laid down on these points; and some of those which are very pungent and acrid when raw, become bland and wholesome when cooked, their acridity being dissipated by heat.

Among the most important edible fungi are:

Hymenomycetes.—The Common Mushroom, Champignon, and numerous other agarics and fungi closely allied to true agarics, as species of *Cortinaria*, *Cantharellus*, &c. These will be noticed in the article MUSHROOM.



Clavaria Botrytis.

divides into numerous small branches. It is said that all the species of this genus are esculent, although some are very superior to the rest in flavor and delicacy. One species (*C. flava*) is popularly known in Germany as *Ziegenbart* or Goat's-beard. They grow on the ground in woods and pastures.

Gasteromycetes.—Different kinds of Puff-ball (q. v.), in a young state, and whilst still fleshy throughout.

Ascomycetes.—Different species of Morel (q. v.), *Helvella* (q. v.), *Verpa*, *Peziza*, &c. The Common Truffle (q. v.), and allied species. *Cyttaria Darwinii*, which grows on living branches of South American beeches, and forms a principal part of the food of the natives of Tierra del Fuego during some months of the year.

It is a curious fact that the poisonous properties of mushrooms vary with climate, and probably with the season of the year at which they are gathered. Another circumstance deserving of notice is, that by idiosyncrasy some individuals are liable to be seriously affected even by those species which are usually regarded as innocent. Some species which are poisonous in this country, are used freely by the Russians; it appears they are in the habit of salting, boiling, and compressing them before they are eaten; and this may in some instances suffice to account for their having no noxious effects.

Symptoms and Effects.—The noxious species of mushrooms act sometimes as narcotics, at others as irritants. It would appear from the reports of several cases, that when the narcotic symptoms are excited, they come on soon after the meal at which the mushrooms have been eaten, and that they are chiefly manifested by giddiness, dimness of sight, and debility. The person appears as if intoxicated, and there are singular illusions of sense. Spasms and convulsions have been occasionally witnessed among the symptoms when the case has proved fatal. In some instances, the symptoms of poisoning have not commenced until thirty hours after the meal; and in these, narcotism followed the symptoms of irritation. It might be supposed that these variable effects were due to different properties in the mushrooms, but the same fungi have acted on members of the same family, in one case like irritants, and in another like narcotics. In most cases, recovery takes place, especially if vomiting be early induced. In the few instances which have proved fatal, there has been greater or less inflammation in the stomach and bowels, with congestion of the vessels of the brain.

Treatment.—The free use of emetics and castor oil.—Taylor *On Poisons*.

See Dr. Badham's *Treatise on the Esculent Funguses of Great Britain*; and *Fungi*, by M. C. Cooke, edited by Rev. M. J. Berkeley (1875).

FUNGIBLES. In the law of Rome, the contract of loan was divided into *mutuum* and *commodatum*, a division which has been adopted by the law of Scotland, and by most of the continental systems which are founded on the civil law. The former had reference to objects which admitted of being estimated by weight, measure, or number, or which could not be used without being given away or consumed. These objects, consisting of money, corn, wine, oil, and the like, could be used only by him who possessed the full right of ownership, and consequently the contract of *mutuum* transferred the ownership to the borrower, who became bound to return, not the object borrowed, but its equivalent. Objects of this nature, from the fact that they were got rid of one for another (*fungantur*), were called fungibles. The other class of movable objects, again, to which the Roman contract of *commodatum*, or hire, properly so called, applied, were transferred to the borrower on condition that he should return the same individual objects to the lender.

FUNGUS (Lat. a mushroom) is a term applied in pathology and surgery with several significations. Thus, any excrescence from a surface of skin, or mucous membrane, or even from deeper parts, is sometimes called a fungus, more especially if it have a soft mushroom-like character, and a broad short pedicle. When the pedicle is long and narrow, it is called *Polypus* (q. v.). The

growths to which the term fungus is chiefly applied are those which have the characters of Cancer (q. v.); especially *fungus hæmatodes*, a very dangerous variety. But fungus has yet another application in pathology, to those minute incrustations and alterations of the skin which are dependent upon the growth of vegetable parasites, as Favus, Ringworm (q. v.), &c.

FUNNEL (Lat. *funo*, to pour), in steam-vessels, is the iron tube designed to convey away above the deck the smoke and gases set at liberty during the combustion of fuel in the boiler-flues, and also, from its height, to afford a sufficient draught to the furnaces. In large ships, the funnel is of great size; and in men-of-war, usually telescopic, so that, by simple mechanism, it may be withdrawn during an action from the chance of injury by cannon-shot.

FUNNEL, a conical vessel terminating in a tube, and used for pouring liquids into narrow-mouthed vessels, and in laboratories for filtering. See **FILTER**. For common purposes, they are made of tin-plate or copper, but when for corrosive liquids, they are made of glass or earthenware. In some parts of Great Britain, as in the midland counties of England, a funnel is called a 'tundish;' in other parts, a 'filler.'

FUR is the term applied to the incrustation which is formed in the interior of vessels (tea-kettles, boilers of steam-engines, &c.) when calcareous water has been for a considerable time boiled in them. Many spring waters contain carbonate of lime held in solution by carbonic acid. When this water is boiled, the acid is expelled, and the carbonate is deposited, often in association with a little sulphate, forming a lining more or less coherent upon the sides of the vessel. In steam-boilers, this may be prevented by the addition of a small quantity of sal-ammoniac (hydrochlorate of ammonia) to the water; double decomposition takes place, carbonate of ammonia being formed and volatilized, while chloride of calcium remains in solution.

FUR AND FURRIERY. The skins of animals, having hair or fur as a coating, have been used in Europe as an article of clothing for many centuries. Since European countries, however, have become more and more cleared and inhabited, fur-bearing animals have nearly disappeared; and the supply is now chiefly obtained from other regions, especially North America.

All the chief fur-bearing animals will be found described under their proper headings: we shall do little more here than barely enumerate them. *Ermine* fur is of a pure white, except the tip of the tail, which is black. The spotted appearance of this fur is not natural; it is produced by sewing the black tail-tips on the white fur at certain spots. *Stoat* fur is a kind of inferior ermine. *Sable* fur, obtained chiefly from Northern Russia and Siberia, is valued in proportion to the darkness of its color.

Marten fur, especially that of a rich dark-brown olive color, is much sought for. *Fiery-fox* fur, brought chiefly from the north-eastern part of Asia, is admired both for its brilliant fiery color and for its fineness. *Red-fox* fur, differing in some particulars from the kind just named, is much sought after by the Chinese for trimmings, linings, and robes. *Silver-fox* fur has a peculiar lustrous silver-gray color. *Nutria* fur, belonging to the animal called the *coypou*, is brought largely from South America, chiefly as a cheap substitute for beaver. *Sea-otter* fur has been known in Europe about a century and a half, being obtained from the otters which frequent the seas washing the Asiatic shores of the Russian dominions; it varies from a beautiful brown to jet-black, and is very fine, soft, and glossy. *Seal* fur is obtained from the seals frequenting various coasts, chiefly in the Southern Ocean. *Beaver* fur was once much in request for the manufacture of hats; but the growing scarcity of the animal, and the substitution of silk hats for beaver hats, has lessened its importance. The fur of various other animals is similarly valued, either for its warmth or its beauty; such as that of the bear, racoon, badger, mink, lynx, musquash or musk-rat, rabbit, hare, squirrel, and chinchilla.

For manufacturing purposes, furs are classified into *felted* and *dressed*. Felted furs, such as beaver, nutria, hare, and rabbit, are used for hats and other felted fabrics, in which the hairs or filaments are made so as to interlace or entangle as to form a very strong and close plexus. The quality of the fur is better when the skin is taken from the animal in winter than in any other season, giving rise to the distinction between 'seasoned' and 'unseasoned' skins. The removal of the fur from the pelt is a necessary preliminary to the preparation of fur for felting purposes. In many kinds of skin, such as that of the hare, the fur is of two kinds—a close short layer of felting fur next the pelt, and longer outer hairs of unfelting fur. The removal of these two is affected separately. The long hairs are cut off by a kind of shears; and the true fur is then removed by the action of a knife, bearing some resemblance to a cheese-cutter, requiring much care in its management. In some sorts of skin, the long hairs are removed by pulling instead of shearing; in others, the greasiness of the pelt renders necessary a cleansing process before the shearing can be conducted, with the aid of soap and boiling water; and

In others, both pelt and fur are so full of grease as to require many repetitions of cleansing. For beaver skins, a machine of very beautiful construction is employed in cutting the fur from the pelt. When the coarse hairs have been removed to form a stuffing for cushions, the skin is placed in a machine containing a broad keen blade equal in length to the width of the skin. This blade has a peculiar reciprocating movement given to it, producing a kind of chopping effect on any substance to which it is applied, by coming nearly in contact with another blade placed parallel with it. The skin is guided between rollers into the space between the two blades; and then the action of the upper blade crops off the fur from the pelt in a very complete manner—every particle being removed, and yet the pelt is not cut. The fur falls upon an endless apron, which carries it to a chest, or trunk, containing a blowing-machine; this machine separates the fur into three or four qualities, by blowing to the furthest distance the lightest and most valuable filaments, leaving the heavier and coarser to be deposited sooner.

Furs have their felting property sometimes increased by the process of *carroting*, in which the action of heat is combined with that of sulphuric acid. The chief employment of felted furs is described under HAT MANUFACTURE.

Dressed furs are those to which the art of the *furrier* is applied for making muffs, coats, and fur-trimmings to garments. The fur is not separated from the pelt for these purposes; the two are used together; and the pelt is converted into a kind of leather to fit it for being so employed. The fur-hunters always exercise great care in drying the skins after removing them from the animals, seeing that any putrefactive action would ruin the fur. When brought to England, the skins undergo certain cleansing processes. They are steeped and scoured in a bath of bran, alum, and salt, to remove greasiness from the pelt; and then in a bath of soap and soda, to remove oiliness from the fur. When thoroughly washed and dried, it is found that the pelt, by the action of the alum, has been converted into a kind of *tanned* or kid leather.

When the skins are cleansed and dried, they are made up into garments and trimmings by sewing through the pelt. The skins, however, are very irregular in shape, and often differ much in color in different parts; they require to be cut up into pieces, matched according to tint, and sewn together edge to edge. This requires much skill, especially where the furs are of a valuable sort. A fur garment or trimming, appearing to the eye as if it were one uniform piece, is thus generally made up of many variously shaped pieces. The shaping for use, and the lining with silk and other materials, call for no description.—The great source of furs is the Hudson's Bay Territory (q. v.).

FURFURAMIDE, FURFURINE, AND FURFUROL. When starch, sugar, or bran is acted upon by dilute sulphuric acid and peroxide of manganese, the distillate contains not only Formic Acid (q. v.), but a small quantity of an essential oil, which, after being purified by redistillation, is colorless, has a fragrant odor somewhat resembling that of bitter almonds, and when dissolved in cold sulphuric acid, forms a beautiful purple liquid. This oil is termed Furfural, and its composition is represented by the formula $C_{10}H_8O_4$.

If furfural be treated with ammonia, it is converted into Furfuramide ($C_{10}H_{12}N_2O_4$), which occurs in colorless crystals, insoluble in water, but soluble in alcohol, and perfectly neutral.

If furfuranide is boiled with a solution of potash, it dissolves, its elements assume a new arrangement, and the solution on cooling deposits long silky needles of a powerfully alkaline base, Furfurine, which is isomeric with furfuranide. It is dissolved by dilute acids, and completely neutralizes them; and on adding ammonia to these solutions, the alkaloid is precipitated unchanged. It was discovered by the late Professor Fownes; and as the first vegeto-alkali artificially formed, its production was regarded as a great step in organic chemistry.

FURIDPU'R, a town of Bengal Proper, capital of a district of the same name, stands on the right bank of the Ganges, here called the Podda, in lat. $23^{\circ} 36'$ N., and long. $89^{\circ} 50'$ E. It is 115 miles to the north-east of Calcutta. Excepting the public establishments, which it possesses as the capital of the district of its own name, the place is mainly a scattered series of native villages; and, in fact, it claims notice chiefly as having at one time been a nest of river-pirates. Pop. (1872) 8593.

FURIDPU'R, or **DACCA JELALPUR**, the district mentioned in the preceding article, stretches in N. lat. between $23^{\circ} 3'$ and $24^{\circ} 5'$, and in E. long. between $89^{\circ} 30'$ and $90^{\circ} 15'$, containing 1496 sq. m., and (1872) 1,012,589 inhabitants. It is everywhere intersected by branches or feeders of the Ganges, which, as the surface barely rises above the level of the sea, are all, unless in the dry season, good for navigation. The soil is in general rich.

FURIES. See **EUMENIDES**.

FURLONG (the length of a furrow), a measure of length, the eighth part of a mile or 220 yards. See **YARD**.

FURLOUGH, a military term signifying leave of absence. Non-commissioned officers and private soldiers on furlough must be provided with a pass, or they are liable to be seized and dealt with as deserters.

FURNACES of various kinds (regenerator, reverberatory, Siemens's, &c.) are discussed in the articles **IRON**, **GLASS**, **LEAD**, &c.

FURNEAUX, the name of an English navigator, who was second in command on Cook's second voyage, is used of a group of islands in Bass's Strait, between Australia and Tasmania. Flinders Island, the principal one, is 46 miles long by 10 broad.

FURNES, a small town of Belgium, in West Flanders, lies 27 miles W.S.W. of Bruges, where four important lines of canal meet. The town-house is a fine Gothic structure. F. trades in linen, cattle, hops, and cheese. Pop. (1870) 4500.

FURNESS, a district in N.W. of Lancashire, forming a peninsula between Morecambe Bay and the Irish Sea. The chief town is Barrow-in-F. The ruin of F. ABBEY is situated in a beautiful glen two miles from Barrow, and is one of the finest examples of the transition Norman and Early English architecture in the country. Founded in 1127 for the Benedictines, it afterwards became a Cistercian house. It was long one of the wealthiest abbeys in the kingdom. The civil jurisdiction of the princely abbots of F. extended beyond the limits of the district of Furness.

FURNITURE, the name of an organ-stop or register, consisting of two or more ranks of pipes to each note, all of a higher pitch than the 15th stop.

FURNITURE, HOUSEHOLD, HIRING OF. If a man lets out furniture for immediate use, there is an implied warranty that it is fit for use, and free from all defects inconsistent with the reasonable and beneficial enjoyment of it. *Sutton v. Temple*, 12; *Meason and Welsby*, 60. The hirer must use the furniture for a proper purpose. If it is applied to a purpose inconsistent with the terms of the contract, or if it is sold by the hirer, the owner is entitled to maintain an action for its value. These general rules may be regarded as prevailing both in England and Scotland. In case of wilful injury done to furniture by a tenant within the metropolitan police district, it is provided by 2 and 3 Vict. c. 71, s. 38, that the police magistrate may award compensation to the amount of £15. In England as well as Scotland, the use of furniture for life is often made the subject of a bequest; and in this case, allowance will be made for ordinary wear and tear in the use of the furniture.

Lien on Furniture for Rent.—As a general rule, all furniture found on the premises, whether the property of the tenant or of a third party, may be distrained for rent, on the principle that the landlord has a lien over it in respect of the place in which it is found, and not in respect of the person to whom it belongs. To this rule there are some exceptions in favor of trade, as of tools in actual use, &c. In Scotland, the landlord has a similar right over the furniture in a house, so that hired furniture may be seized; but furniture lent without payment of rent does not fall under this Hypothec (q. v.). Even where furniture has been sold, the landlord has a claim over it while it remains on the premises.

FURRUCKABAD (Happy Residence), a city of the Doab (q. v.), stands near the right bank of the Ganges, in lat. $27^{\circ} 24'$ N., and long. $79^{\circ} 40'$ E. It is a handsome, clean, and healthy place, 570 feet above the level of the sea, with a considerable trade, and a population of (1871) 79,204. Independently of its position on the grand artery of the country, F. is within 20 miles of the great route between Calcutta and Delhi. Here Lord Lake defeated the troops of Holkar in 1805.

FURRUCKABAD, the district of which the city of the same name is the capital, in the N.-W. Provinces, stretches in N. lat. between $26^{\circ} 46'$ and $27^{\circ} 43'$, and in E. long. between $78^{\circ} 57'$ and $80^{\circ} 2'$. With a population of (1871) 918,784, it contains only 1702 sq. m., scarcely one-twelfth of the area being beyond the limits of the Doab. The commercial crops are principally cotton, tobacco, and indigo.

FURS, in Heraldry. Shields being often covered with the skins of wild animals, on which the fur was left, there came to be certain kinds of fur which were used in coat-armor, as well as in trimming and lining the robes of knights and nobles, and the mantles which were represented as surrounding their shields. The principal heraldic furs are—1. Ermine of which the field is white, and the spots black; 2. Ermines of which the field is black, and the spots white; 3. Erminois which has the field gold, with black spots; 4. Vair, which consisted of pieces of the shape of little glass pots (Fr. *verres*, of which the word is a corrupt spelling). It is said that the furriers used such glasses to whiten furs in, and because they were generally of an azure (blue) color, the fur in

question came to be blazoned *argent* and *azure*; whilst counter-vair, in which the cups are represented as placed base against base, in place of edge to base, as in *vair* was *or* and *azure*. 5. Potent

FURS.



Potent. Counter-vair. Vair. Ermine.

and counter-potent, which are supposed to resemble the heads of crutches, placed differently, but having the same tinctures—viz., *azure* and *argent*.

FÜRST, JULIUS, a distinguished orientalist of Jewish parentage, was born 12th May 1805, at Zerkowa, in the grand-duchy of Posen, Prussia, where his father was Lecturer on Circumcision in the synagogue. F. was educated for the rabbinical profession, and displayed at a very early age a most remarkable power of acquiring knowledge. He studied at Berlin, where the German philosophy made sad havoc of his previous convictions. The conflict in his mind between science and rabbinical lore ended, in 1829, in the defeat of the latter, and F. immediately proceeded to Breslau, where he continued his oriental, theological, and antiquarian studies, which were completed at Halle in 1831, under Gesenius, Wegscheider, and Tholuck. In 1833 he went to Leipzig, where he became professor in the university in 1864. Among his numerous and valuable writings may be mentioned *Lehrgebäude der Aramäischen Idiome* (System of Aramaic Idioms, Leip. 1835), a work which brought the Semitic languages within the sphere of comparative grammar, then in its infancy, and which, besides, sought to establish a system of analytic-historic investigation in regard to these languages themselves; *Perlenschnüre Aramäischer Gnomén und Lieder* (Pearl-strings of Aramaic Gnomes and Songs, Leip. 1836), with elucidations and glossary; *Concordantie Librorum Sacrorum Veteris Testamenti Hebraice et Chaldaice* (Concordances of the Sacred Books of the Old Testament in Hebrew and Chaldaic, Leip. 1837–1840), a work of indefatigable industry and careful research, which has obtained for its author a great reputation both in Germany and other countries; *Ari Nohem* (Leip. 1840), a polemical treatise on the genuineness of the Sohar and the worth of the Cabbala; *Die Sprüche der Väter* (The Sayings of the Fathers, Leip. 1839); *Die Israelitische Bibel* (The Hebrew Bible, Berlin, 1838), translated into German from the original, by himself, in conjunction with other scholars; *Der Orient; Berichte, Studien und Kritiken für Jüdische Geschichte und Literatur* (The East; Notices, Studies, and Criticisms in connection with Jewish History and Literature, Leip. 1840); *Die Jüdischen Religionsphilosophen des Mittelalters* (The Jewish Religious Philosophers of the Middle Ages, Leip. 1845); *Geschichte der Juden in Asien* (History of the Jews in Asia, Leip. 1849); *Bibliotheca Judaica* (1849–1853); *Hebräisches und Chaldaisches Handwörterbuch* (Hebrew and Chaldaic Manual, Leip. 1851–1854); and an edition of Winer's *Chaldee Reading-Book* (1864). He died in 1873.

FÜRSTENWALDE, a small walled town of Prussia, in the province of Brandenburg, on the right bank of the Spree, 30 miles east-south-east of Berlin. It has a brick church of the 14th c., the *Marienkirche*, which contains a fine Gothic *Sacramentshäuschen* (or pyx for keeping the host), built of sandstone, and dating from 1510. F. manufactures linens and woollens, and carries on some trade by river. Pop. (1880) 10,781.

FÜRTH, a flourishing manufacturing town of Bavaria, in Middle Franconia, is situated at the confluence of the Rednitz and the Pegnitz, about 5 miles north-west of Nürnberg, with which it is connected by a railway, laid out in 1835, and the first that was completed in Germany. It has numerous churches, synagogues, a town-hall, theater, &c. It is the most industrious and most prosperous manufacturing town of Bavaria; its mirrors, chandeliers, snuff-boxes, lead-pencils, its brass and wood wares, and its articles of dress, are famous. The making of metallic leaf, and the manufacture of articles in bronze, are most important branches of industry. F. also produces pinchback rings, watch-keys, brass nails, spectacles, and optical instruments, in great abundance. An annual fair, lasting fourteen days takes place at Michaelmas. Pop. (1880) 31,063, of whom 4000 are Jews, and the rest Protestants. F. first appears in history about the beginning of the 10th c., when it belonged to the archbishops of Bamberg. Subsequently it acknowledged the authority of the Burgrafs of Nuremberg. In 1634, during the Thirty Years' War, the Austrian Croats burned it to the ground. In 1680, a great fire almost laid it in ashes again. It first began to attain importance as a seat of manufactures in the latter half of the last century.

FURY AND HECLA STRAIT, lying in lat. 70° N., and long. from 82° to 86° W., separates Melville Peninsula on the south from Cockburn Island on the north, and connects Fox's Channel on the east with the Gulf of Boothia on the west. It is of no value whatever as a means of communication, nor is ever likely to be so, its western entrance having been ascertained by Captain Parry, who discovered it, on his second voyage, to be impenetrably closed from shore to shore by the accumulated ices of many years. It is traversed from west to east by a strong current, which passes down Fox's Channel into Hudson's Strait.

FURZE (*Ulex*), a genus of plants of the natural order *Leguminosae*, sub-order *Papilionaceae*, distinguished by a two-leaved calyx with a small scale or bractea on each side of the base, stamens all united by their filaments, and a turgid pod scarcely longer than the calyx. The **COMMON F.** (*U. Europaeus*), also called **WHIN** and **GORSE**, is a shrub about two or three feet high, extremely branched; the branches green, striated, and terminating in spines; the leaves few and lanceolate; the flowers numerous, solitary, and yellow. It is common in many of the southern parts of Europe and in Britain, although it does not reach any considerable elevation on the British mountains, and often suffers from the frost of severe winters; whereas in mild seasons its flowers may be seen all winter, so that there is an old proverb, 'Love is out of season when the furze is out of blossom.' It is scarcely known in any of the northern parts of Europe; and Linnaeus is said to have burst into exclamations of grateful rapture when he first saw a common covered with F. bushes glowing in the profusion of their rich golden flowers. F. is sometimes planted for hedges, but is not well suited for the purpose, occupying a great breadth of ground, and not readily acquiring sufficient strength; besides, it does not, when cut, tend to acquire a denser habit. It is useful as affording winter food for sheep, and on this account is burned down to the ground by sheep-farmers when its stems become too high and woody, so that a supply of green succulent shoots may be secured.

In some parts of Wales, F., chopped and bruised, forms the principal part of the winter fodder of horses. In some places, it is sown to yield green food for sheep or other animals, but is preferable to other green crops only on dry sandy soils, where they could not be advantageously cultivated. It is most extensively cultivated in Flanders. It is chopped and bruised by means of a mallet, one end of which is armed with knife-blades; or by means of a simple machine, called a gorse-mill.—A double-flowering variety is common in gardens. A very beautiful variety, called **IRISH F.**, because originally found in Ireland (*U. strictus* of some botanists), is remarkable for its dense, compact, and erect branches. A dwarf kind of F. (*U. nanus*) occurs in some places, and is perhaps also a mere variety; if so, there is only one species known.

In fox-hunting countries, F. is encouraged on account of the excellent cover it affords. It is also a favorite cover for rabbits.

FUSARO, LAKE OF, a small lake of South Italy, in the province of Naples, 11 miles west from Naples, on the peninsula of Baiæ. It is not far from the site of the ancient Cumæ, of which it is supposed to have been the port. Numerous remains of massive buildings, villas, and tombs are still to be seen in the neighborhood. At the southern extremity of the lake is a canal of Roman construction, communicating with the sea, now known as the *Foce del Fusaro*. The water of the lake is brackish, more salt than fresh. The lake is famous for its oysters, which have been cultivated here (see **OYSTER**) since the times of the ancient Romans. They are larger and of finer flavor than those of the Bay of Naples. The lake is supposed to be the crater of an extinct volcano; and, in 1838, great quantities of noxious gases were emitted, by which the oysters of the lake were killed. The lake of F. received from the ancients the name of *Acherusia Palus*, probably at first bestowed on it by the Greeks of Cumæ in consequence of its proximity to Avernus, and its crater-like character. In the later times of the Roman Empire, however, its banks were adorned with the villas of wealthy Romans.

FUSE, **FUSEE**, a tube of wood or metal, perforated down the side with a vertical row of holes, and used for firing shells. The tube is filled with a composition of nitre, sulphur, and gunpowder, which will burn gradually. The distance between each hole representing a second, the range and time of flight are computed, and that hole is left open which will communicate the fire in the fuse to the loaded shell at the moment the latter touches the ground after being discharged. Of course, when combustion reaches this aperture, the shell is burst by the explosion of the contained gunpowder, and scattered around in numerous fragments. Fuses constructed on a similar principle are used in exploding military mines (q. v.).

FUSEL or **FOUSEL OIL**, known as a **POTATO SPIRIT**, is a frequent impurity in spirits distilled from fermented potatoes, barley, rye, &c., to which it communicates a peculiar and offensive odor and taste, and an unwholesome property. Being less volatile

than either alcohol or water, it accumulates in the last portions of the distilled liquor. According to Liebig, it is principally formed in the fermentation of alkaline or neutral liquids, while it never occurs in acidulous fermenting fluids which contain tartaric, racemic, or citric acid. It mainly consists of a substance to which chemists have given the name of amylic alcohol, whose composition is represented by the formula $\text{HO}, \text{C}_{10}\text{H}_{19}\text{O}$. It is a colorless limpid fluid, which has a persistent and oppressive odor and a burning taste. It is only sparingly soluble in water, but may be mixed with alcohol, ether, and the essential oils in all proportions. Any spirit which produces a milky appearance, when mixed with four or five times its volume of water, may be suspected to contain it.

Fusel oil is principally sold in this country for the purpose of yielding pear essence for the so-called jargonelle-drops; it has likewise been patented as a solvent for quinine; and according to Liebig, it is sometimes employed in lighting distillery buildings.

FUSELI, HENRY, the second son of John Caspar Fuseli, or Fuessli, a portrait-painter, and author of *Lives of the Swiss Painters*, was born at Zurich in 1742. He studied in his native town and at Berlin, travelled with Lavater in 1761, and then went to England, where, by Reynolds's advice, he devoted himself to art. In pursuance of this object, he proceeded to Italy in 1770, where he remained for eight years, studying in particular the works of Michael Angelo and in 1778 returned to England. In 1790 he was elected a member of the Royal Academy, where, nine years later, he became professor of painting. He died at Putney Hill, near London, 16th April 1825, and was buried beside his friend, Sir Joshua Reynolds, in St. Paul's. His most remarkable works are 'The Ghost of Dion,' from Plutarch; 'Lady Macbeth,' 'Hercules and the Horses of Diomedes,' and his 'Milton's Gallery,' comprising 47 designs from *Paradise Lost*. F.'s imagination was bold, but coarse; he had more genius than art; and his execution was often spasmodic in the extreme. His art criticism, however, strange to say, ranks among the best in the language. His literary works, with a narrative of his life, were published by Knowles (3 vols., London, 1831).

FUSIBILITY. With few exceptions, all solids which can bear a high temperature without undergoing chemical change, may be melted. Many substances which are popularly regarded as infusible—as, for example, platinum and flint—readily fuse before the oxyhydrogen blow-pipe, or between the poles of a powerful galvanic battery; even carbon has been partially fused by the last-named means. There are many substances which cannot be melted because they are decomposed by the action of heat. Thus, wood and many other organic compounds are decomposed into certain gases, which escape, and into carbon and fixed salts, which are left. Similarly, carbonate of lime (chalk) is decomposed into carbonic acid gas and lime at a temperature below its fusing-point. If, however, we prevent the gas from escaping by confining the carbonate of lime in a hermetically closed gun-barrel, it can be melted at a high furnace-heat.

A table of 'The Order of Fusibility of the Metals' is given by Miller in his *Elements of Chemistry*, 2d edition, vol. ii. p. 294.

FUSING AND FREEZING POINTS are terms applied to the temperature at which solids assume the liquid form, and liquids become solid. The following table gives some of the best determinations of the fusing-point:

Mercury.....	—39°	Alloy (1Sn,2Bi).....	286°
Oil of vitriol.....	—30°	“ (3Sn,2Pb).....	333°
Bromine.....	9°·5	Tin.....	451°
Oil of turpentine.....	14°	Bismuth.....	512°
Ice.....	32°	Nitrate of soda.....	591°
Lard.....	91°	Lead.....	620°
Phosphorus.....	111°·5	Nitrate of potash.....	642°
Potassium.....	136°	Zinc.....	773°
Yellow wax.....	143°·6	Antimony, (about).....	900°
Stearic acid.....	158°	Silver.....	1773°
Sodium.....	207°·7	Copper.....	1996°
Fusible metal (5Pb,3Sn,8Bi).....	212°	Gold.....	2016°
Iodine.....	226°·4	Cast iron.....	2786°
Sulphur.....	239°	Wrought iron, higher than.....	3280°

We see from this table that alloys may have a fusing point far below that of any of the metals which enter into their composition. Similarly, mixtures of various silicates, fuse at a temperature far below that which is required to melt any one of them, and the same remark applies to mixtures of various chlorides, carbonates, &c.

Most solids when heated to their fusing-point, change at once into perfect liquids; but some—as, for example, platinum, iron, glass, phosphoric acid, the resins, and many others—pass through an intermediate pasty condition before they attain perfect fluidity, and, in these cases, it is difficult, if not impossible, to determine the exact fusing point. This intermediate condition is termed

vitreous fusion, because it is a characteristic property of glass. It is in this intermediate state that glass is worked, and iron and platinum forged.

As a general rule, the freezing-point is the same as the fusing-point—that is to say, if a substance in the liquid form be cooled below the fusing-point, it again becomes solid; but there are cases in which we can cool a liquid several degrees below its fusing-point; thus, by keeping water perfectly still, we can cool it to 5°, or even to 1°·4 before it freezes. If, however, we drop a solid body into water in this condition, or if we shake the vessel containing it, congelation begins at once, and the temperature rises to 32°. This phenomenon is exhibited to a still greater degree in viscid fluids, like the oils. It is well known that the freezing-point of water is depressed by the presence of salts. Thus, sea-water freezes at about 26°·6, and a saturated solution of common salt must be cooled as low as 4° before freezing. Despretz has given the freezing-points of various saline solutions at different degrees of concentration in the fourth volume of the *Comptes Rendus*, p. 435.

FUSIBLE METAL. Fusible metal is composed of 2 parts of bismuth, 1 of lead and 1 of tin. It fuses at 201° F., becoming pasty before it completely melts. It expands in a very anomalous manner; its bulk increases regularly from 32° to 95°; it then contracts gradually to 131°; it then expands rapidly till it reaches 176°, and from that point till it melts, its expansion is uniform. The faculty of expanding as it cools, while still in a comparatively soft state, renders the alloy very serviceable to the die-sinker, who employs it to test the accuracy of his die, every line being faithfully reproduced in the cast made of the alloy. The proportions of the three metals are sometimes varied, and another formula is given in the table in FUSING AND FREEZING POINTS.

FUSIL (Fr. *fusée*, a spindle) is represented heraldically as longer and more acute than a Lozenge (q. v.).

FUSILIER'S were formerly soldiers armed with a lighter fusil or musket than the rest of the army; but at present all regiments of foot carry the improved rifle. Fusilier is therefore simply a historical title borne by a few regiments—viz., the Scots Fusilier Guards, the 5th Northumberland, 7th Royal, 21st North British, 23d Welsh, 87th Irish, 101st and 104th Bengal, 102d Madras, and 103d Bombay Fusiliers.

FU'STIAN, a cotton fabric having a pile like velvet, but shorter, and which is manufactured in nearly the same manner as velvet—viz., by leaving loops standing upon the face of the fabric, and then cutting them through so as to form upright threads, which are afterwards smoothed by shearing, singeing, and brushing. See VELVET; also MOLESKIN AND CORDUROY.

FUSTIC, a name given to two kinds of dye-wood used for producing a yellow color, and with chemical additions, other colors, such as brown, olive, and green. The French name *Fustec* seems to be connected with *Fustet*, a kind of sumach found in the south of Europe; and to have been transferred to a very different plant, the *Maclura tinctoria* of Don, or *Morus tinctoria*, a tree of the natural order *Moraceæ*, a native of the West Indies, Mexico, Brazil, Columbia, &c. The fustic is a large and handsome tree, the wood is of a greenish-yellow color, and is sometimes used in mosaic-cabinet-work and turning, but chiefly in dyeing. About 10,000 tons are imported annually into Britain. The tree is particularly abundant in Campeachy. The wood contains a great quantity of coloring matter, which forms the most durable of vegetable yellow dyes; but as the color is rather dull, it is more used for producing other colors. The name OLD FUSTIC is sometimes given to it, and YOUNG FUSTIC to the wood of *Rhus cotinus*. These terms began to be employed about the beginning of last century, from the mistaken notion that the one, in small pieces, was the wood of the young tree, and the other, in comparatively large logs, of the same tree in a more mature state.—The OSAGE ORANGE (q. v.) of North America (*Maclura aurantiaca*) is nearly allied to old fustic, and its wood also affords a yellow dye.

OLD FUSTIC, or Yellow Wood, is employed for dyeing woollens yellow, and also to impart to them green and olive colors when mixed with indigo and salts of iron. It furnishes a yellow coloring matter, which may be obtained in crystals by evaporating its watery solution. This substance is termed moritannic acid, and its composition is represented by the formula $\text{C}_{20}\text{H}_{16}\text{O}_{20}$. The bichromates of potash and of lead have to a great degree superseded the use of OLD FUSTIC.

YOUNG FUSTIC is the wood of *Rhus cotinus* or *Venetian sumach*. It contains a yellow coloring matter, to which the name *Fusteric* has been given. It is generally used in combination with other dyes in order to strike some particular tint.

FUSUS (Lat. a spindle), a genus of gasteropodous molluscs nearly allied to *Murex* (q. v.), having a spindle-shaped shell, with a very elevated spire, the first whorl often much dilated, and a straight elongated canal. The whorls are not crossed by varices, as in *Murex*. The species were formerly, however, included in

that genus. About 100 existing species have been described, and more than threetimes that number of fossil ones. The existing species are distributed over the whole world, living generally on muddy and sandy sea-bottoms at no great depths. *F. antiquus* is known in the south of England as the RED WHELK, and in Scotland as the ROARING BUCKIE, from the continuous sound—as of waves breaking on the shore—heard when the empty shell is applied to the ear. In the cottages of Zetland, the shell, generally about six inches long, is used for a lamp, being suspended horizontally by a cord, its cavity containing the oil, and the wick passing through the canal. This mollusc is often dredged up with oysters. It is eaten by the poor, but is more generally used as bait for cod, skates, &c.

This genus makes its first appearance in the Oolite, in which 10 species have been noticed. The numbers increase to 35 in the Cretaceous rocks, to 100 in the Eocene, and to 150 in the Miocene and Pliocene.

FUTAK, a town of Lower Hungary, in the county of the Lower Baes, is situated on the left bank of the Danube, in lat. 45° 15' N., and long. 19° 42' W. It has a beautiful castle and garden, and the inhabitants grow vegetables and tobacco extensively. F. has a great trade in corn, and has a fair in November, frequented by merchants from Turkey, Greece, and Armenia. Pop. (1880) 5367.

FUTEHGU'NGE (in English, *Victory Market*) is the name of two places in Rohilkund, the scenes respectively, as the name implies, of two battles gained by the British over the Rohillas.—1. *Eastern F.*, a town of the district of Bareilly, is situated near the right bank of the Bhagal, in lat. 28° 4' N., and long. 79° 42' E. The action, from which this spot is designated, was fought in 1774, giving to the Nawab of Oude, then an ally of the English East India Company, a large part of Rohilkund; and it was, in fact, to commemorate that event, that Eastern F. was built by that prince.—2. *Western F.*, a town also of the district of Bareilly, is situated in lat. 28° 28' N., and long. 79° 24' E. The conflict that distinguished this locality occurred in 1796. The only eminence in the neighborhood, the most hotly contested point in the struggle, bears twofold testimony to the story, in the memorials of those who fell—a plain and simple monument of fourteen British officers, and a carved and minareted tomb of two Rohilla chieftains.

FUTTEHPUR, a town of the Doab, N.-W. Provinces, on the great trunk-road between Calcutta and Delhi, stands in lat. 25° 51' N., and long. 80° 54' E., 70 miles north-west of Allahabad, and 50 miles to the south-east of Cawnpore. It is a thriving place, with (1871) 20,478 inhabitants. Besides the buildings belonging to the civil establishment of the district of its own name, it contains a small but very elegant mosque.

FUTTEHPUR, the district of which the town of the preceeding article is the capital, lies wholly within the Doab, and occupies its entire breadth from Jumna to Ganges. It extends immediately to the west of the district of Allahabad, in lat. from 25° 25' to 26° 13' N., and in long. from 80° 12' to 81° 23' E., containing 1583 square miles, and (1871) 663,815 inhabitants. It yields large quantities of cotton, and by means of its bordering rivers, and a branch of the Ganges Canal, it possesses considerable facilities for inland navigation.

FUTTUHA, or FUTWA, a town of (1871) 11,295 inhabitants, in the district of Patna, and presidency of Bengal, stands at the confluence of the Punpun and the Ganges, in lat. 25° 30' N., and long. 85° 22' E. As the Ganges is here deemed peculiarly sacred, F. is, at certain seasons of the year, the resort of vast numbers of pilgrims.

FUTTYGU'RH, the military cantonment of Furruckabad, stands about three miles to the east of that city, on the opposite or left bank of the Ganges, being in lat. 27° 22' N., and long. 79° 41' E. Its name became peculiarly famous, or rather infamous, in the mutiny of 1857, less, however, for the outbreak that occurred on the spot, than for the unparalleled sufferings of the hapless fugitives—men, women, and children. Pop. (1871) 10,335.

FUTTYPU'R, a town in the district of Saugur, and chief-commissionership of the Central Provinces, stands on the Union, a tributary of the Nerbudda, about 20 miles from the point of junction, being in lat. 22° 38' N., and long. 78° 38' E. It is a place of some importance, as being the residence of three Gond rajahs.

FUTURE DEBT is a debt wherein the obligation to pay and the time for payment is fixed and certain, but the day for performance has not arrived. Of such a debt, it was said in the civil law *dies cedit etsi nondum venerit*; and it was distinguished from

a contingent debt, i. e., a debt payable on the performance of a condition which was uncertain, in which it was said *dies nec cedit nec venit*. Thus, an obligation to pay six months hence is a future debt; an obligation to pay 'if my ship returns from Spain,' is contingent. In the event of the death or bankruptcy of a person having large commercial transactions, it is often of great importance that the right of the holders of such securities should be accurately fixed. In Rome, on the death or bankruptcy of a citizen, a creditor holding a claim for a future debt was entitled to payment, deducting a percentage proportionate to the date at which his debt was payable; but a contingent creditor only received a security for payment in case his debt should become payable. This general principle has been introduced into the legal systems of modern states. In Holland and in France, the rights of creditors having claims not immediately payable are based upon the rule of the civil law.

In England, a future debt, in order to found a valid claim, must be in writing, but it may be constituted by bond, bill, or note or other security. By common-law, such a claim could not be enforced until the actual time for payment has arrived; and formerly, in case of bankruptcy, a creditor on a debt of this kind was not allowed to insist in his claim. At the same time, the bankrupt's discharge was held not to release him for a debt which had not been admitted to claim in the process; and hence debtors were sometimes incarcerated for years on debts which they were wholly unable to discharge. See IMPRISONMENT FOR DEBT. This state of things was productive of manifest injustice on both debtor and creditor; on the latter, by excluding him from insisting in his claim at a time when he might have obtained a partial payment; on the former, by punishing him for his default when he was deprived of the means of making any return. The subject was frequently discussed in parliament before a remedy was applied. At last, by 6 Geo. IV. c. 16, s. 51, it was enacted that, in cases of bankruptcy, where a debt was not immediately payable, the creditor should be entitled to prove his debt and receive a dividend, deducting interest at 5 per cent. for the period which was to elapse before the date when the debt was payable in due course. By s. 56, debts payable on a contingency might be valued, and a dividend paid on the estimated value. Similar provisions were inserted in the 12 and 13 Vict. c. 196, ss. 172 and 177. By the last bankruptcy act, 24 and 25 Vict. c. 134, s. 153, it is enacted that a person having a claim for unliquidated damages, which are of the nature of a future debt, may have his claim assessed by a jury either in the court of equity, or before a common-law judge, or, in case of agreement between the parties, by the court without a jury.

By the common law of Scotland, the rule of the civil law, as to the rights of creditors having a future claim, has always been recognized. In the event of bankruptcy, creditors in both future and contingent debts are allowed to rank, but the latter only to the extent of receiving a security until the condition is purified. But by 19 and 20 Vict. c. 79, s. 53, which is now the ruling statute as to bankruptcy in Scotland, contingent creditors may have their debts valued, and may vote in the Sequestration (q. v.), and draw dividends proportionate to the valuation. It is also enacted, s. 14, that all creditors whose debts are not *contingent* may concur in the petition for bankruptcy. But the Scotch law affords to future debtors a further privilege, unknown to the system of the sister-country—viz., that of arrestment in security, whereby a creditor having a future claim is enabled, in case his debtor seem to be wilfully diminishing his means of discharging his debt, to attach the goods of the debtor as a security for the payment of his debt. See ARRESTMENT.

FYNE, LOCH, an arm of the sea running north and north-east from the Sound of Bute in the south of Argyshire, to beyond Inverary, in the north, and is bounded by the district of Cowal on the E., and by those of Argyre, Knapdale, and part of Cantire on the W. It is 43 miles long, 2 to 10 miles broad, and 40 to 70 fathoms deep. Its shores are deeply indented, and bordered by low bare hills, which rise higher and are wooded near Inverary. On the west side, it sends off a small branch leading to the Crinan Canal. Loch F. is celebrated for its herrings.

FYZABA'D, a rapidly decaying city of Oude, stands on the right bank of the Ghogra, here a navigable river, in lat. 26° 47' N., and long. 82° 10' E. Originally an appendage, as it were, of Ayodha or Oude, the ancient capital from which the country took its name, F. became, in 1730, itself the seat of government. But in 1775, immediately after the annexation of part of Rohilkund (see FUTEHGU'NGE), it was supplanted by Lucknow, which lay about 90 miles to the west, in the direction of the newly acquired territory. Pop. (1871) 37,804.

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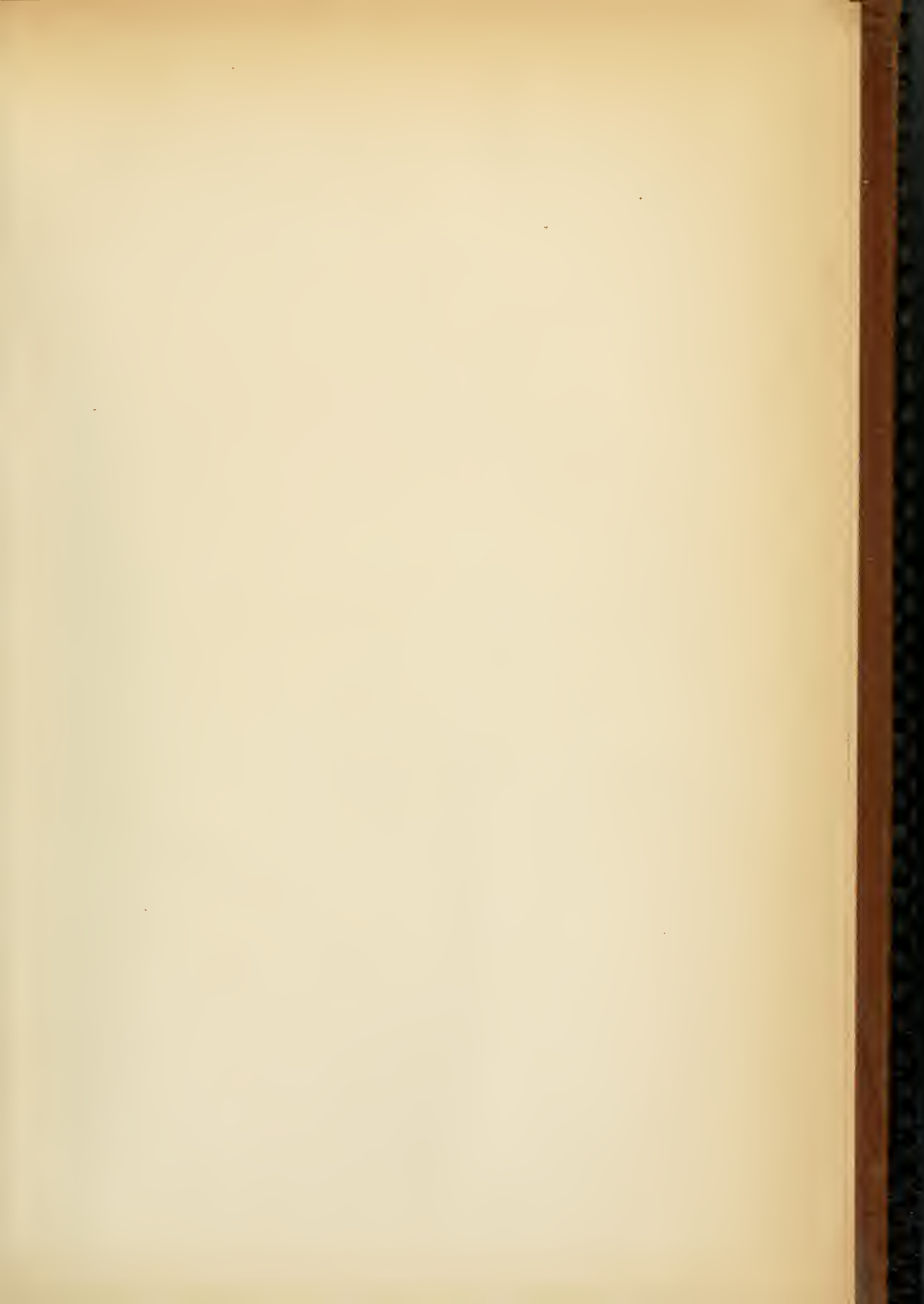
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